OKLAHOMA
STATE DEPARTMENT of EDUCATION
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STATE SUPERINTENDENT of PUBLIC INSTRUCTION

Oklahoma End-of-Instruction Assessments (OK EOI)

2015–16 TECHNICAL REPORT

measured progress

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CHAPTER 1 OVERVIEW OF THE OKLAHOMA END-OF-INSTRUCTION ASSESSMENTS

1.1 PURPOSE OF THE OKLAHOMA END-OF-INSTRUCTION ASSESSMENTS

The Oklahoma End-of-Instruction (EOI) assessments require that students who complete an area of instruction must take the corresponding standardized test. Each test has the purpose of measuring each student's knowledge relative to the Oklahoma Academic Standards (OAS), Oklahoma's content standards (Appendix A). These tests are part of the Achieving Classroom Excellence (ACE) legislation passed in 2005 and amended in 2006, which outlines the curriculum, the competencies, and the testing requirements for students to receive a high school diploma from the State of Oklahoma. Algebra I, English II, Biology I, and U.S. History were existing tests in the program with Algebra II, Geometry, and English III added as operational tests for the 2007–08 testing cycle. The spring 2009 administration was the first administration with graduation requirements attached to them for the incoming freshmen students. In order to graduate with a high school diploma from the State of Oklahoma, these students, as well as future incoming freshmen students, are required to score proficient or above to show understanding of key Oklahoma Academic Standards on the standardized assessments for Algebra I and English II, as well as score proficient or above in two of the following five standardized test assessments: Algebra II, Biology I, English III, Geometry, and U.S. History. Students who fail to earn a proficient score are given several opportunities to retake these tests throughout the year.

All Oklahoma secondary-level students, enrolled in a regular education program and completing instruction in Algebra I, Algebra II, Biology I, Geometry, English II, English III, and U.S. History, must take the corresponding Oklahoma Core Curriculum Tests End-of-Instruction (OCCT EOI) tests. The OCCT EOI tests are administered mainly online, although paper and pencil versions are available if needed. All EOI testing administrations have one writing prompt for English II and English III for 2015–16. These EOI standardized assessment tests are administered in the winter/trimester, spring, and summer, including form variations other than operational (OP), as Braille (BR), retest (RT), and equivalent (EQ) forms.

In fall 2014, Measured Progress was contracted by the Oklahoma State Department of Education (SDE) to develop, administer, and maintain the Oklahoma School Testing Program (OSTP) OCCT, and Oklahoma Modified Alternate Assessment Program (OMAAP) for ACE EOI. This technical report provides objective information regarding technical aspects of the Oklahoma OCCT EOI assessments used in 2015–16 by specifying the technical details of the work accomplished from summer 2015 through the end of spring 2016 on these tests. This volume is intended to be one source of information for Oklahoma K–12 educational stakeholders (including testing coordinators, educators, parents/guardians, and other interested citizens) about the development, implementation, scoring, and technical attributes of the OCCT EOI assessments.

Other sources of information regarding the OSTP-ACE EOI tests include the *OSTP 2015–16 Test Preparation Manual,* interpretation manuals, implementation materials, and training materials for administrators, schools, and teachers; and guides for teachers, students, and parents/guardians found at ok.gov/sde/assessment-administrator-resources-administrators. Technical manuals from previous assessment administrations may be found at (sde.ok.gov/sde/documents/2014-08-29/occt-technical-manuals-archive).

The 2015 OCCT EOI assessments for summer, 2015-16 EOI assessments for the winter trimester, and the EOI assessments for the spring 2016 for Algebra I, Algebra II, Biology I, Geometry, English II, English III, and U.S. History were developed by Measured Progress in collaboration with the Oklahoma SDE and were administered by the SDE.

1.2 Purpose of This Report

This report summarizes the research data analyses conducted on the OCCT EOI 2015–16 test administrations and provides data evidences in support of the test validity and reliability of the tests, and the overall technical soundness of the assessment.

The OSTP was established to improve academic achievement for all Oklahoma students, and it also meets the requirements of the No Child Left Behind (NCLB) Act (US DOE, 2002), which was introduced by the federal government in 2001. Note that in 2016 NCLB was replaced by the Every Student Succeeds Act (ESSA), which goes into effect 2017. The OSTP is a statewide assessment program that, in an attempt to meet the needs of the students of the State of Oklahoma, encompasses two different assessment types—the OCCT and the Oklahoma Alternate Assessment Program (OAAP), the portfolio assessment for students with the most severe cognitive disabilities. (Note: The OMAAP program was phased out in spring 2013 for first-time test takers and is only available to students with a previous End-of-Instruction OMAAP score for ACE purposes. The OMAAP program will be completely phased out after the spring 2016 test administration.)

The State of Oklahoma tests are used to assess student achievement; target student, classroom, and program improvement; and inform parents/guardians of student progress. The administration of the OCCT, OMAAP, and OAAP tests fulfills the NCLB Act and state mandates for testing mathematics and reading, and the test results are used for federal accountability. The scope and general administration of the OSTP is outlined in state law 70 O.S. § 1210.505. Rules that govern the specifics of test administration and other details are available under Oklahoma Administrative Code (OAC) 210:10-13.

English II, English III, Algebra I, Algebra II, Geometry, Biology I, and U.S. History are given as EOI tests in high school. All students must take the OCCT for content areas in which a modified assessment is not available. The Department of Special Education oversees the implementation of the OAAP, or portfolio assessment, which includes all grades 3–8 content areas and EOI for Algebra I, Algebra II, Biology I, Geometry, U.S. History, English II, and English III based on the grade level of the student.

This document serves to provide detailed descriptions and evidence of reliability and validity of the OCCT EOI, a component of the Oklahoma assessment system. The psychometric soundness of the assessment and the validity evidence is reflected in the work done by the Oklahoma SDE and in the process of the OCCT development. The reliability and validity evidence of OCCT can be found in the development of the Priority Academic Student Skills (PASS), most recently the OAS, the development of the OSTP items and operational test form, the review of the alignment of the content to the test, the administrations of the test, the machine-scoring and hand-scoring of student responses, the setting of cut scores, and the psychometric analyses (Barton, 2007). Details on the reliability and validity of the assessments are provided in separate chapters of this report. Note that Oklahoma TAC members also reviewed this document for technical quality, accuracy, and completeness.

1.3 Organization of This Report

This report includes data and analysis results on the operational forms in the winter/trimester 2015–16 and spring 2016 administrations. Descriptions of the Oklahoma content standards are provided in sections 3.2.1 (English II & English III), 3.3.1 (Mathematics), 3.4.1 (Science), and 3.5.1 (Social Studies). All operational and field-test items for the OCCT EOI winter/trimester 2015–16 and spring 2016 were subjected to cycles of reviews by the SDE and Measured Progress. The item development and alignment process and test development are detailed in Chapter 3—Test Design and Development. The test administrations processes for PBT and CBT can be found in Chapter 4—Test Administration. Discussion of the operational population and the research samples utilized in the analysis is found in Section 3.6—Test Development Process. Chapter 5 of this report describes in detail the processes that were implemented to monitor the quality of the hand-scoring of student responses for short-answer and constructed-response items.

The winter/trimester 2015–16 OCCT EOI scores were based on a pre-equating design. The spring 2016 OCCT EOI scores were based on a pre-equating design for Algebra I, Algebra II, Biology I, English II, English III, and Geometry, where full post-equating analyses were conducted for U.S. History. The winter/trimester 2015–16 and spring 2016 OCCT EOI operational and field-test items were analyzed and processed separately. Complete descriptions of both the operational and field-test item analyses and the calibration/scaling and equating analyses are found in Chapter 6—Classical Item Analysis and Chapter 7—Item Response Theory Scaling and Equating. Summary of reliability and validity for different levels of analyses are found in Chapter 8—Reliability and Chapter 10—Validity. A summary of reporting is including in Chapter 9.

CHAPTER 2 CURRENT YEAR UPDATES

In 2015–16, the OCCT for EOI was administered by Measured Progress. This was the second year that MP did the administration of the OCCT for the SDE. Since new standards are under development, there was no new development of items to the Priority Academic Student Skills (PASS) standards. Field-test slots were filled using existing items.

The items, test maps, testing times, and instructions for administration remained essentially the same from the previous year's administration. Technical manuals from previous assessment administrations may be found at sde.ok.gov/sde/documents/2014-08-29/occt-technical-manuals-archive.

CHAPTER 3 TEST DESIGN AND DEVELOPMENT

3.1 TEST SPECIFICATIONS

3.1.1 Criterion Reference Test

Items on the Achieving Classroom Excellence (ACE) End-of- Instruction (EOI) tests were developed specifically for Oklahoma and are directly linked to the Oklahoma Academic Standards (OAS). These are the basis for the reporting categories developed for each content area and are used to help guide the development of test items. Each item is designed to measure a specific standard and objective. Existing blueprints and test specifications were developed by previous vendors.

3.1.2 Item Types

Multiple-choice items were administered for English II, English III, Algebra I, Algebra II, Geometry, U.S. History, and Biology. Each item requires approximately one minute for most students to answer. This item type affords efficient use of limited testing time and allows coverage of a wide range of knowledge and skills.

In the English II and English III tests, students also composed an extended response to a prompt. Responses were scored on the development and organization of ideas, the appropriateness and precision of word choices, the structure and coherence of paragraphs, and the understanding and usage of standard English conventions.

Previous test items released for public use are provided by the SDE (see www.ok.gov/sde/documents/2013-09-05/blueprints-plds-item-specs).

3.1.3 Description of Test Design

The ACE EOI tests are structured using both core (or operational) and matrix items. Core items are taken by all students in a given grade level. Student scores are based only on core items. Matrix items are new items included on the test for field-test purposes. In addition, field-test items are divided among the multiple forms of the test for each grade and content area. Five test forms were administered for each grade and content area. Each student takes only one form of the test and therefore answers a fraction of the field-test items. Field-test items are not distinguishable to students and have a negligible impact on testing time. Because all students participate in the field test, an adequate sample size is provided to produce reliable data that can be used to inform item selection for future Oklahoma EOI tests.

3.2 English II and English III Test Specifications

3.2.1 Standards

The test framework for English II and English III was based on the OAS, and each item on both tests was designed to measure a specific standard and objective. A list of assessable standards for each course is provided in Table 3-1.

Table 3-1. 2015–16 OK EOI: English II and English III Standards

Reading/Literature	Writing/Grammar/Usage/Mechanics
Standard 1: Vocabulary	Standard 1 and 2: Writing
Standard 2: Comprehension	Standard 3: Grammar/Usage and Mechanics
Standard 3: Literature	
Standard 4: Research and Information	

3.2.2 Item Types

The ACE EOI English II and English III tests include multiple-choice items and one writing prompt. Multiple-choice items require students to demonstrate a wide range of knowledge and skills, taking approximately one minute of response time per item. In addition, both English II and English III tests included one writing prompt. For the English II prompt, students were allotted 55 minutes to complete their response; for the English III prompt, students were given 80 minutes.

3.2.3 Test Design

Table 3-2 summarizes the numbers and types of items that were used in the 2015–16 English II and English III tests. Note that all students received the core items and one set of field-test items. Each multiple-choice item was worth one point. In the English II test, the writing prompt response was worth up to 6 points; in the English III test, the writing prompt response was worth up to 10 points. Two operational forms (A and B) were administered during the spring administration window.

Table 3-2. 2015–16 OK EOI: Composition of the ACE English II and English III EOI Tests

Subject	Operational (OP) Forms (A and B)	Field-Test (FT) Forms	OP Items (per form)	FT Items (per form)	Possible Points (each test form)
English II	2	5	61	10	66
English III	2	5	63	10	72

3.2.4 Blueprints

Table 3-3 summarizes the distribution of emphasis in terms of the ideal percentage of score points allocated to each of the standards on the English II and English III tests. The test blueprints identify the amount of content covered on the tests and are based on the importance and coverage of the OAS in Oklahoma schools. The test blueprints are provided by the SDE (see www.ok.gov/sde/documents/2013-09-05/blueprints-plds-item-specs). The actual number of items and associated score points aligned to each objective can be found in Appendix C. As shown here, the distribution of score points on all of the 2015/16 English I and II operational forms fell within ideal ranges.

Table 3-3. 2015–16 OK EOI: OAS Reading Standards – Distribution of Emphasis in Terms of Target Percentage of Test by Subject

English II Standards	Ideal Percentage	Actual Percentage Winter/Tri 2015	Actual Percentage Spring 2016 Form A	Actual Percentage Spring 2016 Form B
Reading/ Literature				
Vocabulary	9–12%	9%	9%	9%
Comprehension	24–30%	26%	26%	27%
Literature	26–30%	29%	29%	27%
Research and Information	9%	9%	9%	9%
Writing/Grammar/Usage/Mechanics				
Writing	9%	9%	9%	9%
Grammar/Usage and Mechanics	18%	18%	18%	18%
Total	100%	100%	100%	100%

English III Standards	Ideal Percentage	Actual Percentage Winter/Tri 2015	Actual Percentage Spring 2016 Form A	Actual Percentage Spring 2016 Form B
Reading/ Literature				
Vocabulary	8–11%	8%	8%	8%
Comprehension	22–28%	25%	24%	24%
Literature	24–28%	25%	25%	25%
Research and Information	8–10%	8%	10%	10%
Writing/Grammar/Usage/Mechanics				
Writing	14%	14%	14%	14%
Grammar/Usage and Mechanics	19%	19%	19%	19%
Total	100%	100%	100%	100%

3.2.5 Depth of Knowledge (DOK)

Each item on the ACE EOI English II and English III tests is assigned a DOK level according to the cognitive demand of the item. DOK is not synonymous with difficulty. The DOK level rates the complexity of the mental processing a student must use to answer the question. The DOK levels and the percentage of items on the tests at each of the levels by grade are shown in Tables 3-4 and 3-5. As shown in the following tables, the distribution of DOKs for the items on the 2015/16 English I and II operational forms fell within ideal ranges.

Table 3-4. 2015–16 OK EOI: Depth of Knowledge—English II

Depth of Knowledge	Ideal Percentage of Items	Actual Percentage of Items Winter/Tri 2015	Actual Percentage of Items Spring 2016 Form A	Actual Percentage of Items Spring 2016 Form B
Level 1 – Recall and Reproduction	10–15%	12% (7 items)	15% (9 items)	17% (10 items)
Level 2 – Skills and Concepts	60–70%	66% (40 items)	60% (36 items)	60% (36 items)
Level 3 – Strategic Thinking	15–25%	22% (13 items)	25% (15 items)	23% (14 items)

Table 3-5. 2015–16 OK EOI: Depth of Knowledge—English III

Depth of Knowledge	Ideal Percentage of Items	Actual Percentage of Items Winter/Tri 2015	Actual Percentage of Items Spring 2016 Form A	Actual Percentage of Items Spring 2016 Form B
Level 1 – Recall and Reproduction	10–15%	13% (8 items)	13% (8 items)	13% (8 items)
Level 2 – Skills and Concepts	60–70%	69% (43 items)	69% (43 items)	71% (44 items)
Level 3 – Strategic Thinking	15–25%	18% (11 items)	18% (11 items)	16% (10 items)

3.2.5.1 READING DOK DEFINITIONS

Level 1 requires students to recall, observe, question, or represent facts or simple skills or abilities. Requires only surface understanding of text, often verbatim recall. Examples include:

- Support ideas by reference to details in text.
- Use dictionary to find meaning.
- Identify figurative language in passage.
- Identify correct spelling or meaning of words.

Level 2 requires processing beyond recall and observation. Requires both comprehension and subsequent processing of text. Involves ordering, classifying text, as well as identifying patterns, relationships, and main points. Examples include:

- Use context to identify unfamiliar words.
- Predict logical outcome.
- Identify and summarize main points.
- Apply knowledge of conventions of Standard American English.
- Compose accurate summaries.

- Make general inferences and predictions for a portion of text.

Level 3 requires students to go beyond the text. Requires students to explain, generalize, and connect ideas. Involves inferencing, prediction, elaboration, and summary. Requires students to support positions using prior knowledge and to manipulate themes across passages. Examples include:

- Determine effect of author's purpose on text elements.
- Summarize information from multiple sources.
- Critically analyze literature.
- Compose focused, organized, coherent, and purposeful prose.
- Make explanatory and descriptive inferences and interpretations across an entire passage.

Level 4 may require extended higher-order processing. May involve taking information from one text/passage and applying this information to a new task. May require generating hypotheses and performing complex analyses and connections among texts. Examples include:

- Analyze and synthesize information from multiple sources.
- Examine and explain alternative perspectives across sources.
- Create compositions that synthesize, analyze, and evaluate.
- Describe and illustrate common themes across a variety of texts.

3.2.5.2 WRITING/GRAMMAR/USAGE AND MECHANICS DOK DEFINITIONS

- Level 1 requires students to write and speak using standard English conventions, including appropriate grammar, punctuation, capitalization, and spelling.
- Level 2 requires students to be able to connect ideas in writing, construct compound sentences, and use organizational strategies in written work.
- Level 3 requires that students develop compositions that include multiple paragraphs and may include complex sentence structure and demonstrate some synthesis and analysis.
- Level 4 requires that students write multiparagraph compositions that demonstrate synthesis and analysis of complex ideas or themes.

3.2.6 Passage Types

Each English II reading passage will contain identifiable key concepts with relevant supporting details. Passages will be appropriate for determining the purpose for reading, analyzing character traits, compare/contrast, problem/solution, interpretation, analysis, drawing conclusions, making an inference, being conducive for vocabulary analogies, and relevant reading tasks as defined by the OAS for grade 10.

The passages will be well written and include a variety of sentence types and lengths. They may include dialogue, will reflect Oklahoma's cultural diversity, and will possess sufficient structural integrity to allow them to be self-contained. Literary passages will reflect genres studied at the grade 10 level, including essay, short story, novel, drama, narrative, and lyric poetry.

Each English III reading passage will contain identifiable key concepts with relevant supporting details. Passages will be appropriate for students to apply a wide range of strategies to comprehend, interpret, evaluate, and respond to a wide variety of texts. Specific skills include using context to determine word meanings; making inferences and interpretations; and analyzing characteristics, text structures, and content. Passages will be appropriate for relevant reading tasks as defined by the OAS for grade 11.

The passages will be well written and include a variety of sentence types and lengths. They may include dialogue, will reflect Oklahoma's cultural diversity, and will possess sufficient structural integrity to allow them to be self-contained. Literary passages will reflect genres studied at the grade 11 level, including nonfiction, essay, short story, novel, drama, and poetry.

A test form may contain at least two reading selections that will allow students to make comparisons and connections between texts.

All passages will be reviewed to eliminate cultural or other forms of bias that might disadvantage any group(s) of students. The passages will avoid subject matter that might prompt emotional distress. Permission to use selections from copyrighted material will be obtained as necessary.

The majority of the selections used for the EOI test will include authentic literature; a portion may be selected from commissioned works. Selections should not exceed 1,500 words. Each reading passage will generate approximately six to twelve multiple-choice questions from the Oklahoma Academic Standards, including vocabulary, comprehension, literature, and research and information. Each grammar passage will generate approximately six to ten multiple-choice questions from the OAS, including grammar, usage, mechanics, and manuscript conventions.

3.2.6.1 READABILITY

The selected reading passages will be at the appropriate grade level. The readability of all passages is evaluated using three recognized readability formulas. The formulas chosen for each grade level vary according to the purpose for which the formula was developed. Appropriate readability formulas for English II and English III include the Flesch-Kincaid Rating, the Dale-Chall Readability Rating, or any other formulas considered reliable.

In addition, sentence structure, length, vocabulary, content, visuals, and organization are reviewed when selecting appropriate grade-level passages. The teacher committee that reviews passages provides the final decisions in regard to the readability of a passage.

3.3 MATHEMATICS TEST SPECIFICATIONS

3.3.1 Standards

The framework for ACE EOI mathematics assessments was based on the OAS, and each item on the Algebra I, Algebra II, and Geometry EOI tests was designed to measure a specific standard and objective.

The Algebra I objectives are organized into three content standards.

- Standard 1: Number Sense and Algebraic Operations
- Standard 2: Relations and Functions
- Standard 3: Data Analysis, Probability, & Statistics

The Geometry objectives are organized into five content standards.

- Standard 1: Logical Reasoning
- Standard 2: Properties of 2-Dimensional Figures
- Standard 3: Triangles and Trigonometric Ratios
- Standard 4: Properties of 3-Dimensional Figure
- Standard 5: Coordinate Geometry

The Algebra II objectives are organized into three content standards.

- Standard 1: Number Sense and Algebraic Operations
- Standard 2: Relations and Functions
- Standard 3: Data Analysis, Probability, & Statistics

3.3.2 Item Types

The ACE Algebra I, Algebra II, and Geometry EOI tests consisted of a collection of multiple-choice items. Multiple-choice items were administered to provide breadth of coverage of the assessment targets. Because multiple-choice items require approximately one minute for most students to answer, these items make efficient use of limited testing time and allow coverage of a wide range of knowledge and skills. Each multiple-choice item was worth one score point.

3.3.3 Test Design

Table 3-6 summarizes the numbers of multiple-choice items that were used on the ACE Algebra I, Algebra II, and Geometry EOI tests. Note that in mathematics all students received one of the operational test forms (OP) and one set of field-test items (FT). Each multiple-choice item was worth one point.

Table 3-6. 2015–16 OK EOI: Composition of the ACE Algebra I, Geometry, and Algebra II EOI Tests

Subject	OP Forms	FT Forms	OP Items (per form)	FT Items (per form)	Possible Points (each test form)
Algebra I	3	5	55	10	55
Geometry	3	5	55	10	55
Algebra II	3	5	55	10	55

3.3.4 Blueprints

Table 3-7 summarizes the distribution of emphasis in terms of the ideal percentage for each of the standards for the Algebra I, Geometry, and Algebra II tests. The test blueprints identify the amount of content covered on the tests and is based on the importance and coverage of the OAS s in Oklahoma schools. The ideal test blueprints are provided by the SDE (see www.ok.gov/sde/documents/2013-09-05/blueprints-plds-item-specs). The actual number of items aligned to each objective can be found in Appendix C.

Table 3-7. 2015–16 OK EOI: OAS Mathematics Standards – Distribution of Emphasis in Terms of Target Percentage of Test by Subject

Algebra I Standards	Ideal Percentage	Actual Percentage Winter/Tri 2015	Actual Percentage Spring 2016 Form A	Actual Percentage Spring 2016 Form B
Number Sense and Algebraic Operations	27%	27%	27%	27%
Relations and Functions	56%	56%	56%	56%
Data Analysis, Probability, & Statistics	16%	16%	16%	16%
Total	100%	100%	100%	100%

Geometry Standards	Ideal Percentage	Actual Percentage Winter/Tri 2015	Actual Percentage Spring 2016 Form A	Actual Percentage Spring 2016 Form B
Logical Reasoning	11%	11%	11%	11%
Properties of 2-Dimensional Figures	36%	36%	36%	36%
Triangles and Trigonometric Ratios	22%	22%	22%	22%
Properties of 3-Dimensional Figures	18%	18%	18%	18%
Coordinate Geometry	13%	13%	13%	13%
Total	100%	100%	100%	100%

continued

Algebra II Standards	Ideal Percentage	Actual Percentage Winter/Tri 2015	Actual Percentage Spring 2016 Form A	Actual Percentage Spring 2016 Form B
Number Sense and Algebraic Operations	27%	27%	27%	27%
Relations and Functions	56%	56%	56%	56%
Data Analysis, Probability, & Statistics	16%	16%	16%	16%
Total	100%	100%	100%	100%

3.3.5 Depth of Knowledge

Each item on the ACE EOI mathematics test is assigned a DOK level according to the cognitive demand of the item. DOK is not synonymous with difficulty. The DOK level rates the complexity of the mental processing a student must use to answer the question. The description of the DOK levels and the percentage of items on the tests at each of the levels by course are shown in Tables 3-8 through 3-10.

The difference in the tables between the Ideal Percentages and the Actual Percentages is due to the constraints of the current item bank.

Table 3-8. 2015–16 OK EOI: Depth of Knowledge—Algebra I

Depth of Knowledge	Ideal Percentage of Items	Actual Percentage of Items Winter/Tri 2015	Actual Percentage of Items Spring 2016 Form A	Actual Percentage of Items Spring 2016 Form B	Actual Percentage of Items Spring 2016 Form C
Level 1 – Recall and Reproduction	10–15%	15% (8 items)	11% (6 items)	13% (7 items)	15% (8 items)
Level 2 – Skills and Concepts	60–70%	64% (35 items)	67% (37 items)	65% (36 items)	62% (34 items)
Level 3 – Strategic Thinking	15–25%	22% (12 items)	22% (12 items)	22% (12 items)	24% (13 items)

Table 3-9. 2015–16 OK EOI: Depth of Knowledge—Geometry

Depth of Knowledge	Ideal Percentage of Items	Actual Percentage of Items Winter/Tri 2015	Actual Percentage of Items Spring 2016 Form A	Actual Percentage of Items Spring 2016 Form B	Actual Percentage of Items Spring 2016 Form C
Level 1 – Recall and Reproduction	10–15%	15% (8 items)	15% (8 items)	13% (7 items)	15% (8 items)
Level 2 – Skills and Concepts	60–70%	62% (34 items)	65% (36 items)	64% (35 items)	65% (36 items)
Level 3 – Strategic Thinking	15–25%	24% (13 items)	20% (11items)	24% (13 items)	20% (11 items)

Table 3-10. 2015–16 OK EOI: Depth of Knowledge—Algebra II

Depth of Knowledge	Ideal Percentage of Items	Actual Percentage of Items Winter/Tri 2015	Actual Percentage of Items Spring 2016 Form A	Actual Percentage of Items Spring 2016 Form B	Actual Percentage of Items Spring 2016 Form C
Level 1 – Recall and Reproduction	10–15%	13% (7 items)	13% (7 items)	13% (7 items)	13% (7 items)
Level 2 – Skills and Concepts	60–70%	62% (34 items)	64% (35 items)	67% (37 items)	65% (36 items)
Level 3 – Strategic Thinking	15–25%	24% (13 items)	24% (13 items)	20% (11 items)	22% (12 items)

Level 1 (Recall and Reproduction) requires the student to recall facts, terms, definitions, or simple procedures, perform simple algorithms, or apply formulas. One-step, well-defined, or straight algorithmic procedures should be included at this level.

Level 2 (Skills and Concepts) requires the students to make some decisions as to how to approach the problem or activity. Level 2 activities include making observations and collecting data; classifying, comparing, and organizing data; and organizing and displaying data in tables, charts, and graphs.

Level 3 (Strategic Thinking) requires reasoning, planning, using evidence, and a higher level of thinking. Level 3 activities include making conjectures, drawing conclusions from observations, citing evidence and developing a logical argument for concepts, explaining phenomena in terms of concepts, and using concepts to solve nonroutine problems.

Level 4 (Extended Thinking) requires complex reasoning, planning, developing, and thinking most likely requiring an extended amount of time. The cognitive demands of the item should be high and the work should be very complex. Students are required to make several connections (relate ideas within the content area or among content areas) and have to select one approach among many alternatives on how the situation should be solved in order to be at this highest level.

Note: These descriptions are adapted from Review Background Information and Instructions, Standards and Assessment Alignment Analysis, CCSSO TILSA Alignment Study, May 21–24, 2001, Version 2.0. For an extended description of each DOK level, see the website at facstaff.wcer.wisc.edu/normw/TILSA/INFO%20and%20INSTR%20Align%20Anal%20513.pdf.

3.3.6 Use of Calculators

Approved calculators were allowed on the ACE Algebra I, Geometry, and Algebra II EOI tests. For approved calculators, see the calculator policy posted on the OK SDE website at sde.ok.gov/sde/sites/ok.gov.sde/files/documents/files/Calculator%20Policy%202014_0.pdf.

3.4 Science Test Specifications

3.4.1 Standards

The test framework for the EOI Biology test was based on the OAS, and each item on the Biology test was designed to measure a specific process standard/objective and a specific content standard/objective, except for Safety Items, which only align to a specific process standard/objective.

The Biology objectives are organized into five process standards and five content standards.

- Process Standard 1: Observe and Measure
- Process Standard 2: Classify
- Process Standard 3: Experimental Design
- Process Standard 4: Interpret and Communicate
- Process Standard 5: Model
- Content Standard 1: The Cell
- Content Standard 2: The Molecular Basis of Heredity
- Content Standard 3: Biological Diversity
- Content Standard 4: The Interdependence of Organisms
- Content Standard 5: Matter/Energy/Organization in Living Systems

3.4.2 Item Types

The EOI Biology test consisted of a collection of multiple-choice items. Multiple-choice items were administered to provide breadth of coverage of the assessment targets. Because multiple-choice items require approximately one minute for most students to answer, these items make efficient use of limited testing time and allow coverage of a wide range of knowledge and skills. Each multiple-choice item was worth one score point. Previous test items released for public use are provided by the SDE (see sde.ok.gov/sde/documents/2013-09-05/blue-prints-plds-item-specs).

3.4.3 Test Design

Table 3-11 summarizes the number of multiple-choice items that were used on the EOI Biology test. Note that in science all students received the operational items (OP) and one set of field-test items (FT). Each multiple-choice item was worth one point.

Table 3-11. 2015–16 OK EOI: Composition of the ACE Operational Biology Tests

Subject	OP Forms	FT Forms	OP Items (per form)	FT Items (per form)	Possible Points (each test form)
Biology	2	18	60	15	60

Field Test

The field-test items used on the EOI Biology test were written as clusters of items aligned to the assessable Biology performance expectations (standards) identified in the 2014 Oklahoma Academic Standards for Science (see sde.ok.gov/sde/sites/ok.gov.sde/files/OAS_Science_Standards_3-2-15.pdf ; see also Appendix A). Clusters contained either three multiple-choice items linked with a common stimulus or a set of two multiple-choice items and a technology enhanced item (TE items/TEI) linked with a common stimulus. Field-test items for a range of performance expectations were tested such that the resulting item bank would support a sampling of the assessable performance expectations of the Oklahoma Academic Standards for Science (OAS-S).

3.4.4 Blueprints

Operational

The test blueprints identify the amount of content covered on the tests and are based on the importance and coverage of the OAS in Oklahoma schools. The ideal test blueprints are provided by the SDE (see sde.ok.gov/sde/documents/2013-09-05/blue-prints-plds-item-specs).

The distribution of emphasis for the EOI Biology process and content standards is shown in Tables 3-12 and 3-13. The actual number of items aligned to each objective can be found in Appendix C.

Table 3-12. 2015–16 OK EOI: OAS Biology Process Standards – Distribution of Emphasis in Terms of Target Percentage of Test by Grade

Process Standard	Ideal Percentage	Actual Percentage Winter/Tri 2015	Actual Percentage Spring 2016 Form A	Actual Percentage Spring 2016 Form B
P1.0 Observe and Measure	10%	10%	10%	10%
P2.0 Classify	12–13%	12%	12%	13%
P3.0 Experimental Design	27–32%	30%	30%	28%
P4.0 Interpret and Communicate	33–40%	35%	35%	35%
P5.0 Model	13%	13%	13%	13%
Total	100%	100%	100%	100%

Table 3-13. 2015–16 OK EOI: OAS Biology Content Standards – Distribution of Emphasis in Terms of Target Percentage of Test by Grade

Content Standard	Ideal Percentage	Actual Percentage Winter/Tri 2015	Actual Percentage Spring 2016 Form A	Actual Percentage Spring 2016 Form B
Again C1.0 The Cell	21–27%	21%	21%	23%
C2.0 The Molecular Basis of Heredity	21–-27%	23%	23%	21%
C3.0 Biological Diversity	21–27%	21%	21%	21%

continued

Content Standard	Ideal Percentage	Actual Percentage Winter/Tri 2015	Actual Percentage Spring 2016 Form A	Actual Percentage Spring 2016 Form B
C4.0 The Interdependence of Organisms	14–18%	14%	14%	14%
C5.0 Matter/Energy/Organization in Living Systems	21%	21%	21%	21%
Total	100%	100%	100%	100%

Note: The difference in the tables between the Ideal Percentages and the Actual Percentages is due to the constraints of the current item bank.

Field Test

For the EOI Biology test 18 field-test forms were administered, with 15 field-test items per form.

3.4.5 Depth of Knowledge

Each item on the EOI Biology test is assigned a DOK level according to the cognitive demand of the item. DOK is not synonymous with difficulty. The DOK level rates the complexity of the mental processing a student must use to answer the question. The description of the DOK levels and the percentage of items on the tests at each of the levels by grade are shown in Table 3-14.

Table 3-14. 2015–16 OK EOI: Depth of Knowledge—Biology

Depth of Knowledge	Ideal Percentage of Items	Actual Percentage of Items Winter/Tri 2015	Actual Percentage of Items Spring 2016 Form A	Actual Percentage of Items Spring 2016 Form B
Level 1 – Recall and Reproduction	10–15%	10% (6 items)	12% (7 items)	13% (8 items)
Level 2 – Skills and Concepts	50–60%	60% (36 items)	55% (33 items)	55% (33 items)
Level 3 – Strategic Thinking	30–40%	30% (18 items)	33% (20 items)	32% (19 items)

Level 1 is the recall of information such as a fact, definition, term, or a simple procedure, as well as performing a simple science process or procedure. Level 1 only requires students to demonstrate a rote response, use a well-known formula, follow a set procedure (like a recipe), or perform a clearly defined series of steps. A “simple” procedure is well defined and typically involves only one step. Verbs such as *identify*, *recall*, *recognize*, *use*, *calculate*, and *measure* generally represent cognitive work at the recall and reproduction levels. Simple word problems that can be directly translated into and solved by a formula are considered Level 1. Verbs such as *describe* and *explain* could be classified at different DOK levels, depending on the complexity of what is to be described and explained.

A student answering a Level 1 item either knows the answer or does not; that is, the answer does not need to be "figured out" or "solved." In other words, if the knowledge necessary to answer an item automatically provides the answer to the item, then the item is at Level 1. If the knowledge necessary to answer the items does not automatically provide the answer, the item is at least at Level 2. Some examples that represent, but do not constitute all, Level 1 performance are:

- Recall or recognize a fact, term, or property.
- Represent in words or diagrams a scientific concept or relationship.
- Provide or recognize a standard scientific representation for simple phenomenon.
- Perform a routine procedure such as measuring length.

Level 2 includes the engagement of some mental processing beyond recalling or reproducing a response. The content knowledge or process involved is more complex than in Level 1. Items require students to make some decisions as to how to approach the question or problem. Keywords that generally distinguish a Level 2 item include *classify*, *organize*, *estimate*, "*make observations*, *collect and display data*, and *compare data*. These actions imply more than one step. For example, to compare data requires first identifying characteristics of the objects or phenomenon and then grouping or ordering the objects. Level 2 activities include making observations and collecting data; classifying, organizing, and comparing data; and organizing and displaying data in tables, graphs, and charts.

Some action verbs, such as *explain*, *describe*, or *interpret*, could be classified at different DOK levels, depending on the complexity of the action. For example, interpreting information from a simple graph and requiring reading information from the graph is a Level 2. An item that requires interpretation from a complex graph, such as making decisions regarding features of the graph that need to be considered, and how information from the graph can be aggregated is at Level 3. Some examples that represent, but do not constitute all, Level 2 performance, are:

- Specify and explain the relationship between facts, terms, properties, or variables.
- Describe and explain examples and nonexamples of science concepts.
- Select a procedure according to specified criteria and perform it.
- Formulate a routine problem given data and conditions.
- Organize, represent, and interpret data.

Level 3 requires reasoning, planning, using evidence, and a higher level of thinking than the previous two levels. The cognitive demands of a Level 3 are complex and abstract. The complexity does not result only from the fact that there could be multiple answers, a possibility for both Levels 1 and 2, but because the multistep task requires more demanding reasoning. In most instances, requiring students to explain their thinking is at Level 3; requiring a very simple explanation or a word or two should be at Level 2. An activity that has more than one possible answer and requires students to justify the response they give would most likely be a Level 3. Experimental designs in Level 3 typically involve more than one dependent variable. Other Level 3 activities include drawing conclusions from observations; citing evidence and developing a logical argument for concepts; explaining phenomena in terms of concepts; and using concepts to solve nonroutine problems. Some examples that represent, but do not constitute all, Level 3 performance are:

- Identify research questions and design investigations for a scientific problem.
- Solve nonroutine problems.
- Develop a scientific model for a complex situation.
- Form conclusions from experimental data.

Use of Hess Matrix in Assigning DOK Level

In assigning a DOK level to items, the matrix developed by Karin Hess (see static.pdesas.org/content/documents/M2-Activity_2_Handout.pdf) was also used as a reference. This matrix shows the intersections between Bloom’s Revised Taxonomy and Webb’s DOK levels, providing additional information that can be useful when assigning DOK level.

3.4.6 Use of Calculators

Approved calculators were allowed on the OCCT EOI Biology test. For approved calculators, see the calculator policy posted on the OK SDE website at sde.ok.gov/sde/sites/ok.gov.sde/files/documents/files/Calculator%20Policy%202014_0.pdf.

3.5 Social Studies

3.5.1 Standards and Objectives

The test framework for social studies EOI is based on the OAS, and each item on the social studies test is designed to measure a specific standard and objective. The measure of Oklahoma students’ level of proficiency responding to a variety of items linked to grade-level social studies content standards are identified in the OAS. A list of assessable standards for each course is provided below.

ACE U.S. History

- Standard 1: Transformation of the United States from Post-Reconstruction to the Progressive Era, 1878–1900
- Standard 2: Expanding Role of the United States in International Affairs
- Standard 3: Cycles of Economic Boom and Bust in the 1920s and 1930s
- Standard 4: Role of the U.S. in International Affairs and World War II, 1933–1946
- Standard 5: U.S. Foreign and Domestic Policies during the Cold War, 1945–1975
- Standard 6: U.S. Foreign and Domestic Policies, 1976 to the Present

3.5.2 Item Types

The OCCT EOI U.S. History tests consisted of a collection of multiple-choice items. Multiple-choice items were administered to provide breadth of coverage of the assessment targets. Because multiple-choice items require approximately one minute for most students to answer, these items make efficient use of limited testing time and allow coverage of a wide range of knowledge and skills. Each multiple-choice item was worth one score point.

3.5.3 Reviews at State Level

Table 3-15 summarizes the numbers and types of items that were used in the 2015–16 U.S. History EOI tests. Note that in social studies all students received the common items and one set of field-test items. Each multiple-choice item was worth one point.

Table 3-15. 2015–16 OK EOI: Composition of the ACE U.S. History Tests

Subject	Operational (OP) Forms	Field-Test (FT) Forms	OP Items (per form)	FT Items (per form)	Possible Points (each test form)
U.S. History	1	5	60	10	60

3.5.4 Blueprints

Table 3-16 summarizes the distribution of emphasis in terms of the ideal percentage for each of the standards for the U.S. History test. The test blueprints identify the amount of content covered on the tests and are based on the importance and coverage of the OAS in Oklahoma schools. The ideal test blueprints are provided by the SDE (see sde.ok.gov/sde/office-assessments). The actual number of items aligned to each objective can be found in Appendix C.

Table 3-16. 2015–16 OK EOI: OAS Social Studies Standards – Distribution of Emphasis in Terms of Target Percentage of Test by Subject

U.S. History Standards	Ideal Percentage	Actual Percentage Winter/Tri 2015	Actual Percentage Spring 2016 Form A	Actual Percentage Spring 2016 Form B
Standard 1: Transformation of the United States from Post-Reconstruction to the Progressive Era, 1878–1900	13–15%	13%	13%	12%
Standard 2: Expanding Role of the United States in International Affairs	10%	10%	10%	10%
Standard 3: Cycles of Economic Boom and Bust in the 1920s and 1930s	13–15%	13%	13%	13%
Standard 4: Role of the U.S. in International Affairs and World War II, 1933–1946	13–15%	13%	13%	15%

continued

U.S. History Standards	Ideal Percentage	Actual Percentage Winter/Tri 2015	Actual Percentage Spring 2016 Form A	Actual Percentage Spring 2016 Form B
Standard 5: U.S. Foreign and Domestic Policies during the Cold War, 1945–1975	30%	30%	30%	30%
Standard 6: U.S. Foreign and Domestic Policies, 1976 to the Present	20%	20%	20%	20%
Total	100%	100%	100%	100%

3.5.5 Depth of Knowledge

Each item on the ACE EOI social studies test in is assigned a DOK level according to the cognitive demand of the item. DOK is not synonymous with difficulty. The DOK level rates the complexity of the mental processing a student must use to answer the question. The DOK levels and the percentage of items on the tests at each of the levels by grade are shown in Table 3-17.

Table 3-17. 2015–16 OK EOI: DOK—U.S. History

U.S. History				
Depth of Knowledge	Ideal Percentage of Items	Actual Percentage of Items Winter/Tri 2015	Actual Percentage of Items Spring 2016 Form A	Actual Percentage of Items Spring 2016 Form B
Level 1 – Recall and Reproduction	10–15%	13% (8 items)	15% (9 items)	12% (9items)
Level 2 – Skills and Concepts	60–70%	63% (38 items)	60% (36 items)	60% (36 items)
Level 3 – Strategic Thinking	15–25%	23% (14 items)	25% (15 items)	25% (15 items)

Level 1 (Recall and Reproduction) asks students to recall facts, terms, concepts, and trends, or to recognize or identify specific information contained in graphics. This level generally requires students to identify, list, or define. The items at this level usually ask the students to recall who, what, when, and where. Items that require students to "describe" and/or "explain" could be classified as Level 1 or Level 2, depending on what is to be described and/or explained. A Level 1 "describe and/or explain" would require students to recall, recite, or reproduce information. Items that require students to recognize or identify specific information contained in documents, excerpts, quotations, maps, charts, tables, graphs, or illustrations are generally Level 1.

Level 2 (Skills and Concepts) includes the engagement of some mental processing beyond recalling or reproducing a response. This level requires students to: contrast or compare people, places, events, and concepts; convert information from one form to another; give an example; classify or sort items into meaningful categories; draw conclusions; or describe, interpret, or explain issues and problems, patterns, reasons, cause and effect, significance or impact, relationships, points of view, or processes. A Level 2 "describe and/or explain" would require students to go beyond a description of recalled information to describe and/or explain the result or "how" or "why."

Level 3 (Strategic and Extended Thinking) requires reasoning, using evidence, and utilizing a higher level of thinking than Level 1 and Level 2. Students will go beyond explaining or describing "how and why" to justifying the "how and why" through application and evidence. The cognitive demands at Level 3 are more complex and more abstract than Level 1 or Level 2. Items at Level 3 can include: drawing conclusions from multiple or complex stimuli; citing evidence; applying concepts to new situations; using concepts to solve problems; analyzing similarities and differences in issues and problems; proposing and evaluating solutions to problems; recognizing and explaining misconceptions; or making connections across time and place to explain a concept or "big idea." Items may require planning, investigating, or developing. At this level, the cognitive demands may be high, work may be very complex, and students may be required to: connect and relate ideas and concepts within the content area; analyze and synthesize information from multiple sources; examine and explain alternative perspectives across a variety of sources; and/or describe and illustrate how common themes and concepts are found across time and place. Students may make predictions with evidence as support.

3.6 Test Development Process

3.6.1 Item Selection and Operational Test Assembly

In preparation for the item selection meeting, the test developers and psychometricians at Measured Progress considered the following when selecting sets of items to propose for the common (including items for release) and the embedded field tests:

- **Content coverage/match to test design.** The test design stipulates a specific number of multiple-choice and constructed-response items from each content area. Item selection for the embedded field test was based on the number of items in the existing pool of items eligible for the common item set.
- **Item difficulty and complexity.** Item statistics drawn from the data analysis of previously tested items were used to ensure similar levels of difficulty and complexity from year to year as well as quality psychometric characteristics.
- **"Cueing" items.** Items were reviewed for any information that might "cue" or provide information that would help to answer another item.

During assembly of the test forms, the following criteria were considered:

- **Option balance.** Items were balanced among the forms so that each form contained a fairly equal distribution of keys (correct answers).
- **Key patterns.** The sequence of keys was reviewed to ensure that key order appeared random.
- **Page fit.** Item placement was modified to ensure the best fit and arrangement of items on any given page.
- **Facing-page issues.** For multiple items associated with a single stimulus (inquiry task) and multiple-choice items with large graphics, consideration was given to whether those items needed to begin on a left- or right-hand page and to the nature and amount of material that needed to be placed on facing pages. These considerations serve to minimize the amount of page flipping required of students.
- **Relationship between forms.** Although equating and field-test items differ across forms, these items must take up the same number of pages in each form so that sessions begin on the same page in every form. Therefore, the number of pages needed for the longest form often determines the layout of each form.
- **Visual appeal.** The visual accessibility of each page of the form was taken into consideration, including such aspects as the amount of white space, the density of the text, and the number of graphics.

3.6.2 Operational Test Draft Review

After the forms were laid out as they would appear in the final test booklets, they were again thoroughly reviewed by Measured Progress editors and test developers to ensure that the items appeared exactly as the state assessment specialists had requested. Finally, all the forms were reviewed by the state specialists for their final approval.

3.6.3 Alternative Presentations

Common items were translated into Braille by a subcontractor that specializes in test materials for students who are blind or visually impaired. In addition, Form 1 for each grade was also adapted into a large-print version. The Braille vendor reviewed forms concurrently with the SDE review. This review included looking at items for any potential Braille ability issues. If any concerns were noted these went go back to the Measured Progress content team (CDD) for review and feedback. Measured Progress then provided the necessary information to the SDE to determine next steps or decisions needed including options to suppress the item.

CHAPTER 4 TEST ADMINISTRATION

4.1 RESPONSIBILITY FOR ADMINISTRATION

The *2015–16 OCCT Test Administration Manual* indicated that principals and/or their designated OCCT test coordinators (TCs) were responsible for the proper administration of the OCCT tests. Uniformity of administration procedures from school to school was ensured by using manuals that contained explicit directions and scripts to be read aloud to students by test administrators (TAs). In addition, standardized training materials were prepared by SDE and used to train TCs and TAs for the administration. The SDE also conducted site monitoring visits during the test administration to assure all guidelines were followed.

4.2 ADMINISTRATION PROCEDURES

Assessment training modules, test administration workshops, pre-recorded webinars, and test administration manuals were provided to give clear direction and support for the test administration for paper/pencil and computer based assessments. (Refer to 4.4 for a brief description of the training) .The districts' designated OCCT test coordinators (TC) were instructed by SDE to read the *2015–16 OCCT Test Administration Manual*. The checklists included in the *2015–16 OCCT Test Administration Manual* outlined tasks to be performed by school staff before, during, and after test administration. In addition to these checklists, the *2015–16 OCCT Test Administration Manual* described the testing material sent to each school and how to inventory it, track it during administration, and return it after testing was complete. The *2015–16 OCCT Test Administrator Manual* included checklists for the administrators to use to prepare themselves, their classrooms, and the students for the administration of the tests. The *2015–16 OCCT Test Administrator Manual* contained sections that detailed the procedures to be followed for each test session and instructions for preparing the material before the test coordinator returned it to Measured Progress.

4.3 TEST ADMINISTRATION WINDOW

The test administration window was as follows:

Table 4-1. 2015–16 OK EOI: Test Administration Window

Testing Period	Dates
Winter Retest	11/30/15–12/18/15
Winter Paper and Pencil	11/30/15–12/18/15
Winter Online	11/30/15–1/8/16
Trimester Paper and Pencil	1/18/16–2/5/16
Trimester Online	1/18/16–2/12/16
Operational Retest	3/28/16–4/8/16
Spring Paper and Pencil	4/11/16–5/6/16
Spring Online	4/11/16–5/13/16

continued

Testing Period	Dates
Summer Paper and Pencil	5/30/16– /29/16
Summer Online	5/30/16–7/29/16

Total administration by test mode, paper-based tests (PBT) or online computer-based tests (CBT), for each grade and subject is shown in the table below.

Table 4-2. 2015-16 OK EOI: Test Modes by Subject and Grade

Grade	Subject	Test Mode	Count
Spring EOI OMAAP	Algebra 1 OMAAP	Paper	1
	Biology OMAAP	Paper	5
	English 2 OMAAP	Paper	1
	US History OMAAP	Paper	3
Spring EOI	Algebra 1 Form A	Online	31,803
		Paper	784
	Algebra 1 Form B	Online	18,916
	Algebra 2 Form A	Online	18,505
		Paper	152
	Algebra 2 Form B	Online	11,775
	Biology Form A	Online	24,278
		Paper	508
	Biology Form B	Online	21,413
	English 2 Form A	Online	27,158
		Paper	521
	English 2 Form B	Online	17,886
	English 3 Form A	Online	20,175
		Paper	322
	English 3 Form B	Online	13,037
	Geometry Form A	Online	24,933
		Paper	345
	Geometry Form B	Online	15,295
	US History Form A	Online	25,328
		Paper	375
	US History Form B	Online	15,549
Spring Retest	Algebra 1_r	Online	2,561
	Algebra 2_r	Online	220
	Biology_r	Online	2,021
	English 2_r	Online	1,303
	English 3_r	Online	474
	Geometry_r	Online	1,005
	US History_r	Online	661

4.4 Participation Requirements and Documentation

The intent of the Oklahoma SDE is for all students in grades 3 through 8 and high school to participate in the OCCT tests through a standard administration, an administration with accommodations, or an alternate assessment. Furthermore, any student who is absent during any session of the OCCT testing is expected to take a make-up test within the testing window. Opt outs were not allowed in Oklahoma.

Title 70, § 1210.508 and § 1210.523 of the Oklahoma Statutes requires that the State Board of Education conduct criterion-referenced tests in grades three through eight and conduct end-of-instruction exams in grades nine through twelve. In addition to the statutory requirements, the State Board of Education's administrative rule 210:10-13-2 states that "All public school districts shall administer the state mandated academic achievement tests of the OSTP to all students enrolled in the designated grades."

Therefore, school districts are required to provide a test to every student enrolled in respective testing grades. Both the statute and the language in the promulgated rule require every school district to administer a test to every student enrolled in a tested grade/subject area. Because of these statutory and rule requirements, there is no "opt-out" option offered through the OSDE. In addition, 70 O.S. § 5-117 states that local school boards of education do not have the authority to take actions inconsistent with state law or rules that have been adopted by the State Board of Education.

Schools were required to return a Student Answer Document for every enrolled student in the grade level, with the exception of students who took an alternate assessment in the previous school year. Students who were alternately assessed in the 2015–16 school year were not required to participate in the OCCT in 2015–16. On those occasions when it was deemed impossible to test a particular student, school personnel were required to inform the SDE.

A summary of participation on the 2015–16 Oklahoma EOI by demographic category is shown in Appendix D. Students, who were 2nd time testers were only required to retake an EOI if they failed to Pass an EOI and needed it for graduation purposes.

4.4.1 Students with Disabilities

All students were expected to participate in the 2015–16 OCCT tests, unless they completed an alternate assessment during the 2015–16 school year.

For a large-print accommodation, Form 1 of the test at all grade levels was enlarged to 20-point font for students with visual impairments. At all grades, only the operational items were translated into Braille by American Printing House for the Blind, a subcontractor that specializes in test materials for students who are blind or have visual impairments.

For CBT, the following accommodations were available to students:

- Color Contrast where the student can select alternative font and background colors
- Reverse Contrast where all colors are inverted
- Screen Zoom where the entire screen is zoomed up to 150%
- Guideline where the student has a box they can use to read long passages a little easier (similar to using a ruler or piece of paper to move down the page as you read)

- Text to Speech where the computer reads the text to the student.

4.4.2 English Language Learners

Students who had received less than 12 months of consecutive instruction in a U.S. public school and were designated as limited English proficient (LEP) were only required to take the Mathematics, Science, and Social Studies OCCTs. A one-year optional exemption was available for the reading and writing OCCTs.

4.5 ADMINISTRATOR TRAINING

In addition to distributing the *2015–16 OCCT Test Administration Manual*, the Oklahoma SDE and Measured Progress conducted test administration workshops and webinars to inform school personnel about the OCCT tests and to provide training on the policies and procedures regarding administration of the tests. In-person trainings were offered at various locations throughout the state in March. In addition, an audio PowerPoint test administration workshop presentation was prerecorded and provided to the state for inclusion on the SDE website. All test administrators were required to get training.

4.6 DOCUMENTATION OF ACCOMMODATIONS

The *OSTP Accommodations Manual* provided directions for coding information related to accommodations and modifications (Appendix E) in the Student Answer Document. All accommodations used during any test session were required to be coded by authorized school personnel—not by students—after testing was completed. See Table 4-1 for the numbers of students tested with and without accommodations for the 2015–16 school year. In addition, the numbers of students who were tested with accommodations are presented by accommodation type in Appendix F.

Table 4-3. 2015–16 OK EOI: Numbers of Students Tested With and Without Accommodations by Subject and Grade

Subject	Grade	Number of Students Tested: *With Accommodations*	Number of Students Tested: *Without Accommodations*
Algebra I	HS	4,228	43,044
Algebra II	HS	1,234	28,535
Biology	HS	3,563	39,225
English II	HS	2,300	41,327
English III	HS	1,801	30,911
Geometry	HS	2,814	36,314
U.S. History	HS	2,840	37,081

A test accommodation is a change in the way a test is administered or in the way a student responds to test questions. Similar to instructional accommodations, test accommodations are intended to offset the effects of a student's disability and to provide him or her with the opportunity to demonstrate knowledge and skills on statewide assessments.

The right of a student with a disability to receive allowable accommodations on OSTP tests is protected by both federal and state laws. The student's current individualized education program (IEP)/504 plan must specify precisely which test accommodation(s) he or she will receive. In cases where an IEP/504 plan is under development, the school personnel responsible for writing the plan must have already met and agreed upon the necessary accommodation(s) before a student may be provided the accommodation(s).

A student who does not have a documented disability or is not served by a current IEP/504 plan is not eligible to receive accommodations on OSTP tests, except for Emergency Accommodation situations. Scribes may be provided for any student (with or without an IEP or Section 504 plan) who has a short-term medical condition that affects his or her physical dexterity, which impedes his or her ability to respond to the assessment format. Refer to the OK Accommodations Manual on the SDE website for more detailed information regarding assessment accommodations. This manual can be found at sde.ok.gov/sde/sites/ok.gov.sde/files/documents/files/OK%20Accommodations%20Manual.pdf. Test accommodations can also be found in Appendix E.

4.7 Test Security

Maintaining test security is critical to the success of the OCCT. The *2015–16 OCCT Test Administration Manual* explains in detail all test security measures and test administration procedures. The SDE takes the matter of test security very seriously and has implemented stringent procedures to protect the security of the OCCT.

Each district test coordinator, building test coordinator, test administrator, and test proctor is responsible for all secure test materials received and for returning all secure test materials (see Section 210:10-13-4 of the Oklahoma Administrative Code). Violation of regulations may result in revocation of a person's teaching, counseling, administrative, and/or other certificates. The tests, and all of the materials associated with these tests, are secure materials. It is important to prevent an opportunity for any student to have access to the tests and thus have an advantage over other students before the administration of the tests. Prior exposure to the tests or individual items would invalidate scores. The materials associated with these tests may not be photographed, photocopied or reproduced in any other fashion, including paraphrasing—to do so is in violation of copyright law. All test items have been copyrighted by SDE. In addition, students are not permitted to have cell phones on their person during testing, to help prevent them from taking pictures of items.

The 2015–16 OCCT Test Administration Manual describes, in detail, policy and procedures for nondisclosure of test content, securing test materials, use of proctors, use of security forms, test administrator responsibilities, and reporting test irregularities. SDE also conducts site visits during test administration to assure compliance to policies.

Materials were inventoried when returned to Measured Progress at the end of the test administration. A materials discrepancy report was provided after all secure materials were scanned. Measured Progress used this report to contact District Test Coordinators (DTC) whose schools appear on the list to have them conduct a search for any missing materials to ensure they are returned. Measured Progress also conducted a physical box search on site at their facilities to search for materials. For the materials found by the DTC, Measured Progress arranged for the return of the materials. If materials were not located by Measured Progress or the DTC, a spreadsheet was maintained to document the missing materials.

4.8 Test and Administration Irregularities

During the administration of the 2016 spring OCCT assessment, the district of Broken Arrow had its computer-based testing closely monitored as it experienced a denial of service cyber-attack during the assessment window. This attack flooded resources with superfluous requests in an attempt to prevent requests from being fulfilled. It was confirmed that no district data were jeopardized and the majority of students were able to complete their testing on schedule.

4.9 Service Center

To provide additional support to schools before, during, and after testing, Measured Progress operates the OCCT Service Center. The support of a service center is essential to the successful administration of any statewide test program. The service center provides a centralized location in Dover, NH to which individuals in the field can call, using a toll-free number, to ask specific questions or report any problems he or she may be experiencing. Representatives are responsible for receiving, responding to, and tracking calls, then routing issues to the appropriate person(s) for resolution. All calls are logged into a database that includes notes regarding the issue and resolution of each call.

The service center was staffed year-round and was available to receive calls from 8:00 a.m. to 4:00 p.m. (CST), Monday through Friday. Extra representatives and extended hours were added, beginning approximately two weeks before the start of the testing window and ending two weeks after the end of the testing window to assist with handling the additional call volume. There are three levels of support provided to callers as needed and based upon the issue needing support:

1) Level 1 Support – Measured Progress Technical Product Support
2) Level 2 Support – Measured Progress OSTP Program Help Desk
3) Level 3 Support – eMetric Support for Computer Based Testing Issues / Technical Support

CHAPTER 5 SCORING

The majority of End-of-Instruction (EOI) tests were completed through an online administration. This online platform automatically saves an electronic record of each student's responses. Machine Scored items are automatically scored by the system. Student responses to the writing prompts were typed by the students into the test administration engine. These responses were transferred into the iScore system, the secure server-to-server electronic scoring system designed by Measured Progress. Any students who completed a paper-based test had their completed answer documents returned to Measured Progress, where the responses and student identification and demographic information were scanned into the system. Images of the student work were then loaded into iScore. Scoring of all responses was done through iScore, regardless of the test administration method.

Any student responses that could not be physically scanned (e.g., answer documents damaged during shipping) were physically reviewed and scored on an individual basis by trained, qualified scorers. These scores were linked to the student's demographic data and merged with the student's scoring file by Measured Progress's Data and Reporting Services Department.

5.1 MACHINE-SCORED ITEMS

Student item responses are compared to scoring keys using item analysis software. This robust software compares the student response of the item to the answer key and assigns a maximum score for correct responses (1 point for MC items) and incorrect answers (0 points). Technology Enhance items and Evidence-Based Selected Response items can award multiple points for correct responses or partially correct responses, as dictated by the answer key. Student responses with blank item responses are also assigned 0 points.

The majority of EOI responses were submitted online, and the scoring of the multiple-choice and Technology Enhanced items is integrated into the test administration platform. For students who completed the paper-based version of the test, completed materials were scanned and scored.

The hardware elements of the scanners monitor themselves continuously for correct read, and the software that drives these scanners also monitors correct data reads. Standard checks include recognition of a sheet that does not belong or is upside down or backward, identification of critical data that are missing (e.g., a student ID number), test forms that are out of range or missing, and page or document sequence errors. When a problem is detected, the scanner stops and displays an error message directing the operator to investigate and correct the situation.

5.2 ONLINE SCORING OF COMPUTER-BASED TESTS (CBT)

Student item responses are compared to scoring keys using item analysis software. This robust software compares the student response of the item to the answer key and assigns a maximum score for correct responses (1 point) and incorrect answers are assigned 0 points. Student responses with blank item responses are also assigned 0 points. At the end of an administration, a second independent validation of all the student responses is conducted to compare and validate results to ensure accurate machine-scoring.

5.3 Person-Scored Items

The images of student responses to constructed-response items were hand-scored through the iScore system. Use of iScore minimizes the need for scorers to physically handle answer documents and related scoring materials. Student confidentiality was easily maintained since all EOI scoring was blind (district, school, and student names were not visible to scorers). The iScore system maintained the linkage between the student response images and their associated test booklet numbers.

Through iScore, qualified scorers at computer terminals accessed electronically-scanned images of student responses. Scorers evaluated each response and recorded each score via keypad or mouse entry through the iScore system. When a scorer finished one response, the next response appeared immediately on the computer screen.

The use of iScore also helped ensure that access to student response images was limited to only those who were scoring or working for Measured Progress in a scoring management capacity.

5.3.1 Scoring Location and Staff

Scoring Location

The iScore database, its operation, and its administrative controls are all based in Dover, New Hampshire. Measured Progress has three scoring sites. Table 5-1 presents the locations where 2015–16 EOI test item responses by content area and grade were scored.

Table 5-1. 2015–16 OK EOI: Operational Scoring Locations by Content Area and Grade

Test Administration	Dover, NH	Menands, NY	Longmont, CO
Winter Retest		X	
Winter Operational		X	
Winter Trimester		X	
Spring Retest		X	
Spring Operational		X	X

The iScore system monitored accuracy, reliability, and consistency across all scoring sites. Constant daily communication and coordination were accomplished through e-mail, telephone, and secure websites to ensure that critical information and scoring modifications were shared and implemented across all scoring sites.

Staff Positions

The following staff members were involved with scoring the 2015–16 EOI responses:

- The Oklahoma scoring project manager oversaw communication and coordination of scoring across all scoring sites.
- The iScore operational manager coordinated technical communication across all scoring sites.
- The Scoring Content Specialist (writing) ensured consistency of scoring across all scoring sites for all grades tested in that content area. The Scoring Content Specialist also provided read-behind activities (defined in Section 5.2.6) for Scoring Supervisors.
- Several Scoring Supervisors, selected from a pool of experienced Scoring Team Leaders for their ability to score accurately and to instruct and train scorers, participated in benchmarking activities for each specific grade and content area. Scoring Supervisors provided read-behind activities for Scoring Team Leaders at their sites.
- Numerous Scoring Team Leaders, selected from a pool of skilled and experienced scorers, provided read-behind activities for the scorers at their scoring tables. (The ratio of Scoring Team Leaders to Scorers was approximately 1:6.)
- Scorers at scoring sites scored operational and retest EOI student responses. Recruitment of scorers is described in Section 5.2.2.

5.3.2 Scorer Recruitment and Qualifications

For scoring the 2015–16 EOI tests, Measured Progress actively sought a diverse scoring pool. The broad range of scorer backgrounds included scientists, business professionals, authors, teachers, graduate school students, and retired educators. Demographic information (e.g., gender, race, educational background) about scorers was electronically captured for reporting.

All scorers were required to have, at a minimum, a four-year college degree with demonstrated coursework related to the content being scored. Preference was given to individuals with degrees in content or education. In all cases, potential scorers were required to submit documentation (e.g., résumé and/or transcripts) of their qualifications.

Table 5-2 summarizes the qualifications of the 2015–16 EOI scoring leadership and scorers.

Table 5-2. 2015–16 OK EOI: Qualifications of Scoring Leadership and Scorers

Scoring Responsibility	Educational Credentials				Total
	Doctorate	*Master's*	*Bachelor's*	*Other*	
Scoring Leadership	15.15%	33.33%	51.51%	0%	100%
Scorers	6.67%	29.33%	64%	0%	100%

Scoring Leadership = Scoring Supervisors and Scoring Team Leaders

All scorers were required to sign a nondisclosure/confidentiality agreement.

5.3.3 Methodology for Scoring Polytomous Items

Possible Score Points

The ranges of possible score points for the different polytomous items (items that are scored correct for a multiple number of points) are shown in Table 5-3.

Table 5-3. 2015–16 OK EOI: Possible Score Points for Polytomous Item Types

Polytomous Item Type	Possible Score Point Range
Writing Prompt (English II, English III)	1-4; 5 traits

Nonscorable Items

Scorers could designate a response as nonscorable for any of the following reasons:

- Response was blank (no attempt to respond to the question).
- Response was unreadable (illegible, too faint to see, or only partially legible/visible)—*see following note*.
- Response was written in a language other than English.
- Response was completely off-task or off-topic.
- Response was an exact copy of the assignment.
- Student made a statement refusing to write a response to the question.

Nonscorable responses do not receive a number score. *Note: "Unreadable" responses were eventually resolved, whenever possible, by researching the actual answer document (electronic copy or hard copy, as needed).* Unreadable responses are rare, since most of the responses are submitted online.

Scoring Procedures

Scoring procedures for polytomous items used double-blind scoring. Double-blind scored items were scored independently by two scorers, whose scores were tracked for "interrater agreement." (For further information on double-blind scoring and the interrater agreement, see Section 5.2.6 and Appendix G.). As seen in Appendix G, scorers were in exact agreement between 58% and 72% of the time and were in exact or adjacent agreement at least 97% of the time. A small number of responses were scored as an edit by the Content Specialist and would have only received one score. These responses would have included any responses sent back late and not included in the scoring window, any unusual response that was placed on hold for consultation with the SDE, or other responses that required special handling or attention by the Content Specialist.

5.3.4 Scorer Training

Scorer training began with an introduction of the on-site scoring staff and an overview of the purpose and goals of the project (including discussion about the security, confidentiality, and proprietary nature of testing materials, scoring materials, and procedures).

Next, scorers thoroughly reviewed and discussed the rubric for each item to be scored. Rubrics were developed as part of the item development process (discussed in Chapter 3).

Following review of an item's rubric, scorers reviewed or scored the particular response set (i.e., anchor sets, practice sets) organized for that training. (These sets are defined in the following paragraphs.)

Anchor Set

Scorers first reviewed an anchor set of exemplary responses for an item. This is a set approved and provided by the Oklahoma SDE. Responses in anchor sets are typical, rather than unusual or uncommon; solid, rather than controversial or borderline. There were separate anchor sets for each of the traits, and training of the anchor papers was done at the trait level. OMAPP responses, which are single-trait items, had only one anchor set.

Responses were read aloud to the room of scorers in descending score order. Announcing the true score of each anchor response, trainers facilitated group discussion of responses in relation to score point descriptions to help scorers internalize the typical characteristics of score points.

This anchor set continued to serve as a reference for scorers as they went on to calibration, scoring, and recalibration activities for that item.

Practice Set

Next, scorers practiced applying the scoring guide and anchors to responses in the mixed practice set. The practice set is intended to mimic live scoring. As such, scorers assigned scores in each of the traits to each response.

After scorers independently read and scored a training set response, trainers would poll scorers or use online training system reports to record their initial range of scores. Trainers then led a group discussion of the responses, directing scorers' attentions to difficult scoring issues (e.g., the borderline between two score points). Throughout the training, trainers modeled how to discuss scores by referring to the anchor set and to the rubric. The overall training process, including training on the rubric, anchor sets, and practice sets, vary from item to item but tend toward six hours of training time per prompt.

5.3.5 Leadership Training

Scoring Supervisors were trained in advance by the Content Specialist. In addition to a discussion of the items and their responses, Scoring Supervisor training included greater detail on the client's rationale behind the score points than that covered with regular scorers to better equip Scoring Supervisors to handle questions from the scorers.

5.3.6 Monitoring of Scoring Quality Control

Scorers were constantly monitored by Measured Progress for accuracy during the course of the project. Read-behind and double-blind statistics were reviewed daily. Recalibration sets were administered repeatedly during the course of the project. Scorers who demonstrated inaccurate or inconsistent scoring through these quality-control measures were stopped from scoring. Their work for the day was voided and rescored by other qualified scorers. Scorers were retrained and allowed to resume scoring. However, anyone who repeatedly demonstrated accuracy and consistency in scoring below standard was removed from the project.

Scorers were monitored for continued accuracy and consistency throughout the scoring process, using the following methods and tools (which are defined in this section):

- read-behind procedures
- double-blind scoring
- recalibration sets

It should be noted that any scorers whose accuracy rate fell below the expected rate for a particular item and monitoring method were retrained on that item. The accuracy rate was viewed across multiple quality control tools, but was based on the threshold of 60% exact agreement and 90% exact plus adjacent agreement at the trait level. Upon approval by the Scoring Supervisor or Scoring Content Specialist, as appropriate, the scorer was allowed to resume scoring. Scorers who met or exceeded the expected accuracy rates continued scoring. The use of multiple monitoring techniques is critical toward monitoring scorer accuracy during the process of live scoring.

Read-Behind Scoring Procedures

Read-behind scoring refers to scoring leadership (usually a Scoring Team Leader) scoring a response after a scorer has already scored the response. The practice was applied to all writing prompts.

Responses placed into the read-behind queue were randomly selected by scoring leadership; scorers were not aware which of their responses would be reviewed by their Team Leader. The iScore system allowed one, two, or three responses per scorer to be placed into the read-behind queue at a time.

The Team Leader entered his or her score into iScore before being allowed to see the scorer’s score. The Team Leader then compared the two scores and the score of record (i.e., the reported score) was determined as follows:

- If there was exact agreement between the scores, no action was necessary; the regular scorer’s score remained.

- If the scores were adjacent (i.e., differed by one point), the Team Leader's score became the score of record. (A significant number of adjacent scores for a scorer triggered an individual scoring consultation with the Team Leader, after which the Scoring Supervisor determined whether or when the scorer could resume scoring.)
- If the scores were discrepant (i.e., differed by more than one point), the Team Leader's score became the score of record. (This triggered an individual consultation for the scorer with the Team Leader, after which the Scoring Supervisor determined whether or when the scorer could resume scoring on that item.)

Table 5-4 illustrates how scores were resolved by read-behind; Table 5-5 illustrates how scores were resolved by double-blind scoring.

Table 5-4. 2015–16 OK EOI: Examples of Read-Behind Scoring Resolutions[1]

Scorer Score	Leadership Score	Final
4-4-4-4-4	4-4-4-4-4	4-4-4-4-4
4-3-3-4-3	3-3-3-4-3	3-3-3-4-3
4-3-3-3-3	2-2-2-3-2	2-2-2-3-2

[1] In all cases, the leadership score is the final score of record.

Table 5-5. 2015–16 OK EOI: Examples of Double-Behind Scoring Resolutions[1]

Scorer #1	Scorer #2	Leadership Resolution	Final
4-4-4-4-4	4-4-3-4-4	-	4-4-4-3.5-4
4-3-3-2-2	2-2-2-2-2	3-3-2-2-2	3-3-2-2-2
2-1-1-2-2	1-1-1-1-2	-	1.5-1-1-1.5-2
2-2-2-2-2	4-4-4-4-4	3-3-3-2-3	3-3-3-2-3
1-1-1-1-1	2-2-2-2-2	-	1.5-1.5-1.5-1.5-1.5
1-1-1-1-1	3-3-3-3-3	2-2-2-2-2	2-2-2-2-2

[1] For adjacent scorer scores, the average of the two scores is the score of record. In the case of discrepant scores, the leadership score is the final score of record.

Team Leaders were tasked with conducting read-behinds on 10% of the total student population, with targets to distribute the read-behinds across all the scorers assigned to them. Scorers who hovered at the threshold of acceptable accuracy would have been targeted with more read-behinds than scorers who were consistently demonstrating high levels of accuracy.

Scoring Supervisors and the Scoring Content Specialist conducted reviews of read-behinds conducted by Scoring Team Leaders. This system allows the senior members of leadership to see a list of all read-behinds conducted by a Scoring Team Leader, the score assigned by the scorer and the Team Leader, and the ability to review the response. This process ensures all Team Leaders are correctly applying the rubric to their read-behinds and ensures consistency in the quality-control process between Team Leaders.

Double-Blind Scoring

Double-blind scoring refers to two scorers independently scoring a response without knowing whether the response was to be double-blind scored. The practice was applied to all writing prompts. All writing prompts were scored with 100% double-blind scoring. For OMAPP responses, scoring leadership reviewed and agreed on the final score for the response.

If there was a discrepancy (i.e., a difference greater than one score point) between double-blind scores, the response was placed into an arbitration queue. Arbitration responses were reviewed by scoring leadership (Team Leader or Scoring Supervisor) without knowledge of the two scorers' scores. Scoring leadership assigned the final score. Scoring leadership consulted individually with any scorer whose scoring rate fell below the required accuracy rate, and the Scoring Supervisor determined whether or when the scorer could resume scoring on that item. Once the scorer was allowed to resume scoring, scoring leadership carefully monitored the scorer's accuracy by increasing the number of read-behinds. Accuracy rates for double-blind scoring are reviewed in combination with other quality-control tools and discussion with Team Leaders. However, the general threshold is 60% exact agreement and 90% exact/adjacent agreement at the trait level.

Recalibration Sets

To determine whether scorers were still calibrated to the scoring standard, they were required to take an online recalibration set at the start of the day at various points during the scoring project.

Each recalibration set consisted of five responses representing the entire range of possible scores.

Any scorer who demonstrated difficulty was retrained before being allowed by the Scoring Supervisor to continue scoring. Once allowed to resume scoring, scoring leadership carefully monitored these scorers by increasing the number of read-behinds.

Scoring Reports

Measured Progress's electronic scoring software, iScore, generated multiple reports that were used by scoring leadership to measure and monitor scorers for scoring accuracy, consistency, and productivity.

5.4 WRITING SCORING

Writing prompts were administered as a part of the English II and English III winter 2014 and spring 2015 administrations. The writing score is a weighted composite of five analytic scores that focus on specific domains of writing skills. The steps for calculating the English II writing scores follow and are illustrated for an example in Table 5-6. The SDE was on-site to observe the first week of the scoring process.

5.4.1 Steps to Calculate OCCT EOI English II Writing Scores

- STEP 1: Average the trait scores from the two raters to obtain each of the five analytic trait scores. Average the scores in Column C and Column D, and write the results in Column E (in Table 5-6).

- STEP 2: Apply the weights to the trait scores. Multiply the numbers in Column B and Column E. Write the results in Column F.
- STEP 3: Sum all the weighted trait scores in Column F (lower right corner).
- STEP 4: Transform the sum of the weighted trait scores. That is, multiply the weighted sum of the trait scores by 1.7 and subtract 1.025, as shown in the following the table.
- STEP 5: Round the transformed weighted composite score to the nearest whole number to obtain the final writing score. After calculation, the final writing score value will range from 1 to 6.

Table 5-6. 2015–16 OK EOI: Calculating Writing Composite Scores for English II

A	B	C	D	E	F
Analytic Traits	Weight	Trait Scores from Rater 1	Trait Scores from Rater 2	Average (C+D)/2	Weighted Trait Scores (B X E)
Ideas and Development	0.30	3	2	(3+2)/2=2.5	.30 X 2.5 = 0.75
Organization, Unity, and Coherence	0.25	3	3	(3+3)/2=3.0	.25 X 3.0 = 0.75
Word Choice	0.15	3	2	(3+2)/2=2.5	.15 X 2.5 = 0.375
Sentences and Paragraphs	0.15	2	3	(2+3)/2=2.5	.15 X 2.5 = 0.375
Grammar/Usage and Mechanics	0.15	3	2	(3+2)/2=2.5	.15 X 2.5 = 0.375
					Sum Above = 2.625

Transformed Writing Score = 2.625 X 1.7 – 1.025 = 3.4375

Final Writing Score = 3

5.4.2 Steps to Calculate OCCT English III Writing Scores

The steps that follow show the calculation of the ACE English III writing scores based on the trait scores for a writing prompt. Table 5-7 shows an example of the calculation of the ACE English III writing scores.

- STEP 1: Average the trait scores from the two raters to obtain each of the five analytic trait scores. Average the scores in Column C and Column D, and write the results in Column E.
- STEP 2: Multiply the weights by 5 to give new weights. Multiply the numbers in Column B by 5, and write the results in Column F.
- STEP 3: Multiply each trait score by the new weight to give the weighted score. Multiply Column E by Column F, and write the results in Column G.

- STEP 4: Sum all the weighted scores in Column G (lower right corner).
- STEP 5: Transform the sum of the weighted trait scores. Multiply the weighted sum of the trait scores by .58 and subtract 1.67843, as shown in the following the table.
- STEP 6: Round the transformed score to the nearest whole number to obtain the final English III writing score. After calculation, the final ACE English III writing score value will range from 1 to 10.

Table 5-7. 2015–16 OK EOI: Calculating Writing Composite Scores for English III

A	B	C	D	E	F	G
Analytic Traits	Weight	Trait Scores from Rater 1	Trait Scores from Rater 2	Average (C+D)/2	New Weight (B X 5)	Weighted Trait Scores (E X F)
Ideas and Development	0.30	2	2	2.0	(.30 X 5) = 1.5	(2 X 1.5) = 3
Organization, Unity, and Coherence	0.25	1	2	1.5	(.25 X 5) = 1.25	(1.5 X 1.25) = 1.875
Word Choice	0.15	2	3	2.5	(.15 X 5) = 0.75	(2.5 X .75) = 1.875
Sentences and Paragraphs	0.15	3	3	3.0	(.15 X 5) = 0.75	(3 X .75) = 2.25
Grammar/Usage and Mechanics	0.15	4	3	3.5	(.15 X 5) = 0.75	(3.5 X .75) = 2.625
						Sum Above= 11.625

Transformed ACE English III Writing Score = 11.625 X .58 – 1.67843 = 5.06407

Final Writing Score = 5

CHAPTER 6 CLASSICAL ITEM ANALYSIS

As noted in Brown (1983), "A test is only as good as the items it contains." A complete evaluation of a test's quality must include an evaluation of each item. Both *Standards for Educational and Psychological Testing* (AERA et al., 2014) and *Code of Fair Testing Practices in Education* (2004) include standards for identifying quality items. Items should assess only knowledge or skills that are identified as part of the domain being tested and should avoid assessing irrelevant factors. Items should also be unambiguous and free of grammatical errors, potentially insensitive content or language, and other confounding characteristics. In addition, items must not unfairly disadvantage students in particular racial, ethnic, or gender groups.

Both qualitative and quantitative analyses are conducted to ensure that Oklahoma End-of-Instruction (EOI) items meet these standards. Qualitative analyses are described in earlier chapters of this report; this chapter focuses on quantitative evaluations. Statistical evaluations are presented in four parts: 1) difficulty indices, 2) item-test correlations, 3) differential item functioning (DIF) statistics, and 4) dimensionality analyses. The item analyses presented here are based on the statewide administration of the Oklahoma EOI in spring 2016. Note that the information presented in this chapter is based on the items common to all forms, since those are the items on which student scores are calculated. (Item analyses are also performed for field-test items, and the statistics are then used during the item review process and form assembly for future administrations.)

6.1 CLASSICAL DIFFICULTY AND DISCRIMINATION INDICES

All multiple-choice, constructed-response, and short-answer items are evaluated in terms of item difficulty according to standard classical test theory practices. Difficulty is defined as the average proportion of points achieved on an item and is measured by obtaining the average score on an item and dividing it by the maximum possible score for the item. Multiple-choice and short-answer items are scored dichotomously (correct vs. incorrect); for these items, the difficulty index is simply the proportion of students who correctly answered the item. Constructed-response items are scored polytomously, meaning that a student can achieve a score of 0, 1, 2, 3, or 4. By computing the difficulty index as the average proportion of points achieved, the indices for the different item types are placed on a similar scale, ranging from 0.0 to 1.0 regardless of the item type. Although this index is traditionally described as a measure of difficulty, it is properly interpreted as an *easiness* index, because larger values indicate easier items. An index of 0.0 indicates that all students received no credit for the item, and an index of 1.0 indicates that all students received full credit for the item.

Items that are answered correctly by almost all students provide little information about differences in student abilities, but they do indicate knowledge or skills that have been mastered by most students. Similarly, items that are correctly answered by very few students provide little information about differences in student abilities but may indicate knowledge or skills that have not yet been mastered by most students. In general, to provide the best measurement, difficulty indices should range from near-chance performance (0.25 for four-option multiple-choice items or essentially zero for constructed-response or short-answer items) to 0.90, with the majority of items generally falling between around 0.4 and 0.7. However, on a standards-referenced assessment such as the Oklahoma EOI, it may be appropriate to include some items with very low or very high item difficulty values to ensure sufficient content coverage.

A desirable characteristic of an item is for higher-ability students to perform better on the item than lower-ability students do. The correlation between student performance on a single item and total test score is a commonly used measure of this characteristic of the item. Within classical test theory, the item-test correlation is referred to as the item's discrimination, because it indicates the extent to which successful performance on an item discriminates between high and low scores on the test. For constructed-response items, the item discrimination index used was the Pearson product-moment correlation; for dichotomous items (multiple-choice and short-answer), the corresponding statistic is commonly referred to as a point-biserial correlation. The theoretical range of these statistics is –1.0 to +1.0, with a typical observed range from 0.2 to 0.6.

Discrimination indices can be thought of as measures of how closely an item assesses the same knowledge and skills assessed by other items contributing to the criterion total score. That is, the discrimination index can be thought of as a measure of construct consistency.

A summary of the item difficulty and item discrimination statistics for each subject is presented in Table 6-1. Note that the statistics are presented for all operational items by item type (multiple-choice and open-response, which includes writing prompts). The mean difficulty and discrimination values shown in the table are within generally acceptable and expected ranges.

Table 6-1. 2015–16 Spring OK EOI: Summary of Item Difficulty and Discrimination Statistics by Subject

Subject	Grade	Item Type	Number of Items	*p*-Value		Discrimination	
				Mean	*Standard Deviation*	*Mean*	*Standard Deviation*
Algebra I	HS	All	109	0.63	0.16	0.40	0.09
		MC	109	0.63	0.16	0.40	0.09
		OR	0				
Algebra II	HS	All	108	0.61	0.15	0.36	0.10
		MC	108	0.61	0.15	0.36	0.10
		OR	0				
Biology	HS	All	110	0.64	0.13	0.39	0.08
		MC	110	0.64	0.13	0.39	0.08
		OR	0				
English II	HS	All	124	0.68	0.14	0.37	0.12
		MC	114	0.69	0.15	0.35	0.09
		OR	10	0.66	0.01	0.66	0.02
English III	HS	All	134	0.64	0.16	0.35	0.13
		MC	124	0.64	0.17	0.32	0.09
		OR	10	0.68	0.01	0.67	0.03

continued

Subject	Grade	Item Type	Number of Items	*p*-Value		Discrimination	
				Mean	*Standard Deviation*	*Mean*	*Standard Deviation*
Geometry	HS	All	102	0.68	0.16	0.38	0.09
		MC	102	0.68	0.16	0.38	0.09
		OR	0				
U.S. History	HS	All	115	0.65	0.15	0.35	0.10
		MC	115	0.65	0.15	0.35	0.10
		OR	0				

MC = multiple-choice; OR = open-response

A comparison of indices across tests is complicated because these indices are population and content dependent. Direct comparisons would require that either the items or the students were common across groups. Since that is not the case, it cannot be determined whether differences in performance across content areas are due to differences in student abilities, differences in item difficulties, or both. With this caveat in mind, it appears generally that, for U.S. History students found their items more difficult than in other content areas.

For English II and III, comparing the difficulty indices of multiple-choice items and constructed-response or short-answer items is inappropriate because multiple-choice items can be answered correctly by guessing. Similarly, discrimination indices for the four-point constructed-response items were larger than those for the dichotomous items due to the greater variability of the former (i.e., the partial credit these items allow) and the tendency for correlation coefficients to be higher given greater variances of the correlates.

In addition to the item difficulty and discrimination summaries presented above, item level classical statistics and item level score distributions were also calculated. Item level classical statistics are provided in Appendix H; item difficulty and discrimination values are presented for each item. The item difficulty and discrimination indices are within generally acceptable and expected ranges. Very few items were answered correctly at near-chance or near-perfect rates. Similarly, the positive discrimination indices indicate that students who performed well on individual items tended to perform well overall. There were a small number of items with near-zero discrimination indices, but none was negative. Item-level score-point distributions are provided for constructed-response items on English II and III in Appendix I; for each item, the percentage of students who received each score point is presented.

6.2 DIF

Code of Fair Testing Practices in Education (2004) explicitly states that subgroup differences in performance should be examined when sample sizes permit and that actions should be taken to ensure that differences in performance are due to construct-relevant, rather than irrelevant, factors. *Standards for Educational and Psychological Testing* (AERA et al., 2014) includes similar guidelines. As part of the effort to identify such problems, Oklahoma EOI items were evaluated in terms of DIF statistics.

For the Oklahoma EOI, the standardization DIF procedure (Dorans & Kulick, 1986) was employed to evaluate subgroup differences. The standardization DIF procedure is designed to identify items for which subgroups of interest perform differently, beyond the impact of differences in overall achievement. The DIF procedure calculates the difference in item performance for two groups of students (at a time) matched for achievement on the total test. Specifically, average item performance is calculated for students at every total score. Then an overall average is calculated, weighting the total score distribution so that it is the same for the two groups.

When differential performance between two groups occurs on an item (i.e., a DIF index in the "low" or "high" categories, explained below), it may or may not be indicative of item bias. Course-taking patterns or differences in school curricula can lead to DIF but for construct-relevant reasons. On the other hand, if subgroup differences in performance could be traced to differential experience (such as geographical living conditions or access to technology), the inclusion of such items should be reconsidered.

Computed DIF indices have a theoretical range from -1.0 to 1.0 for multiple-choice and short-answer items, and the index is adjusted to the same scale for constructed-response items. Dorans and Holland (1993) suggested that index values between -0.05 and 0.05 should be considered negligible. The preponderance of Oklahoma EOI items fell within this range. Dorans and Holland further stated that items with values between -0.10 and -0.05 and between 0.05 and 0.10 (i.e., "low" DIF) should be inspected to ensure that no possible effect is overlooked, and that items with values outside the [-0.10, 0.10] range (i.e., "high" DIF) are more unusual and should be examined very carefully.[1]

For the 2015–16 Oklahoma EOI, 10 subgroup comparisons were evaluated for DIF:

- Male versus female
- White versus Native American
- White versus Hispanic
- White versus Black/African American
- White versus American Indian/Alaskan Native
- White versus Pacific Islander
- White versus Two or more races
- Non-ELL versus ELL
- Disability versus no disability

[1] It should be pointed out here that DIF for items is evaluated initially at the time of field-testing. If an item displays high DIF, it is flagged for review by a Measured Progress content specialist. The content specialist consults with the SDE to determine whether to include the flagged item in a future operational test administration.

- Low income versus not low income

The tables in Appendix J present the number of items classified as either "low" or "high" DIF, overall and by group favored. Generally speaking, the number of high DIF items was quite low for most tests. One trend that was noticeable was a number of items that favored non-ELL students over ELL students in the English II, English III, and US history tests. Given the focus on language on tests, however, this is not an unusual result.

6.3 DIMENSIONALITY ANALYSIS

Because tests are constructed with multiple content area subcategories and their associated knowledge and skills, the potential exists for a large number of dimensions being invoked beyond the common primary dimension. Generally, the subcategories are highly correlated with each other; therefore, the primary dimension they share typically explains an overwhelming majority of variance in test scores. In fact, the presence of just such a dominant primary dimension is the psychometric assumption that provides the foundation for the unidimensional item response theory (IRT) models that are used for calibrating, linking, scaling, and equating the 2015–16 spring EOI test forms.

The purpose of dimensionality analyses is to investigate whether violation of the assumption of test unidimensionality is statistically detectable and, if so, (a) the degree to which unidimensionality is violated and (b) the nature of the multidimensionality. Findings from dimensionality analyses performed on the 2015–16 spring EOI common items for mathematics (Algebra I, Algebra II, and Geometry), English (English II and English III), science (Biology I), and social studies (U.S. History) are reported below. [Notes: (1) Only common items were analyzed since they are used for score reporting; (2) only multiple-choice items were analyzed for English since the writing prompt is a known intentional secondary dimension and our analysis is focused on finding unintended dimensions.]

The dimensionality analyses were conducted using the nonparametric IRT-based methods DIMTEST (Stout, 1987; Stout, Froelich, & Gao, 2001) and DETECT (Zhang & Stout, 1999). Both of these methods use as their basic statistical building block the estimated average conditional covariances for item pairs. A conditional covariance is the covariance between two items conditioned on total score for the rest of the test, and the average conditional covariance is obtained by averaging across all possible conditioning scores. When a test is strictly unidimensional, all conditional covariances are expected to take on values within random noise of zero, indicating statistically independent item responses for examinees with equal expected scores. Nonzero conditional covariances are essentially violations of the principle of local independence, and local dependence implies multidimensionality. Thus, nonrandom patterns of positive and negative conditional covariances are indicative of multidimensionality.

DIMTEST is a hypothesis-testing procedure for detecting violations of local independence. The data are first randomly divided into a training sample and a cross-validation sample. Then an exploratory analysis of the conditional covariances is conducted on the training sample data to find the cluster of items that displays the greatest evidence of local dependence. The cross-validation sample is then used to test whether the conditional covariances of the selected cluster of items displays local dependence, conditioning on total score on the nonclustered items. The DIMTEST statistic follows a standard normal distribution under the null hypothesis of unidimensionality.

DETECT is an effect-size measure of multidimensionality. As with DIMTEST, the data are first randomly divided into a training sample and a cross-validation sample (these samples are drawn independent of those used with DIMTEST). The training sample is used to find a set of mutually exclusive and collectively exhaustive clusters of items that best fit a systematic pattern of positive conditional covariances for pairs of items from the same cluster and negative conditional covariances from different clusters. Next, the clusters from the training sample are used with the cross-validation sample data to average the conditional covariances: within-cluster conditional covariances are summed; from this sum the between-cluster conditional covariances are subtracted; this difference is divided by the total number of item pairs; and this average is multiplied by 100 to yield an index of the average violation of local independence for an item pair. DETECT values less than 0.2 indicate very weak multidimensionality (or near unidimensionality); values of 0.2 to 0.4, weak to moderate multidimensionality; values of 0.4 to 1.0, moderate to strong multidimensionality; and values greater than 1.0, very strong multidimensionality (Roussos & Ozbek, 2006).

DIMTEST and DETECT were applied to the 2015–16 spring EOI test forms. The data for each form were split into a training sample and a cross-validation sample as described above. Every form included at least 11,600 student examinees, so every training sample and cross-validation sample included at least 5,800 students. DIMTEST was then applied to every form. DETECT was applied to each dataset for which the DIMTEST null hypothesis was rejected in order to estimate the effect size of the multidimensionality.

Because of the large sample sizes for the Oklahoma test forms, DIMTEST would be sensitive even to quite small violations of unidimensionality, and the null hypothesis was strongly rejected for every dataset with all *p*-values being less than 0.00005. Strong rejection of the null hypothesis of unidimensionality is not surprising because strict unidimensionality is an idealization that almost never holds exactly for a given dataset. Thus, it was important to use DETECT to estimate the effect size of the violations of local independence found by DIMTEST. Table 6-2 displays the multidimensional effect size estimates from DETECT.

Table 6-2. 2015–16 Spring OK EOI: Multidimensionality Effect Sizes by Subject and Form

Subject	Grade	Form	Multidimensionality Effect Size	
			2015–16	*2014–15*
Algebra I	HS	A	0.23	0.24
		B	0.23	0.24
Algebra II	HS	A	0.19	0.22
		B	0.23	0.20

continued

Subject	Grade	Form	Multidimensionality Effect Size	
			2015–16	*2014–15*
Geometry	HS	A	0.16	0.14
		B	0.14	0.17
Average			0.20	0.20
English II	HS	A	0.12	0.11
		B	0.10	0.10
English III	HS	A	0.13	0.12
		B	0.13	0.20
Average			0.12	0.13
Biology I	HS	A	0.11	0.09
		B	0.12	0.08
Average			0.12	0.09
U.S. History	HS	A	0.11	0.14
		B	0.12	0.10
Average			0.11	0.12

All the DETECT values for 2015–16 indicated very weak to weak multidimensionality. The average DETECT values for the four content areas were 0.20 for mathematics, 0.12 for English, 0.12 for science, and 0.11 for social studies. The values for mathematics tests tended to be a bit higher than the other subjects, potentially because of the reading content present in the items. The DETECT indices for the individual content areas are seen to be very similar between the two forms. In particular, both sets of values indicate very weak to weak multidimensionality for all the tests. Note that the writing prompts were excluded for the English II and III analyses.

A cursory review of the clusters did not reveal any indications of multidimensionality caused by unintended influences. A more thorough investigation employing experts in the substantive content of the test forms would be required to accurately identify the skills and knowledge areas associated with the clusters. In any case, the violations of local independence from all such effects, as evidenced by the DETECT effect sizes, were very small and do not warrant any changes in test design or scoring.

CHAPTER 7 ITEM RESPONSE THEORY SCALING AND EQUATING

In addition to the classical test theory item analyses previously described, the Oklahoma End-of-Instruction (EOI) was analyzed according to item response theory (IRT) models. IRT analyses were first used to place all 2015–16 forms on the same scale, and then to equate the 2015–16 test to the previous year's test. Details on the IRT calibration and equating procedures for the Oklahoma EOI are described below.

7.1 IRT

All spring EOI items were calibrated using IRT. IRT uses mathematical models to define a relationship between an unobserved measure of student performance, usually referred to as theta (θ), and the probability (p) of getting a dichotomous item correct or of getting a particular score on a polytomous item. In IRT, it is assumed that all items are independent measures of the same construct (i.e., of the same θ). Another way to think of θ is as a mathematical representation of the latent trait of interest. Several common IRT models are used to specify the relationship between θ and p (Hambleton & van der Linden, 1997; Hambleton & Swaminathan, 1985). The process of determining the specific mathematical relationship between θ and p is called item calibration. After items are calibrated, they are defined by a set of parameters that specify a nonlinear, monotonically increasing relationship between θ and p. Once the item parameters are known, an estimate of θ for each student can be calculated. This estimate, $\hat{\theta}$, is considered to be an estimate of the student's true score or a general representation of student performance. It has characteristics that are preferable to those of raw scores for equating purposes.

For the 2015–16 spring OK EOI tests, the three-parameter logistic (3PL) model was used for dichotomous items and the generalized partial credit model (GPCM) was used for polytomous items. The 3PL model for dichotomous items can be defined as:

$$P_i(\theta_j) = c_i + (1 - c_i)\frac{\exp[Da_i(\theta_j - b_i)]}{1+\exp[Da_i(\theta_j - b_i)]}, \qquad \text{(Equation 1)}$$

where
i indexes the items,
j indexes students,
α represents item discrimination,
b represents item difficulty,
c is the pseudo guessing parameter, and
D is a normalizing constant equal to 1.701.

For polytomous items, the generalized partial credit model can be defined as:

$$P_{jk}(\theta) = \frac{\exp \sum_{v=0}^{k}\left[Da_j(\theta - b_j + d_v)\right]}{\sum_{c=1}^{m} \exp \sum_{v=1}^{c}\left[Da_j(\theta - b_j + d_v)\right]}, \qquad \text{(Equation 2)}$$

where
j indexes items,
k indexes students,
a represents item discrimination,
b represents item difficulty,
d represents category step parameter, and
D is a normalizing constant equal to 1.0.

For more information about item calibration and determination, the scorer is referred to Lord and Novick (1968), Hambleton and Swaminathan (1985), or Baker and Kim (2004).

7.2 Item Response Results

PARSCALE v4.1 (Muraki & Bock, 1999) software was used to perform all IRT analyses for the Oklahoma EOI. Each item occupied only one block in the calibration run, and the 1.701 normalizing constant was used for 3PL items and 1.0 for the GPCM items. A default convergence criterion of 0.001 was used. The tables in Appendix K give the IRT item parameters of all dichotomous (multiple-choice) items on the 2015–16 Oklahoma EOI tests by subject. Appendix L provides the test characteristic curves (TCCs) and test information functions (TIFs).

TCCs display the expected (average) raw score associated with each θ_j value between -4.0 and 4.0. Mathematically, the TCC is computed by summing the item characteristic curves (ICCs) of all items that contribute to the raw score. The expected raw score at a given value of θ_j is

$$E(X|\theta_j) = \sum_{i=1}^{n} P_i(1|\theta_j), \qquad \text{(Equation 3)}$$

where
i indexes the items (and n is the number of items contributing to the raw score),
j indexes students (here, θ_j runs from –4 to 4), and
$E(X|\theta_j)$ is the expected raw score for a student of ability θ_j.

The expected raw score monotonically increases with θ_j, consistent with the notion that students of high ability tend to earn higher raw scores than do students of low ability. Most TCCs are “S-shaped,” flatter at the ends of the distribution and steeper in the middle.

The TIF displays the amount of statistical information that the test provides at each value of θ_j. Information functions depict test precision across the entire latent trait continuum. There is an inverse relationship between the information of a test and its standard error of measurement (SEM). For long tests, the SEM at a given θ_j is approximately equal to the inverse of the square root of the statistical information at θ_j (Hambleton, Swaminathan, & Rogers, 1991), as follows:

$$SEM(\theta_j) = \frac{1}{\sqrt{I(\theta_j)}}. \qquad \text{(Equation 4)}$$

Compared to the tails, TIFs are often higher near the middle of the distribution where most students are located and where most items are sensitive by design.

7.3 EQUATING

7.3.1 Equating design

The Measured Progress psychometrics team has researched and conducted a wide variety of equating approaches. Because the EOI assessments will be using (IRT) as the underlying statistical model, the equating is best accomplished using IRT methods. Generally, IRT equating methods fall under two broad categories: post-equated and pre-equated. There are a variety of approaches within each of these two categories. Post-equated approaches have the advantage of greater accuracy and precision. The accuracy is likely to be greater because post-equating can correct for item parameter drift; and the precision is greater because the item parameter estimates are based on the large sample sizes of the operational administration, rather than on the smaller field-test sample sizes often associated with pre-equating. In pre-equating designs, greater care must be taken to keep item parameter drift to a bare minimum since there is no chance to correct for it at the time of the scoring and reporting of the operational test results. However, the advantage of pre-equating is the faster reporting of student scores because the IRT model relies on the item parameters from previous administrations of the items.

For any equating design, it is critical that rigorous procedures are implemented to monitor the quality of the equating and check that the assumptions underlying the equating are not violated. Measured Progress psychometricians have conducted research (Parker et al., 2009; Hagge & Keller, 2009; Keller et al., 2008; Keller et al., 2007) and have developed tools to estimate equating error across years under realistic violations of the equating assumptions. Measured Progress psychometricians can, thus, monitor particular well-known violations of IRT equating assumptions and use the research to estimate their effects on the reliability and validity of the equating. Additionally, the Psychometrics and Research Department analyzes the equating data in detail for scale drift through traditional delta analyses and *b*-*b* analyses. The delta analysis converts *p*-values to a type of *z*-score called delta scores using the inverse of the normal cumulative function, followed by a linear transformation to a metric with a mean of 13 and a standard deviation of 4. The delta analysis then compares the old delta to the new delta using linear regression analysis. A standardized perpendicular difference from the regression line is calculated for each item, and any item with a difference of a magnitude of 3 or greater is flagged for drift. The *b*-*b* analyses are similar in nature, with the main difference being that the IRT *b*-parameters are used rather than transformed *p*-values.

Furthermore, Measured Progress has special procedures in place during the calibration phase to check that the quality of the equating items is maintained consistently across years. Equating items that display lack of stability are flagged and removed from equating usage.

For the EOI tests:

- Algebra I and II, English II and II, Biology, and Geometry used the item pre-equating method.
- Winter and trimester administration of U.S. History used the item pre-equating method.
- Spring administration of U.S. History used the anchor-test-nonequivalent-groups post-equating design.

7.3.1.1 PRE-EQUATING

The EOI Algebra I and II, English II and II, Biology, Geometry, and Winter/Trimester U.S. History tests used the item pre-equating method as described in Kolen and Brennan (2014). Item pre-equating allows the raw-to-scale score conversion to be produced before the form is administered, which in turn allows for faster reporting and turnaround times. In item pre-equating, new forms are built from a pool of preexisting IRT-calibrated items. In addition to these operational items, new nonoperational items can also be included on the forms. The operational items are then used as a set of common items for transforming the item parameters of the nonoperational items so that they are the same θ scale as the IRT-calibrated item pool. This allows for the item pool to be expanded continually.

However, with pre-equating there are a number of cautions that need to be taken into consideration. Kolen and Brennan (2014) state that to ensure that items behave the same on each administration the items should appear in the same contexts and positions operationally as they did nonoperationally. Thus, care must to be taken to avoid significant shifts in position and context. Any drift must be carefully monitored and controlled to ensure comparability between forms of the test. In addition, the presence of multidimensionality can be problematic when bringing new items on scale, so dimensionality needs to be carefully monitored as well (see Section 6.3). Chapter 10 describes our scale validation and post-equated check procedures and results of our pre-equating methodology.

Item parameters for the spring 2015–16 administration are displayed in Appendix K. Raw score to scale score look-ups are displayed in Appendix M.

7.3.1.2 POST-EQUATING

Equating for the spring administration of the Oklahoma EOI U.S. History test used the anchor-test-nonequivalent-groups design described by Petersen, Kolen, and Hoover (1989). In this equating design, no assumption is made about the equivalence of the examinee groups taking different test forms (i.e., naturally occurring groups are assumed). IRT is particularly useful for equating nonequivalent groups (Allen & Yen, 1979). The fixed common-item IRT procedure was used: The anchor items from the previous year's administration were identified during this year's calibrations, and their IRT parameters were fixed to last year's values. This method results in all person and item parameters being on the same θ scale as they were in the previous year. The procedures used for equating and scaling do not change the rank ordering of students, give more weight to particular items, or change students' performance-level classifications.

Item parameter estimates for the 2015–16 Oklahoma EOI U.S. History test were placed on the 2014–15 scale by using the method of Stocking and Lord (1983), which is based on the IRT principle of item parameter invariance. According to this principle, the equating items for both the 2014–15 and 2015–16 OCCT tests should have the same item parameters. After the item parameters for each 2015–16 test were estimated using PARSCALE (Muraki & Bock, 2003), the Stocking and Lord method was employed to find the linear transformation (slope and intercept) that adjusted the equating items' parameter estimates such that the 2015–16 OCCT tests' TCC for the equating items was as close as possible to that of the 2015–16 OCCT tests.

7.4 Post-Equating Results

An Equating Report was submitted to the SDE for its approval prior to production of student reports. The equating report details the results of a variety of quality-control activities that were implemented within the Psychometrics and Research Department during IRT calibration and equating, including examining *b*-plots and TCCs and conducting delta and rescore analyses. The evaluations of the equating results are summarized below.

The number of Newton cycles required for convergence during the IRT analysis was 45 for U.S. History; this is within acceptable ranges.

Appendix N presents the results from the delta analysis. This procedure was used to evaluate the performance of equating items, and the discard status presented in the appendix indicates whether the item was used in equating. As can be seen in the appendix, one of the items was identified as problematic based on the results of the delta analyses and was excluded from use in equating.

Also, a-plots and b-plots, which show IRT parameters for 2015–16 plotted against the values for 2014–15, are presented in Appendix O. One item was identified as outliers in the b-b plot and was removed as an equating item.

Table 7-1 below shows all items that required intervention during IRT calibration and equating. As can be seen in the table, all items on the watch list were identified as a result of the delta analyses. In all cases, the identified item was excluded from use in equating. One common issue with 3PL models is related to the *c*-parameter estimation (commonly referred to as the pseudo-guessing parameter). At times, 3PL estimation can lead to less than optimal solutions (or no solution), which in turn can result in unstable parameter estimates (or no estimate). In these cases, this problem can be solved by fixing the *c*-parameter to zero, which effectively makes the model 2PL.

Table 7-1. 2015–16 Spring OK EOI: Items That Required Intervention During IRT Calibration and Equating

Subject	Grade	Item Number	Reasons	Action
U.S. History	HS	143261A	*c*-parameter	set *c* = 0
		143374A	*c*-parameter	set *c* = 0
		143402A	*c*-parameter	set *c* = 0
		143525A	*c*-parameter	set *c* = 0
		143533A	*c*-parameter	set *c* = 0
		156378A	*c*-parameter	set *c* = 0
		156460A	*c*-parameter	set *c* = 0
		156494A	*c*-parameter	set *c* = 0
		156528A	*c*-parameter	set *c* = 0
		157470A	*b*/*b* analysis	removed from equating
		158448A	delta analysis	removed from equating
		164984A	*c*-parameter	set *c* = 0
		164989A	*c*-parameter	set *c* = 0
		166128A	*c*-parameter	set *c* = 0
		167658A	*c*-parameter	set *c* = 0
		167748A	*c*-parameter	set *c* = 0
		167749A	*c*-parameter	set *c* = 0
		176211A	*c*-parameter	set *c* = 0
		176782A	*c*-parameter	set *c* = 0

Once all evaluations of the equating items were complete, the Stocking and Lord (1983) method of equating was used to place the item parameters onto the previous year's scale, as described above. The Stocking and Lord transformation constants are presented in Table 7-2. Note that these constants are on the scale score metric (see Section 7.6) rather than the N (0, 1) metric.

Table 7-2. 2015–16 Spring OK EOI: Stocking and Lord Transformation Constants

Subject	Grade	Slope	Intercept
U.S. History	HS	1.06	-0.08

Item parameters for the U.S. History test are displayed in Appendix K, and raw to scaled score look-ups are displayed in Appendix M.

7.5 Post-Equated Check of Pre-Equated Tests

As described in Section 7.3 most of the End-of-Instruction (EOI) tests, with the exception of U.S. History, were equated using item pre-equating. However, with pre-equating there are a number of cautions that need to be taken into consideration. Kolen and Brennan (2014) state that to ensure that items behave the same on each administration the items should appear in the same contexts and positions operationally as they did nonoperationally. Thus, care must be taken to avoid significant shifts in position and context. Any drift must be carefully monitored and controlled to ensure comparability between forms of the test.

To provide scale validation evidence, Measured Progress performed a rigorous post-equated check of the test data. One primary usage of the check is to use item bank parameters selectively to exclude the adverse effect of parameter drift on the stability and health of the item bank. Another advantage of the check is the usage of more calibration samples to get the better parameter estimates.

The procedures for the post-equated check generally mirror those for post-equating described in Section 7.3.1.2. Once the test score data are received they are calibrated using item response theory (IRT) with the three-parameter logistic (3PL) model and generalized partial credit model (GPCM) described in section 7.1.

Next, to bring the calibrated parameters onto the same scale as the previous years, they are equated using the Stocking and Lord (1983) method of equating. For this process equating items were selected based on a rigorous set of criteria including position, context, and stability. Stability was checked through *b*-*b* and delta analyses to ensure there was no significant drift in the parameters of the equating items.

Finally, the operational item parameters resulting from this process were updated in the item bank, and these updated parameters were used as part of field-test calibrations.

7.6 PERFORMANCE STANDARDS

Cutpoints for the Oklahoma EOI in U.S. History were recently set at standard setting meetings held in summer 2014 (CTB/McGraw-Hill, 2014) and for the Oklahoma EOI in Biology in summer 2013, with other subjects set in previous years (SDE, 2009). Details of the standard setting procedures can be found in the standard setting reports and technical reports of those years. The cuts on the theta scale that were established at those meetings are presented in Table 7-3 below. The θ metric cut scores that emerged from the standard setting meetings will remain fixed throughout the assessment program unless standards are reset for any reason. Also shown in the table are the cutpoints on the reporting score scale (described below).

Table 7-3. 2015–16 Spring OK EOI: Cut Scores on the Theta metric and Reporting Scale by Subject

Subject	Grade	Scaled Score				
		Minimum	*Cut 1*	*Cut 2*	*Cut 3*	*Maximum*
Algebra I	HS	490	662	700	762	999
Algebra II	HS	440	654	700	783	999
Biology I	HS	440	651	700	773	999
English II	HS	440	609	700	817	999
English III	HS	440	670	700	802	999
Geometry	HS	440	635	700	777	999
U.S. History	HS	440	668	700	761	999

7.6.1 Score Distributions

Table Q-1 in Appendix Q shows performance-level distributions for each of the last three years by subject.

7.7 Scaled Scores

Oklahoma EOI scores in each content area are reported on a scale ranging from 440 to 999 (or 490 to 999 for Algebra I). By providing information that is more specific about the position of a student's results, scaled scores supplement performance-level scores. School- and district-level scaled scores are calculated by computing the average of student-level scaled scores. Students' raw scores (i.e., total number of points) on the 2015–16 Oklahoma EOI were translated to scaled scores using a data analysis process called *scaling*. Scaling simply converts from one scale to another. In the same way that a given temperature can be expressed on either Fahrenheit or Celsius scales, or the same distance can be expressed in either miles or kilometers, student scores on the 2015–16 Oklahoma EOI tests can be expressed in raw or scaled scores.

It is important to note that converting from raw scores to scaled scores does not change students' performance-level classifications. Given the relative simplicity of raw scores, it is fair to ask why scaled scores instead of raw scores are used in Oklahoma EOI reports. Foremost, scaled scores offer the advantage of simplifying result reporting across content areas and subsequent years. Because the standard setting process typically results in different cut scores across content areas on a raw score basis, it is useful to transform these raw cut scores to a scale that is more easily interpretable and consistent. For the Oklahoma EOI, a score of 700 is the cut score determining proficiency. This is true regardless of content area or year. Using scaled scores greatly simplifies the task of understanding how a student performed. The raw score to scaled score look-up tables for each content area are presented in Appendix M. Graphs of the scaled score cumulative frequency distributions for 2015 are presented in Appendix P.

Table 7-4 shows the slope and intercept terms used to calculate the scaled scores for each grade. Note that the values in Table 7-4 will not change unless the standards are reset.

Table 7-4. 2015–16 Spring OK EOI: Scaled Score Slope and Intercept by Subject and Grade*

Subject	Grade	*m*-Slope	*b*-Intercept
Algebra I		58.00000	723.80000
Algebra II		77.11640	692.23810
Biology I		76.49429	716.76173
English II	HS	84.80517	734.90335
English III		74.32896	736.12560
Geometry		75.51595	721.98440
US History		54.88000	715.31000

*Note: The slopes and intercepts are used to transform the theta scores on *N*(0,1) scale onto the scale scores (the 700 scale).

CHAPTER 8 RELIABILITY

Although an individual item's performance is an important focus for evaluation, a complete evaluation of an assessment must also address the way items function together and complement one another. Tests that function well provide a dependable assessment of the student's level of ability. Unfortunately, no test can do this perfectly. A variety of factors can contribute to a given student's score being either higher or lower than his or her true ability. For example, a student may misread an item, or mistakenly fill in the wrong bubble when he or she knew the answer. Collectively, extraneous factors that impact a student's score are referred to as measurement error. Any assessment includes some amount of measurement error; that is, no measurement is perfect. This is true of all academic assessments—some students will receive scores that underestimate their true ability, and other students will receive scores that overestimate their true ability. When tests have a high amount of measurement error, student scores are very unstable. Students with high ability may get low scores or vice versa. Consequently, one cannot reliably measure a student's true level of ability with such a test. Assessments that have less measurement error (i.e., errors made are small on average and student scores on such a test will consistently represent his or her ability) are described as more reliable.

There are a number of ways to estimate an assessment's reliability. One possible approach is to give the same test to the same students at two different points in time that are close together. If students receive the same scores on each test, then the extraneous factors affecting performance are small and the test is reliable. (This is referred to as "test-retest reliability.") A potential problem with this approach is that students may remember items from the first administration or may have gained (or lost) knowledge or skills in the interim between the two administrations. A solution to the "remembering items" problem is to give a different but parallel test at the second administration. If student scores on each test correlate highly, the test is considered reliable. (This is known as "alternate forms reliability," because an alternate form of the test is used in each administration.) This approach, however, does not address the problem that students may have gained (or lost) knowledge or skills in the interim between the two administrations. In addition, the practical challenges of developing and administering parallel forms generally preclude the use of parallel forms reliability indices. One way to address the latter problems is to split the test in half and then correlate students' scores on the two half-tests; this in effect treats each half-test as a complete test. By doing this, the problems associated with an intervening time interval and of creating and administering two parallel forms of the test are alleviated. This is known as a "split-half estimate of reliability." If the two half-test scores correlate highly, items on the two half-tests must be measuring very similar knowledge or skills. This is evidence that the items complement one another and function well as a group. This also suggests that measurement error will be minimal.

The split-half method requires psychometricians to select items that contribute to each half-test score. This decision may have an impact on the resulting correlation, since each different possible split of the test halves will result in a different correlation. Another problem with the split-half method of calculating reliability is that it underestimates reliability, because test length is cut in half. All else being equal, a shorter test is less reliable than a longer test. Cronbach (1951) provided a statistic, α (alpha), that eliminates the problem of the split-half method by comparing individual item variances to total test variance. Cronbach's α was used to assess the reliability of the 2015–16 Oklahoma End-of-Instruction (EOI):

$$\alpha \equiv \frac{n}{n-1}\left[1-\frac{\sum_{i=1}^{n}\sigma_{(Y_i)}^2}{\sigma_x^2}\right], \qquad \text{(Equation 6)}$$

where
i indexes the item,
n is the total number of items,
$\sigma_{(Y_i)}^2$ represents individual item variance, and
σ_x^2 represents the total test variance.

8.1 Reliability and Standard Errors of Measurement

Table 8-1 presents descriptive statistics, Cronbach's α coefficient, and raw score standard errors of measurement (SEMs) for each content area. (Statistics are based on common items only.)

Table 8-1. 2015–16 Spring OK EOI: Raw Score Descriptive Statistics, Cronbach's Alpha, and Standard Errors of Measurement (SEM) by Subject

Subject	Grade	Form	Number of Students	Raw Score			Alpha	SEM
				Maximum	*Mean*	*Standard Deviation*		
Algebra I	HS	A	29,513	55	33.54	11.09	0.92	3.09
		B	17,543	55	35.70	10.70	0.92	3.04
Algebra II	HS	A	18,212	55	33.55	9.84	0.90	3.12
		B	11,519	55	33.74	10.40	0.90	3.23
Biology I	HS	A	22,758	60	37.77	11.62	0.92	3.33
		B	19,948	60	39.70	11.69	0.92	3.21
English II	HS	A	26,161	66	44.39	10.88	0.92	3.03
		B	17,187	66	44.47	10.19	0.91	2.97
English III	HS	A	19,401	72	45.83	11.72	0.92	3.31
		B	12,743	72	45.78	10.71	0.90	3.30
Geometry	HS	A	24,287	55	37.03	9.97	0.91	3.00
		B	14,787	55	37.78	10.03	0.91	2.94
U.S. History	HS	A	24,797	60	39.49	11.00	0.91	3.25
		B	15,099	60	38.70	9.91	0.89	3.28

For the spring OK EOI, the reliability coefficients ranged from 0.89 for U.S. History Form B to 0.92 for several subjects. Since content areas have different test designs (e.g., the number of items varies by test), it is inappropriate to make inferences about the quality of one test by comparing its reliability to that of another test from a different content area.

8.2 Subgroup Reliability

The reliability coefficients discussed in the previous section were based on the overall population of students who took the 2015–16 spring Oklahoma EOI. Appendix R presents reliabilities for various subgroups of interest. Subgroup Cronbach's α's were calculated using the formula defined above based only on the members of the subgroup in question in the computations; values are calculated only for subgroups with 10 or more students.

For several reasons, the results of this section should be interpreted with caution. First, inherent differences between content areas preclude making valid inferences about the quality of a test based on statistical comparisons with other tests. Second, reliabilities are dependent not only on the measurement properties of a test but on the statistical distribution of the studied subgroup. For example, it can be readily seen in Appendix R that subgroup sample sizes may vary considerably, which results in natural variation in reliability coefficients. Or α, which is a type of correlation coefficient, may be artificially depressed for subgroups with little variability (Draper & Smith, 1998). Third, there is no industry standard to interpret the strength of a reliability coefficient, and this is particularly true when the population of interest is a single subgroup.

8.3 Subcategory Reliability

Of even more interest are reliabilities for the reporting subcategories within Oklahoma EOI content areas, described in Chapter 3. Cronbach's α coefficients for subcategories were calculated via the same formula defined previously using just the items of a given subcategory in the computations. Results are presented in Appendix R. Once again, as expected, because they are based on a subset of items rather than the full test, computed subcategory reliabilities were lower (sometimes substantially so) than were overall test reliabilities, and interpretations should take this into account.

Since the number of items in the subcategories ranged from 1 to 31 across subjects, there is, as expected, a large amount of variability across reporting categories. The subcategory reliabilities were lower than those based on the total test and approximately to the degree one would expect based on classical test theory. Qualitative differences between content areas once again preclude valid inferences about the quality of the full test based on statistical comparisons among subtests.

8.4 Interrater Consistency

Chapter 5 of this report describes in detail the processes that were implemented to monitor the quality of the hand-scoring of student responses for short-answer and constructed-response items. One of these processes was double-blind scoring: Approximately 2% of student responses were randomly selected and scored independently by two different scorers. Results of the double-blind scoring were used during scoring to identify scorers who required retraining or other intervention and are presented here as evidence of the reliability of the Oklahoma EOI. A summary of the interrater consistency results is presented in Table 8-2 below. Results in the table are collapsed across the hand-scored items by subject and form. The table shows the number of included scores, the percent exact agreement, percent adjacent agreement, correlation between the first two sets of scores, and the percent of responses that required a third score. The third score is required when the scores of the raters are not adjacent. The correlation describes degree of consistency between the two raters with a correlation of one being perfect agreement. The moderate correlations present here agree with the moderate number of adjacent scores present. This same information is provided at the item level in Appendix G.

Table 8-2. 2015–16 Spring OK EOI: Summary of Interrater Consistency Statistics Collapsed Across Items by Subject

Subject	Grade	Number of		Percent		Correlation	Percent of Third Scores
		Score Categories	*Included Scores*	*Exact*	*Adjacent*		
English II	HS	5	212,765	69.69	29.7	0.54	0.61
English III	HS	5	158,295	62.91	35.86	0.61	1.23

8.5 Reliability of Performance-Level Categorization

While related to reliability, the accuracy and consistency of classifying students into performance categories are even more important statistics in a standards-based reporting framework (Livingston & Lewis, 1995). After the performance levels were specified and students were classified into those levels, empirical analyses were conducted to determine the statistical accuracy and consistency of the classifications. For the Oklahoma EOI, students are classified into one of four performance levels: Unsatisfactory (U), Limited Knowledge (LK), Proficient (P), or Advanced (A). This section of the report explains the methodologies used to assess the reliability of classification decisions, and results are given.

Accuracy refers to the extent to which decisions based on test scores match decisions that would have been made if the scores did not contain any measurement error. Accuracy must be estimated, because errorless test scores do not exist. Consistency measures the extent to which classification decisions based on test scores match the decisions based on scores from a second, parallel form of the same test. Consistency can be evaluated directly from actual responses to test items if two complete and parallel forms of the test are given to the same group of students. In operational test programs, however, such a design is usually impractical. Instead, techniques have been developed to estimate both the accuracy and consistency of classification decisions based on a single administration of a test. The Livingston and Lewis (1995) technique was used for the 2015–16 Oklahoma EOI because it is easily adaptable to all types of testing formats, including mixed-format tests.

The accuracy and consistency estimates reported in Appendix S make use of "true scores" in the classical test theory sense. A true score is the score that would be obtained if a test had no measurement error.

Of course, true scores cannot be observed and so must be estimated. In the Livingston and Lewis (1995) method, estimated true scores are used to categorize students into their "true" classifications.

For the 2015–16 Oklahoma EOI, after various technical adjustments (described in Livingston & Lewis, 1995), a four-by-four contingency table of accuracy was created for each content area, where cell $[i, j]$ represented the estimated proportion of students whose true score fell into classification i (where $i = 1$ to 4) and observed score into classification j (where $j = 1$ to 4). The sum of the diagonal entries (i.e., the proportion of students whose true and observed classifications matched) signified overall accuracy.

To calculate consistency, true scores were used to estimate the joint distribution of classifications on two independent, parallel test forms. Following statistical adjustments per Livingston and Lewis (1995), a new four-by-four contingency table was created for each content area and populated by the proportion of students who would be categorized into each combination of classifications according to the two (hypothetical) parallel test forms. Cell $[i, j]$ of this table represented the estimated proportion of students whose observed score on the first form would fall into classification i (where $i = 1$ to 4) and whose observed score on the second form would fall into classification j (where $j = 1$ to 4). The sum of the diagonal entries (i.e., the proportion of students categorized by the two forms into exactly the same classification) signified overall consistency.

Another way to measure consistency is to use Cohen's (1960) coefficient κ (kappa), which assesses the proportion of consistent classifications after removing the proportion of consistent classifications that would be expected by chance. It is calculated using the following formula:

$$\kappa = \frac{(\text{Observed agreement})-(\text{Chance agreement})}{1-(\text{Chance agreement})} = \frac{\sum_i C_{ii}-\sum_i C_{i.}C_{.i}}{1-\sum_i C_{i.}C_{.i}}, \qquad \text{(Equation 7)}$$

where

$C_{i.}$ is the proportion of students whose observed performance level would be Level i (where i = 1–4) on the first hypothetical parallel form of the test;

$C_{.i}$ is the proportion of students whose observed performance level would be Level i (where i = 1–4) on the second hypothetical parallel form of the test; and

C_{ii} is the proportion of students whose observed performance level would be Level i (where i = 1–4) on both hypothetical parallel forms of the test.

Because κ is corrected for chance, its values are lower than are other consistency estimates.

8.5.1 Accuracy and Consistency

The accuracy and consistency analyses described above are provided in Table 8-3. The table includes overall accuracy and consistency indices, including kappa. Accuracy and consistency values conditional on performance level are also given. For these calculations, the denominator is the proportion of students associated with a given performance level. For example, the conditional accuracy value is 0.77 for Proficient for Algebra I. This figure indicates that among the students whose true scores placed them in this classification, 77% would be expected to be in this classification when categorized according to their observed scores. Similarly, a consistency value of 0.69 indicates that 69% of students with observed scores in the Proficient level would be expected to score in this classification again if a second, parallel test form were used.

Table 8-3. 2015–16 OK EOI: Summary of Decision Accuracy (and Consistency) Results by Content Area and Grade—Overall and Conditional on Performance Level

Content Area	Grade	Overall	Kappa	Conditional on Level			
				Unsatisfactory	*Limited Knowledge*	*Proficient*	*Advanced*
Algebra I	HS	0.79 (0.71)	0.59	0.85 (0.75)	0.63 (0.52)	0.77 (0.69)	0.88 (0.82)
Algebra II	HS	0.77 (0.68)	0.56	0.83 (0.72)	0.59 (0.48)	0.77 (0.70)	0.86 (0.78)
Biology I	HS	0.77 (0.69)	0.58	0.89 (0.84)	0.57 (0.46)	0.70 (0.60)	0.86 (0.77)
English II	HS	0.82 (0.75)	0.63	0.82 (0.69)	0.78 (0.69)	0.83 (0.78)	0.86 (0.78)
English III	HS	0.82 (0.75)	0.59	0.83 (0.71)	0.52 (0.40)	0.86 (0.83)	0.85 (0.76)
Geometry	HS	0.80 (0.72)	0.59	0.81 (0.67)	0.72 (0.61)	0.76 (0.69)	0.88 (0.83)
U.S. History	HS	0.75 (0.66)	0.54	0.86 (0.77)	0.52 (0.41)	0.73 (0.64)	0.85 (0.77)

For some testing situations, the greatest concern may be decisions around level thresholds. For example, if a college gave credit to students who achieved an Advanced Placement test score of 4 or 5 but not to students with scores of 1, 2, or 3, one might be interested in the accuracy of the dichotomous decision below-4 versus 4-or-above. For the 2015–16 Oklahoma EOI, Table S-2 in Appendix S provides accuracy and consistency estimates at each cutpoint as well as false positive and false negative decision rates. (A false positive is the proportion of students whose observed scores were above the cut and whose true scores were below the cut. A false negative is the proportion of students whose observed scores were below the cut and whose true scores were above the cut.)

The above indices are derived from Livingston and Lewis’s (1995) method of estimating the accuracy and consistency of classifications. It should be noted that Livingston and Lewis discuss two versions of the accuracy and consistency tables. A standard version performs calculations for forms parallel to the form taken. An “adjusted” version adjusts the results of one form to match the observed score distribution obtained in the data. The tables use the standard version for two reasons: (1) This “unadjusted” version can be considered a smoothing of the data, thereby decreasing the variability of the results; and (2) for results dealing with the consistency of two parallel forms, the unadjusted tables are symmetrical, indicating that the two parallel forms have the same statistical properties. This second reason is consistent with the notion of forms that are parallel; that is, it is more intuitive and interpretable for two parallel forms to have the same statistical distribution.

CHAPTER 9 SCORE REPORTING

The Oklahoma EOI is designed to measure student performance against Oklahoma's content standards. Consistent with this purpose, results on the EOI were reported in terms of performance levels that describe student performance in relation to these established state standards. There are four performance levels: Unsatisfactory, Limited Knowledge, Proficient, and Advanced. Students receive a separate performance-level classification (based on total scaled score) in each content area. The EOI is administered primarily as an online assessment with a paper option offered to students as an accommodation.

Reports are generated at the student, school, and district levels. Student results labels and student reports are printed and mailed to the districts for distribution to the schools. In addition to the paper reports, an online reporting tool is provided for school, district, and state users to dynamically generate their own reports and review the student and summary results of each test. The details of each report are presented in the sections that follow. Samples of the reports are included in Appendix T.

9.1 Decision Rules

To ensure that reported results for the Oklahoma EOI are accurate relative to collected data and other pertinent information, a document delineating decision rules is prepared prior to each reporting cycle. The decision rules are observed in the analyses of Oklahoma EOI test data and in reporting content area results. These rules also guide data analysts in identifying students to be excluded from school-, district-, and state-level summary computations. Copies of the decision rules are included in Appendix U.

9.2 Static Reports

The following reporting deliverables were produced for the Oklahoma tests:

- Student Report
- Student Results Label
- eMetric Data Interaction Online Reporting Tool

The student report and student results labels were printed and shipped to the school districts for distribution to the schools. In addition, the school, district, and state users also had access to the eMetric Data Interaction reporting tool. Each of these reporting deliverables is described in the following sections. Sample reports are provided in Appendix T.

9.2.1 Student Report

The student report created for each student is a double-sided report that provides scaled score, performance level, and reporting category results for each tested content area. Each student receives a separate report for each required content area. The first page of the report provides student demographics and the overall performance results. The back page contains raw score information on the content area reporting categories. There are two printed copies of the report: one for the parent/guardian and one for the school.

The front page of the report provides identifying demographics about the student:

- Student name
- Date of birth
- Student ID
- Grade
- District name
- School name

The middle section of the front page includes a description of the purpose of the EOI. Following the description is a graphical display of the student's scaled score and the earned performance level. Next to the graphical display is a statement about how to interpret the test scores as well as the possible range of scaled scores if the test were taken multiple times.

The bottom section of the front page provides the performance-level descriptors and range of scores for each of the four performance levels as well as an indicator of the level earned by the student.

The back page repeats the student demographics information from the front page header and then leads into a summary of the performance on the standards and objectives of the content area. Descriptions of each standard and the associated objectives are provided along with the following data:

- Number of possible points
- Number of points earned
- Percent of points earned
- Graphical display of the percent of points earned

If there are not enough items in a standard or objective to report a reliable score, the data are suppressed and NR is printed on the report.

9.2.2 Student Results Labels Report

A student results label is generated for each student. Each student label is two-by-four inches and provides the following student information:

- Student Name
- Student Identification Number
- Date of Birth
- Gender
- Grade

The label provides the scaled score and performance level for all tested content areas for the grade level. If a student did not earn a scaled score, the reason the student was not tested is reported.

9.3 INTERACTIVE REPORTS

Data Interaction, eMetric's Web-based reporting solution, features a range of report types that allow analysis across years from the group level down to the individual student level. Each report type may be customized to include or exclude fields and attributes to meet SDE's specific needs. Report types include the following:

- Roster Report
- Group Summary Report
- Graphical Summary Report
- Longitudinal Roster Report
- Pre-defined, or Quick, Report(s)
- Individual Student Report

9.3.1 Roster Report (Single Subject)

The Roster Report includes individual student's scores and demographics by single subject and single administration. Users can select to view, search, and filter by organization (school, district, or entire state, depending on the user's access level) and a variety of demographic data and score data. Drill-down features allow users to directly access individual student results.

9.3.2 Group Summary Report (Performance Levels)

The Group Summary Report provides a comparison of school, district, and state group performance over various summary statistics. Statistics include number of students tested, mean scale score, and number and percent of students in each performance level. Users can customize the display by selecting different content areas, statistics, multiple administrations, demographic variables, and report views, resulting in powerful and flexible ways to create dynamic reports. Drill-down features further allow users to disaggregate by subgroup or directly access individual student results for a selected subgroup.

9.3.3 Group Summary Report (Standards and Objectives)

The Group Summary Report for Standards and Objectives creates reports by school or district with results of standards and objectives by subject for one administration. The data can be filtered and disaggregated by score and demographic data. Drill-down features further allow users to disaggregate by subgroup or directly access individual student results for a selected subgroup.

9.3.4 Graphic Summary Report (Performance Levels)

The Graphic Summary Report provides a visual alternative to analyze group data through the use of graphs and other visualization tools. Summary statistics include percent of students in each performance level, percent of students at or above proficient, and percent of students below proficient. Graphs include bar charts, pie charts, and histograms. Users can customize their graphs by selecting different content areas, statistics, multiple administrations, demographic variables, and views. Drill-down features allow users to disaggregate by subgroup or to directly access individual student results.

9.3.5 Longitudinal Roster Report

The Longitudinal Roster Report displays results of individual student's scores and demographics by single subject in multiple administrations. Users can select to view, search, and filter by organization (school, district, or entire state, depending on the user's access level) and a variety of demographic data and score data. Drill-down features allow users to directly access individual student results.

9.3.6 Quick Reports

Nine Quick Reports are provided. These are the same summary or roster reports outlined above with specific preselected filters requested by the client that provide most commonly used report data. Quick reports provided are:

- Summary Report of Total Tested (by organization, administration, and subject)
- Roster: All Selections (with all scores preselected)
- Group Summary PL: All Selections (with all scores and disaggregate variables preselected)
- Group Summary S & O: All Selections (with all scores and disaggregate variables preselected)
- Graphical Summary PL: All Selections (with all disaggregate variables preselected)
- Longitudinal Roster: All Selections (with all scores preselected)
- Roster: All Subjects (with all subjects reported with limited scores available)
- Group Summary: All Subjects (with all subjects reported)
- Graphical Summary: All Subjects (with all subjects reported)

9.4 Quality Assurance

Quality-assurance measures at Measured Progress are embedded throughout the entire process of analysis and reporting. The data processors and statistical analysts working on the Oklahoma EOI implement quality-control checks of their respective computer programs and intermediate products. Moreover, when data are handed off to different functions within the Data and Reporting Services (DRS) division, the sending function verifies that the data are accurate prior to handoff. Additionally, when a function receives a data set, the first step is to verify the data for accuracy.

Another type of quality-assurance measure is parallel processing. One data analyst is responsible for writing all programs required to populate the student and aggregate reporting tables for the administration. Each reporting table is assigned to another data analyst on staff who uses the decision rules to independently program the reporting table. The production and quality-assurance tables are compared, and only when there is 100% agreement are the tables released for report generation.

The third aspect of quality control involves the procedures implemented by the quality-assurance group to check the accuracy of reported data. Using a sample of schools and districts, the quality-assurance group verifies that reported information is correct. The selection of sample schools and districts for this purpose is very specific and can affect the success of the quality-control efforts. There are two sets of samples selected that may not be mutually exclusive. The first set includes those that satisfy the following criteria:

- One-school district
- Two-school district
- Multischool district
- Special school, e.g., charter school
- Small school that does not have enough students to report aggregations
- School with excluded (not tested) students
- School with homeschooled students

The second set of samples includes districts or schools that have unique reporting situations as indicated by decision rules. This set is necessary to check that each rule is applied correctly. The quality-assurance group uses a checklist to implement its procedures. Once the checklist is completed, sample reports are circulated for psychometric checks and program management review. The appropriate sample reports are then sent to the SDE for review and signoff.

CHAPTER 10 VALIDITY

10.1 TEST SCORE VALIDATION EVIDENCE

Because interpretations of test scores, and not a test itself, are evaluated for validity, the purpose of the *2015–16 Oklahoma EOI Technical Report* is to describe several technical aspects of the Oklahoma EOI tests in support of score interpretations (AERA et al., 2014). Each chapter contributes an important component in the investigation of score validation: test development and design; test administration; scoring, scaling, and equating; item analyses; reliability; and score reporting.

As stated in the overview chapter, *Standards for Educational and Psychological Testing* (AERA et al., 2014) provides a framework for describing sources of evidence that should be considered when constructing a validity argument. The evidence around test content, response processes, internal structure, relationship to other variables, and consequences of testing speak to different *aspects* of validity but are not distinct *types* of validity. Instead, each contributes to a body of evidence about the comprehensive validity of score interpretations.

Evidence on test content validity is meant to determine how well the assessment tasks represent the curriculum and standards for each content area. Content validation is informed by the item development process, including how the test blueprints and test items align to the curriculum and standards. Viewed through this lens provided by the standards, evidence based on test content was extensively described in Chapters 3 and 4. Item alignment with Oklahoma content standards; item bias, sensitivity, and content appropriateness review processes; adherence to the test blueprint; use of multiple item types; use of standardized administration procedures, with accommodated options for participation; and appropriate test administration training are all components of validity evidence based on test content. As discussed earlier, all EOI questions are aligned by Oklahoma educators to specific Oklahoma content standards, and undergo several rounds of review for content fidelity and appropriateness. Items are presented to students in multiple formats (constructed-response, short-answer, and multiple-choice). Finally, tests are administered according to state-mandated standardized procedures, with allowable accommodations, and all test proctors are required to attend annual training sessions.

The scoring information in Chapter 5 describes the steps taken to train and monitor hand-scorers, as well as quality-control procedures related to scanning and machine-scoring. To speak to student response processes, however, additional studies would be helpful and might include an investigation of students' cognitive methods using think-aloud protocols. Also, an aberrant response pattern analysis was conducted to investigate unusual score results. The analyses focused on a comparison of how a student responds to each item in relation to how they were expected to perform given the student's overall achievement. These analyses were conducted on the full student population, regardless of administration mode. Due to the operational equating procedures and limited size of the testing population for some test forms, such as the

Equivalent or Braille forms, it was not possible to conduct the analyses on some test forms. A full description of this study is in Appendix W.

Evidence based on internal structure is presented in great detail in the discussions of item analyses, reliability, and scaling and equating in Chapters 6 through 8. Technical characteristics of the internal structure of the assessments are presented in terms of classical item statistics (item difficulty, item-test correlation), differential item functioning (DIF) analyses, dimensionality analyses, reliability, standard errors of measurement (SEM), and IRT parameters and procedures. Each test is equated to the same content test from the prior year to preserve the meaning of scores over time. In general, item difficulty and discrimination indices were in acceptable and expected ranges. Very few items were answered correctly at near-chance or near-perfect rates. Similarly, the positive discrimination indices indicate that most items were assessing consistent constructs, and students who performed well on individual items tended to perform well overall.

Evidence based on the consequences of testing is addressed in the scaled scores information in Chapter 7 and the reporting information in Chapter 9, as well as in the test interpretation guide, which is a separate document that is referenced in the discussion of reporting. Each of these chapters speaks to the efforts undertaken to promote accurate and clear information provided to the public regarding test scores. Scaled scores offer the advantage of simplifying the reporting of results across content areas and subsequent years. Performance levels provide users with reference points for mastery at each content area, which is another useful and simple way to interpret scores. Several different standard reports are provided to stakeholders. In addition, a data analysis tool is provided to each school system to allow educators the flexibility to customize reports for local needs. Additional evidence of the consequences of testing could be supplemented with broader investigation of the impact of testing on student learning.

To further support the validation of the assessment program, additional studies might be considered to provide evidence regarding the relationship of EOI results to other variables including the extent to which scores from the EOI converge with other measures of similar constructs, and the extent to which they diverge from measures of different constructs. Relationships among measures of the same or similar constructs can sharpen the meaning of scores and appropriate interpretations by refining the definition of the construct.

The evidence presented in this report supports inferences of student achievement on the content represented on the Oklahoma content standards for the EOI assessments for the purposes of program and instructional improvement and as a component of school accountability.

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APPENDICES

APPENDIX A—CONTENT STANDARDS

LANGUAGE ARTS

OVERVIEW

English language arts education incorporates the teaching and learning of reading, writing, speaking, listening, and viewing. Integration of language arts occurs in multiple ways. First, curriculum, instruction, and assessment reflect the integration of listening, speaking, viewing, reading, and writing. The language arts are not perceived as individual content areas, but as one unified subject in which each of the five areas supports the others and enhances thinking and learning. Secondly, there is integration of the teaching and learning of content and process within the curriculum. The common human experiences and the ideas, conflicts, and themes embodied in literature and all oral, written, and visual texts provide a context for the teaching of the processes, skills, and strategies of listening, speaking, viewing, reading, and writing. Finally, literacy educators believe the knowledge, skills, and strategies of language arts are integrated throughout the curriculum, enabling students to solve problems and think critically and creatively in all subject areas.

Language arts is the vehicle of communication by which we live, work, share, and build ideas and understandings of the present, reflect on the past, and imagine the future. Through language arts, we learn to appreciate, integrate, and apply what is learned for real purposes in our homes, schools, communities, and workplaces.

An effective language arts program should encompass process and content—how people communicate as well as what they communicate. Process includes skills and strategies used in listening, speaking, reading, writing, and viewing. Content includes the ideas, themes, issues, problems, and conflicts found in classical and contemporary literature and other texts, such as technical manuals, periodicals, speeches, and videos. Ideas, experiences, and cultural perspectives we discover in texts help us shape our visions of the world. The insight we gain enables us to understand our cultural, linguistic, and literary heritages.

In Grades K-12, a locally developed language arts curriculum, embodying these content standards, will ensure all students are literate and can engage successfully in reading, discovering, creating, and analyzing spoken, written, electronic, and visual texts which reflect multiple perspectives and diverse communities and make connections within language arts and between language arts and other fields.

READING/LITERATURE

The revised reading standards in the *Priority Academic Student Skills (PASS)* reflect scientifically-based reading research and are organized in the following related strands:

Print Awareness
Phonological/Phonemic Awareness
Phonics/Decoding
Vocabulary
Fluency
Comprehension/Critical Literacy

The National Reading Panel has revealed that the most reliably effective approach is systematic and explicit instruction. Skills are taught in a logical sequence and teachers clearly state what is being taught. These reading skills are interrelated and need to be developed in the context of a core curriculum that applies effective reading strategies to achieve success in all academic areas.

PRINT AWARENESS - is the ability to understand how print works. This includes knowing that the print on the page represents the words that can be read aloud and distinguishing between various forms and purposes of print, from personal letters and signs to storybooks and essays.

PHONOLOGICAL/PHONEMIC AWARENESS - is an oral prerequisite to phonics and one of the best predictors of later reading success. It is the understanding that words and syllables can be broken down into smaller units or phonemes. Research indicates that poor phonemic awareness is a major underlying cause of reading difficulty. A student's progress should be monitored throughout the kindergarten year by administering informal phonemic awareness assessments.

PHONICS/DECODING - instruction provides students with a consistent strategy to apply sound-symbol relationships to assist in the identification of unfamiliar words. The goal of teaching children phonics is to teach children to decode unfamiliar words easily and automatically as they read. Children must be encouraged to use this strategy on their own.

VOCABULARY - knowledge is essential to reading because a reader's understanding comes chiefly from his or her vocabulary base. Vocabulary development can be achieved through reading, direct instruction, and student-centered activities. A balanced vocabulary program contains all three of these strategies.

READING FLUENCY - research refers to two stages of reading development. The first is the "decoding stage" where the student learns how to change printed symbols into sounds. During the next stage called the "fluency stage," the student continues to work on decoding skills to the point where the child becomes "unglued" from the print. Word recognition becomes easy, and fluent reading is characterized by a lack of trouble with word identification.

Easy word recognition frees a student's attention to comprehend the text. Achieving speed and accuracy in recognizing words is reading fluency.

COMPREHENSION/CRITICAL LITERACY - is understanding the meaning or point of the text; it is the essence of reading. Comprehension is a complex process. As readers mature they become more strategic in their process to construct meaning from text. Comprehension involves understanding what is read, what is meant, and what is implied. Students read for a variety of purposes, to locate information, to be informed, entertained, persuaded, and so on. Students use a wide range of strategies to help them meet their purpose. These strategies include making predictions, activating prior knowledge, skimming text for literal information, drawing inferences and conclusions, interpreting meaning, summarizing information, analyzing and evaluating text, monitoring reading, and using correction strategies.

Reading requires the coordination of cues as sources of information: sound/symbol relationships, syntax, semantics, and context. When reading, readers use three cueing systems. They derive semantic cues from the text's meaning, syntactic cues from the text's grammatical structure, and graphophonic cues from sound-letter relationships and patterns. Cueing systems are important and are constantly in motion to enable readers to construct meaning. They help readers answer questions such as: Does this make sense? Does this sound right? Does this look right?

Readers use a variety of strategies to ensure comprehension. They predict what they think the text is about to convey and confirm their prediction by checking to see if meaning is maintained. Readers monitor understanding and take action when meaning breaks down by choosing to self-correct or continue to read ahead only to return later to reconstruct meaning from previously read text.

Writing is also a means of learning. This process is "a valuable tool for learning for all students in all subject areas at all ages." While writing to learn, students discover connections, describe processes, express emerging understandings, raise questions, and find answers. For example, students learn content in science or social studies through keeping a response or process journal, or a learning log.

THE WRITING PROCESS

WRITING - should be taught as a natural and integral part of the curriculum. Instruction should encourage whole pieces of writing for real purposes and real audiences (and should include all stages of the writing process). Because writing is recursive, the stages may not occur in a linear sequence, but the writer may revert to an activity characteristic of an earlier stage. The stages of the writing process include prewriting, drafting, revising, editing, and publishing.

PREWRITING - is the process that helps the writer get ready to write. Students gather ideas and organize them. During this stage, the topic is generated and purpose, audience, and form are clarified. It is conceivable that the prewriting stage will take more time than any other stage in the process. Activities may include class discussion, reading, predicting, remembering, word banks, observing, thinking, student notebooks, drawing, free writing, modeling, clustering/webbing, cubing, and brainstorming.

DRAFTING - is putting ideas down on paper with a focus on content, and begins with notes or ideas generated during prewriting. The first draft may be kept in a journal, writer's notebook, writing center, or on a computer disk. Students are also encouraged to explore a topic without grammatical inhibitions or over concern about spelling or punctuation. The teacher's role is to encourage students to "get it down."

REVISING - is refining of content, not mechanics. Revision ("to see again") begins during the prewriting activity and continues through the final draft. It is best achieved in an interactive setting with the teacher or a group of peers. Writers should think again about the choices made for content and add, delete, or rearrange the material. Thus, writing becomes thinking made visible. Writers critically read their own writing and become their own reader. Since revising can be internal and unobservable, revising skills can be taught by modeling the questions asked by critical readers.

EDITING - is the stage in which the writing is made suitable for publication. Positive reinforcement is more effective than corrective comments to improve the quality of writing. Peer editing in writing groups helps teach and reinforce proofreading skills. Students are to locate and correct errors in punctuation, capitalization, spelling, usage, and sentence structure so that errors in conventions do not interfere with a reader's ability to understand the message.

PUBLISHING - the student's work is essential to the composing process. Publication provides an opportunity for the writer's product to be shared with and/or evaluated by the intended audience or reader in general. An authentic audience, one with whom the students want to communicate, is necessary for effective writing. Without some type of publication, students may forget or never realize that their writing is meaningful communication.

It is important to note that not every piece that a writer begins will be carried through the entire writing process and polished for publication. However, each student should be encouraged to develop some pieces of writing thoroughly enough to be published. Publishing is an important motivator in working through the stages of the composing process. The purpose of publishing is to reinforce the idea that writing is an act of communication.

SPELLING

Spelling, writing, and reading are interrelated and coherent. Writing leads to mastery in reading; reading leads to mastery in writing. Combined instruction leads to improvement in both reading and writing.

Research indicates that as children use temporary or phonetic spelling. Phonetic spelling develops and reinforces knowledge of phonics. It is important to understand that temporary spelling is not in conflict with correct spelling. When children use temporary spelling, they are practicing their growing knowledge of phonemes. First grade children should be expected to correctly spell previously studied words and spelling patterns. Temporary spelling of common spelling patterns should progress toward more conventional spelling by the end of second grade with the students mastering the conventional spelling of increasing numbers of words.

Spelling instruction should help students understand how words are put together (word patterns). Therefore, extensive reading and writing help students become good spellers.

HANDWRITING/PENMANSHIP

Young children need an awareness of print to communicate effectively. Handwriting/penmanship is that method for forming letters that comprise a writing system, as well as, how to express thoughts in the written word. Through writing, children form a muscular and visual memory of the letters and words; and, therefore can recognize them. Students must be aware of the importance of legibility to facilitate communication of the intended message. Elements of legible handwriting include letter formation, size and proportion of letters, spacing, slant, alignment of letters on the baseline, and uniform steadiness and thickness of line. Writing should reinforce the fact that language has meaning. It gives students an opportunity to develop personal voice and style upon which they can reflect.

ORAL LANGUAGE/LISTENING/SPEAKING

There is clearly a need for schools to spend more time teaching speaking and listening. More than 75 percent of all communication is devoted to the oral communication process. People in the workplace devote one-third of all working time carrying on face-to-face talk, and corporate managers spend about 60 percent of their time in communicating orally in meetings or on the telephone. Moreover, even with sophisticated electronic communication devices, oral language is still the main way of passing culture from one generation to another. Even with this demonstrated need for effective oral communication, almost two-thirds of young people have difficulty explaining how to get to a local grocery store in directions that can be understood.

Although the "school" emphasis on reading and writing may create the impression that oral language skills are not as important, this is not the case. Oral language is now, and is even more likely to be in the future, the primary means of acquiring and transmitting information.

Fortunately, students begin to learn oral language skills naturally. They listen to the sounds of adults and other children and internalize language patterns quite early in order to communicate orally themselves. However, not all children come to school with equal opportunities to develop language skills. Children who have experienced positive feedback to their efforts to use language, and have had opportunities to hear language used in a variety of social contexts, are better prepared to use oral language as a foundation for their reading and writing development.

Since some children have limited opportunities for oral language in their home environments and since oral language development continues through at least age twelve, all children can improve their oral language ability with instruction and guidance. It is essential that oral language instruction begin in kindergarten and continue throughout school.

VISUAL LITERACY

Visual literacy (both viewing and representing) refers to the ability to comprehend, evaluate, and compose visual messages. Visually literate persons are able to read visual messages, compose visual language statements, and translate from visual to verbal and vice versa. Students learn attitudes, behaviors, and questions to ask which enable them to think abstractly and analytically.

Viewing is an ongoing lifetime activity that extends knowledge and experiences and provides enjoyment and pleasure. Therefore, learners will need to become engaged in a variety of viewing experiences, both in comprehending and composing. The media for visual communication may include: field trips, graphic displays, models, photographs, pictures, transparencies, picture books, newspapers, filmstrips, videotapes, labels, posters, advertisements, cartoons, carvings, paintings, memos, plays, dances, television, charts, maps, diagrams, graphic aids in oral presentations, signs, logos, creative movement, and computers.

It is an important goal of education for learners to be able to critique and use the dominant media of today. Visual literacy is essential for survival as consumers and citizens in our technologically intensive world.

NOTE:
Asterisks (*) have been used to identify standards and objectives that must be assessed by the local school district. All other skills may be assessed by the Oklahoma School Testing Program (OSTP).

Book icons **()** identify Information Literacy skills. Students are best served when these are taught in collaboration and cooperation between the classroom teacher and the library media specialist.

LANGUAGE ARTS

Grade 1

Reading/Literature: The student will apply a wide range of strategies to comprehend, interpret, evaluate, appreciate, and respond to a variety of texts.

Standard 1: Print Awareness - The student will develop and demonstrate knowledge of print awareness.

1. Read from left to right, top to bottom.

2. Track print as text is being read.

3. Recognize the difference among letters, words, and sentences.

Standard 2: Phonological/Phonemic Awareness – The student will develop and demonstrate knowledge of phonological/phonemic awareness.

1. Create and state groups of rhyming words.
   Example: bat/cat/sat/mat

2. Count syllables in a word.

3. Distinguish onset (beginning sound) and rime in one syllable words.
   Examples: onset: /b/ in <u>b</u>at; rime: <u>at</u> in b<u>at</u>

4. Segment and blend the phonemes of one–syllable words.
   Example: bat = /b/ /a/ /t/

5. Isolate phonemes within words by identifying the beginning, middle, and ending sounds in one-syllable words.
   Example: the beginning sound of dog is /d/
   the middle sound in can is /a/

6. Add or delete a phoneme to a word.
   Example: /b/ + at = bat, cat - /k/ = at

Standard 3: Phonics/Decoding – The student will apply sound-symbol relationships to decode unknown words.

1. Phonetic Analysis - Apply phonics knowledge to decode one-syllable words.

   a. Use short and long vowel patterns.
      Example: CVC = mad, hid, cut
      Example: CVCV (final e) = made, hide, cute
      Example: CV[1] = he, me, so

b. Use r-controlled vowel patterns
Example: er = “r” in fern, ir = “r” in bird, and ur = “r” in turn

c. Use blends, digraphs, and diphthongs.
Example: Blends – fl, tr, sl, sm, sn, bl, gr, and str
Example: Digraphs – sh, th, wh
Example: Diphthongs – oi, oy, ou, ow

2. Structural Analysis - Apply knowledge of structural analysis to decode words using strategies such as inflectional endings, contractions and compound words, and possessives.
Example: inflectional endings – adding -s, -es, -ing, or -ed to a word
Example: compound words – cup + cake = cupcake
Example: contraction – can + not = can’t

Standard 4: Vocabulary – The student will develop and expand knowledge of words and word meanings to increase vocabulary.

1. Increase personal vocabulary by listening to and reading a variety of text and literature.

2. Discuss unfamiliar oral and/or written vocabulary after listening to or reading texts.

3. Use new vocabulary and language in own speech and writing.

4. Classify categories of words.
Example: Tell which of the following are fruits and which are vegetables: bananas, oranges, apples, carrots, and peas

Standard 5: Fluency – The student will identify words rapidly so that attention is directed at the meaning of the text.

1. Read regularly in independent-level text (text in which no more than 1 in 20 words is difficult for the reader), effortlessly, and with expression.

2. Read regularly in instructional-level text (text in which no more than 1 in 10 words is difficult for the reader).

3. Students will engage in repeated readings of the same text to increase fluency.

4. Recognize 100-200 high frequency and/or common irregularly spelled words in text. (e.g., have, to, was, where, said).

5. Use punctuation cues (e.g., periods, commas, question marks) in text as a guide to understand meaning.

Standard 6: Comprehension/Critical Literacy – The student will interact with the words and concepts in a text to construct an appropriate meaning.

1. Literal Understanding

a. Read and comprehend both fiction and nonfiction that is appropriately designed for the second half of first grade.

b. Use prereading strategies such as previewing, using prior knowledge, predicting, and establishing a purpose for reading.

Example: Prior to reading the book *Verdi* by Janell Cannon, have students preview the book by looking at the cover, identifying the main character and telling what they know about snakes (what they do, where they live . . . .). Make predictions by doing a picture walk to discuss some of the early actions in the story.

c. Respond to questions designed to aid general comprehension.

2. Inferences and Interpretations - Make simple inferences based on what is stated in text.

3. Summary and Generalization

a. Retell or act out stories and events using beginning, middle, and ending.

b. Respond to who, what, when, where, why, and how questions and discuss the main idea of what is read.

c. Draw and discuss visual images based on text information.

4. Analysis and Evaluation

a. Identify simple cause and effect relationships.

b. Mark favorite passages.

5. Monitoring and Correction Strategies - Apply a basic use of semantics, syntax, and graphophonic cues.

Example: semantic - Does it make sense?
Example: syntax - Does it sound right?
Example: graphophonic - Does it look right?

Standard 7: Literature - The student will read to construct meaning and respond to a wide variety of literary forms.

1. Literary Genres – The student will demonstrate knowledge of and appreciation of the various forms (genres) of literature.

a. Discriminate between fiction and nonfiction.

b. Recognize elements of different cultures in multicultural tales.

2. Literary Elements – The student will demonstrate knowledge of literary elements and techniques and how they affect the development of a literary work.

a. Describe the roles of authors and illustrators in telling a story or presenting information.

b. Identify and describe the plot, setting, and character(s) in a story.

Standard 8: Research and Information - The student will conduct research and organize information.

1. Accessing Information: Select the best source for a given purpose.

   a. Alphabetize words to the first letter.

   b. Read and follow simple written directions.

   c. Recognize author, illustrator, title page, and table of contents (when applicable) as identifying items of information about a book.

   d. Access information from simple charts, maps, graphs, and calendars.

2. Interpreting Information: Analyze and evaluate information from a variety of sources and generate questions about topics of personal interest and find books to gather information.

Writing/Grammar/Usage and Mechanics. The student will express ideas effectively in written modes for a variety of purposes and audiences.

Standard 1: Writing Process. The student will use the writing process to write coherently.

1. Participate in prewriting activities such as brainstorming, discussion, webbing, illustrating or story starters.

2. Introduce a process approach to create a first draft with teacher assistance, applying developmentally appropriate steps of prewriting and first draft composition.

3. Begin understanding of the revision process with teacher assistance.

   a. Create a main idea.

   b. Apply details to support the main idea.

   c. Create a logical sequence of events.

4. Introduce, with teacher assistance, editing/proofreading of the first draft for simple usage, mechanics, and spelling.

5. Introduce and apply, with teacher assistance, standard editing marks for capitalization, deletion, and sentence termination.

6. Publish and present the final writing product to various audiences, such as peers or adults.

Standard 2: Modes and Forms of Writing. The student will communicate through a variety of written forms, for various purposes, and to a specific audience or person.

1. Recognize modes and forms of language such as informing, persuading, and entertaining.

2. Compose simple narratives (stories) with a consistent focus of a beginning, middle, and end that develop a main idea, use details to support the main idea, and present a logical sequence of events.

3. Write brief description, using some details, of a real object, person, place, or event.

4. Develop, with teacher assistance, "thank you" notes, friendly letters, and invitations to a specific audience or person.

5. Make journal entries.

6. Introduce and compose, with teacher assistance, different modes of simple rhymes and poems.

Standard 3: Grammar/Usage and Mechanics. The student will demonstrate appropriate practices in writing by applying Standard English conventions to the revising and editing stages of writing.

1. Grammar/Usage: Students are beginning to recognize appropriate use of nouns, pronouns, verbs, adjectives, and contractions in their writing.

   a. Subject (naming part) and predicate (action part)

   b. Singular and plural nouns

   c. Common and proper nouns

   d. Singular, personal, gender pronouns

   e.Nominative and possessive pronouns

   f. Present and past tense verbs

   g.Contractions

   h. Adjectives

2. Mechanics: Students are expected to demonstrate appropriate language mechanics in writing.

   a. Capitalize the first word of a sentence and the pronoun “I.”

   b.Capitalize all proper nouns (John, Sally).

c.Capitalize greetings (Dear Joe).

d.Capitalize months and days of the weeks (December, Monday).

e. Capitalize titles (Dr., Mr., and Mrs.).

f. Capitalize initials of people (A.J. Smith).

3. Punctuation: Students are expected to demonstrate appropriate punctuation in writing.

   a. Correctly use terminal (end) punctuation.
   b. Use commas correctly in dates.
   c. Use apostrophes correctly in contractions.
   d. Use quotation marks to show that someone is speaking.
   e. Use a period in common abbreviations.

4. Sentence Structure: The student will demonstrate appropriate sentence structure in writing a-complete sentence (simple subject and simple predicate).

5. Sentence Variety: The student will identify declarative (telling), interrogative (asking), and exclamatory (exciting) sentences.

6. Spelling: Students are expected to demonstrate appropriate application of spelling knowledge to the revising and editing stages of writing.

   a. Spell correctly frequently used grade-level-appropriate sight words.
   b. Spell short vowel words using the cvc pattern (Example: it-hit, an-man).
   c. Spell long vowel words using the cvce pattern (Example: lake, bone, time).

7. Handwriting: Students are expected to demonstrate appropriate handwriting in the writing process.

   a. Print legibly and space letters, words, and sentences appropriately.
   b. Print using left to right progression moving from the top to the bottom of the page.

Oral Language/Listening and Speaking: The student will demonstrate thinking skills in listening and speaking.

Standard 1: Listening – The student will listen for information and for pleasure.

1. Listen attentively and ask questions for clarification and understanding.
2. Give, restate, and follow simple two-step directions.

Standard 2: Speaking – The student will express ideas and opinions in a group or individual situations.

1. Stay on topic when speaking.

2. Use descriptive words when speaking about people, places, things and events.

3. Recite poems, rhymes, songs and stories.

4. Retell stories using basic story grammar and relating the sequence of story events by answering who, what, when, where, why, and how questions.

5. Relate an important life event or personal experience in a simple sequence.

6. Provide descriptions with careful attention to sensory detail.

7. Use visual aids such as pictures and objects to present oral information.

Standard 3: Group Interaction - The student will use effective communication strategies in pair and small group context.

1. Show respect and consideration for others in verbal and physical communications.

2. Make contributions in group discussions.

Visual Literacy: The student will interpret, evaluate, and compose visual messages.

Standard 1: Interpret Meaning – The student will interpret and evaluate the various ways visual image-makers including graphic artists, illustrators, and news photographers represent meaning.

1. Respond to visual messages by distinguishing between fiction and nonfiction in stories, videos, and television programs.

2. Respond through talk, movement, music, art, drama and writing in ways that reflect understanding of a variety of stories and poems.

Standard 2: Evaluate Media - The student will evaluate visual and electronic media such as film as compared with printed messages. Example: Make connections between illustrations and print.

Language Arts

Grade 2

Reading/Literature: The student will apply a wide range of strategies to comprehend, interpret, evaluate, appreciate, and respond to a wide variety of texts.

Standard 1: Phonological/Phonemic Awareness – The student will demonstrate the ability to hear, identify, and manipulate words, syllables, onsets, rimes, and individual sounds (phonemes) in spoken words.

1. Demonstrate an awareness of the sounds that are made by different letters by distinguishing beginning, middle, and ending sounds in words, rhyming words, and clearly pronouncing blends and vowel sounds.

    a. Segment and blend the phonemes of one- and two-syllable words.

    Example: salad = /s/ /a/ /l/ /a/ /d/, /s/ /a/ /l/ /a/ /d/ = salad

    b. Substitute a phoneme change to a word.

    Example: slap, change the /p/ to /m/ = slam

Standard 2: Phonics/Decoding – The student will apply sound-symbol relationships to decode unknown words.

1. Phonetic Analysis

    a. Use consonant sounds in beginning, medial, and final positions.

    b. Use short, long, and r-controlled vowel sounds.
    Example: short – CVC pattern – rob
    Example: long – VC final e – robe
    Example: r-controlled – “er” in her, “ir” in bird, “ur” in turn, “ar” in car and “or” in port

    c. Use blends, digraphs, and diphthongs.
    Example: blends – cr, sk, st, sw, squ, thr
    Example: digraphs – ch, wh, sh, th, ph
    Example: diphthongs – oi, oy, ou, ow

2. Structural Analysis

    a. Build and understand compound words, contractions, and base words using prefixes and suffixes.
    Example: compound words – straw + berry = strawberry
    Example: contractions – I am = I’m
    Example: prefixes – un + happy = unhappy
    Example: suffixes – care + ful = careful

Example: care is the base word of careful; happy is the baseword of unhappy

b. Apply knowledge of basic syllabication rules to decode words in text.
Example: VC-CV – rab-bit = rabbit
Example: V-CV – pi-lot = pilot
Example: VC-V – cab-in = cabin

Standard 3: Vocabulary – The student will develop and expand knowledge of words and word meanings to increase vocabulary.

1. Words in Context - Expand vocabulary in language and writing by reading and listening to a variety of text and literature.

2. Synonyms, Antonyms, and Homonyms/Homophones - Understand and explain common antonyms (words with opposite meanings), synonyms (words with the same meanings), and homonyms/homophones (words which sound the same but have different spellings and meanings, e.g., bear and bare).

3. Affixes - Know the meaning of simple prefixes and suffixes.
Example: In unhappy, the "un" means not. In played, the suffix "ed" changes play to past tense.

Standard 4: Fluency – The student will identify words rapidly so that attention is directed at the meaning of the text.

1. Read regularly in independent-level text (text in which no more than 1 in 20 words is difficult for the reader) effortlessly and with expression.

2. Read regularly in instructional-level text that is challenging yet manageable (texts in which no more than 1 in 10 words is difficult for the reader).

3. Engage in repeated readings of same text to increase fluency.

4. Accurately and fluently read 200-300 high frequency and/or irregularly spelled words in meaningful text.

5. Use punctuation cues in text (i.e., commas, periods, question marks, and exclamation points) as a guide to understanding meaning.

Standard 5: Comprehension/Critical Literacy – The student will interact with the words and concepts in a text to construct an appropriate meaning.

1. Literal Understanding

a. Read and comprehend both fiction and nonfiction that is appropriately designed for second grade.

b. Use prereading strategies to preview, activate prior knowledge, make predictions, use picture clues, and establish the purpose for reading (i.e., graphic organizers).

c. Ask and respond to questions to aid comprehension about important elements of fiction and nonfiction.

2. Inferences and Interpretation

   a. Make inferences about events, characters, and ideas in fictional texts by connecting knowledge and experience to the story.

   b. Support interpretations or conclusions with examples taken from the text.

3. Summary and Generalization

   a. Retell or act out narrative text by identifying story elements and sequencing the events.

   b. Produce oral or written summaries of text selections by discussing who, what, when, where, why, and how to identify the main idea and significant supporting details of a text.

4. Analysis and Evaluation

   a. Identify cause and effect relationships in a text.

   b. Make comparisons and draw conclusions based on what is read.

   c. Describe character traits, changes, and relationships.

5. Monitoring and Correction Strategies - Integrate the use of semantics, syntax, and graphophonic cues to gain meaning from the text.
   Example: semantic – Does it make sense?
   Example: syntax – Does it sound right?
   Example: graphophonic – Does it look right?

Standard 6: Literature: The student will read to construct meaning and respond to a wide variety of literary forms.

1. Literary Genres – Demonstrate knowledge of and appreciation for various forms (genres) of literature.
   Example: Recognize defining characteristics of a variety of texts (e.g., poems, informational text, plays, folk tales, fables, predictable books, legends, and fairytales).

2. Literary Elements – Demonstrate knowledge of literary elements and techniques and how they affect the development of a literary work.

   a. Compare different endings to stories and identify the reasons and the impact of the different ending.

b. Compare plots, settings, and characters presented in several texts by the same author (i.e., author studies).

c. Infer the lesson or moral in a variety of texts (e.g., multicultural tales, fables, legends, and myths).

3. Figurative Language and Sound Devices – The student will identify figurative language and sound devices in writing and how they affect the development of a literary work. Example: Identify the use of rhythm, rhyme, and alliteration (using words with repeating consonant sounds [e.g., "Silly Sally went to town."] in poetry).

Standard 7: Research and Information - The student will conduct research and organize information.

1. Accessing Information – Select the best source for a given purpose.

    a. Identify the purposes of various reference materials such as a dictionary, a thesaurus, and an atlas.

    b. Alphabetize to the second letter.

    c. Use guide words to locate words in dictionaries and topics in encyclopedias.

    d. Use title page, table of contents, glossary, and index to locate information.

    e. Use and interpret charts, maps, graphs, schedules, and directions.

2. Interpreting Information – Analyze and evaluate information from a variety of sources.
    Example: Use graphic organizers, such as webbing and mapping, to organize and summarize information.

Writing/Grammar/Usage and Mechanics. The student will express ideas effectively in written modes for a variety of purposes and audiences.

Standard 1: Writing Process. The student will use the writing process to write coherently.

1. Introduce a variety of prewriting activities such as brainstorming, clustering, illustrating, using graphic organizers, and webbing.

2. Use a process approach to write coherently, using developmentally appropriate steps of the writing process: prewriting, drafting, revising, editing/proofreading, and publishing or presenting the final product.

3. Begin writing an independent first draft with a clear beginning, middle, and ending.

4. Use the revision process and continue to use the standard editing marks and proofreading skills introduced in the first grade.

5. Publish and present final writing products with various audiences such as peers or adults.

Standard 2: Modes and Forms of Writing. Communicate through a variety of written forms, for various purposes, and to a specific audience or person.

1. Develop modes and forms of language such as informing, persuading, and entertaining.

2. Write brief personal descriptive narratives (stories) with a consistent focus of a beginning, middle, and ending that:

   a. Present a logical sequence of events.

   b. Develop a main idea.

   c. Use details to support the main idea.

3. Write "thank you" notes, friendly letters (identifying the five parts), and invitations.

4. Make journal entries.

5. Create different modes of simple rhymes and poems.

Standard 3: Grammar/Usage and Mechanics. The student will demonstrate appropriate practices in writing by applying Standard English conventions to the revising and editing stages of writing.

1. Grammar/Usage: Students are expected to recognize subject (naming part), and predicate (action part), correctly use nouns, pronouns, verbs, contractions, and adjectives in their writing.

   a. Subject (naming part) and predicate (action part)

   b. Singular and plural nouns

   c. Common and proper nouns

   d. Singular, plural, and personal pronouns

   e. Nominative and possessive pronouns

   f. Present and past tense verbs

   g. Helping verbs

   h. Adjectives

   i. Contractions (e.g., I'm, You're)

2. Mechanics: Students are expected to demonstrate appropriate language mechanics in writing.

   a. Capitalize correctly the first word in a sentence and the pronoun "I."

b. Capitalize all proper nouns (names of specific people or things, such as Mike, Indian, Jeep).

c. Capitalize greetings (Dear Sir).

d. Capitalize the months and days of the week (January, Monday)

e. Capitalize titles (Dr., Mr., and Mrs.).

f. Capitalize initials of people (A.J. Smith).

3. Punctuation: Students are expected to demonstrate appropriate punctuation in writing.

a. Correctly use terminal (end) punctuation.

b. Use commas correctly in dates.

c. Use apostrophes correctly in contractions.

d. Use quotation marks to show that someone is speaking.

e. Use period in common abbreviations.

4. Sentence Structure: The student will demonstrate appropriate sentence structure in writing declarative, imperative, interrogative, and exclamatory sentences for different modes of writing.

a. Write in complete sentences.

b. Write sentences using a noun, verb, and details.

5. Spelling: Students are expected to demonstrate appropriate application of spelling knowledge to the revising and editing stages of writing.

a. Spell correctly words with short and long vowel sounds, r-controlled vowels, and consonant vowel patterns.

b. Spell frequently used words with irregular spelling patterns.

c. Spell prefixes and suffixes correctly.

d. Recognize the use of homophones/homonyms in spelling.

6. Handwriting: Students are expected to demonstrate appropriate handwriting in the writing process.

a. Print legibly and space letters, words and sentences appropriately.

b. Print using left to right progression moving from the top to the bottom of the page.

Oral Language/Listening and Speaking: The student will demonstrate thinking skills in listening and speaking.

Standard 1: Listening – The student will listen for information and for pleasure.

1. Listen attentively and ask questions for clarification and understanding.

2. Give, restate, and follow simple two- and three-step directions.

Standard 2: Speaking – The student will express ideas and opinions in group or individual situations.

1. Speak articulately and audibly using appropriate language, correct usage, enunciation and volume.

2. Provide descriptions using correct sequence of events and details.

3. Use verbal and nonverbal communication in effective ways, such as making announcements, giving directions, or making instructions.

Standard 3: Group Interaction – The student will use effective communication strategies in pairs and small group context.

1. Show respect and consideration for others in verbal or physical communication.

2. Ask and answer questions related to the topic and make contributions in small or large group discussions.

Visual Literacy: The student will interpret, evaluate, and compose visual messages.

Standard 1: Interpret Meaning – The student will interpret and evaluate the various ways visual image-makers, including graphic artists, illustrators, and news photographers, represent meaning.

1. Distinguish between telling and selling messages in such things as commercials, advertisements, and safety and drug public service announcements.

2. Identify the differences in facts and opinions in print and nonprint media.

Standard 2: Evaluate Media – The student will evaluate visual and electronic media, such as film, as compared with print media.

1. Make connections between illustrations and print.

2. Identify differences in the presentation or depiction of characters and plot that tells of characters in American and other cultures through listening, viewing, or reading (e.g., read *Cinderella* and watch film). Compare and contrast the two.

Language Arts

Grade 3

Reading/Literature: The student will apply a wide range of strategies to comprehend, interpret, evaluate, appreciate, and respond to a wide variety of texts.

***Standard 1: Phonics/Decoding - The student will apply sound-symbol relationships to decode words.**

1. Phonetic Analysis - Apply knowledge of phonetic analysis to decode unknown words (e.g., common letter/sound relationships, consonants, blends, digraphs, vowels, and diphthongs).

2. Structural Analysis - Apply knowledge of structural analysis to decode unknown words (e.g., syllabication rules, affixes, root words, compound words, spelling patterns, contractions, final stable syllables).

3. Apply knowledge of sentence structures and semantics in conjunction with phonics and structural analysis to decode unknown words.

Standard 2: Vocabulary - The student will develop and expand knowledge of words and word meanings to increase vocabulary.

1. Words in Context - Use context clues (the meaning of the text around the word) to determine the meaning of grade-level appropriate words.

2. Affixes - Use prefixes (for example: un-, pre-, bi-, mis-, dis-, en-, in-, im-, ir-), suffixes (for example: -er, -est, -ful, -ness, -ing, -ish, -less), and roots to determine the meaning of words.

3. Synonyms, Antonyms, and Homonyms/Homophones - Determine the meanings of words using knowledge of synonyms, antonyms, homonyms/homophones, and multiple meaning words.

4. Using Resource Materials - Use word reference materials (glossary, dictionary, thesaurus) to determine the meaning and pronunciation of unknown words.

***Standard 3: Fluency - The student will identify words rapidly so that attention is directed at the meaning of the text.**

1. Read regularly in independent-level texts (texts in which no more than 1 in 20 words is difficult for the reader) fluently and accurately, and with appropriate rate, change in voice, and expression.

2. Read regularly in instructional-level texts that are challenging yet manageable (texts in which no more than 1 in 10 words is difficult for the reader).

3. Engage in repeated readings of the same text to increase fluency.

4. Accurately and fluently read 300-400 high frequency and/or irregularly spelled words in meaningful texts.

5. Use punctuation cues (e.g., final punctuation, commas, quotation marks) in text with appropriate phrasing as a guide to understanding meaning.

Standard 4: Comprehension/Critical Literacy - The student will interact with the words and concepts in a text to construct an appropriate meaning.

1. Literal Understanding

    a. Read and comprehend poetry, fiction, and nonfiction that is appropriately designed for third grade.

    b. Use prereading strategies independently to preview, activate prior knowledge, predict content of text, and establish a purpose for reading.

    c. Recall major points in a text and revise predictions about what is read.

    d. Show understanding by asking questions and supporting answers with literal information from the text.

2. Inferences and Interpretation

    a. Make inferences by connecting prior knowledge and experience with information from the text.

    b. Interpret text, including lessons or morals depicted in fairytales, fables, etc., and draw conclusions from evidence presented in the text.

    *c. Participate in creative response to text (e.g., art, drama, and oral presentations).

3. Summary and Generalization

    a. Summarize by recognizing main ideas, key concepts, key actions, and supporting details in fiction and nonfiction.

    b. Make generalizations about a text (e.g., theme of a story or main idea of an informational text).

    c. Produce summaries of fiction and nonfiction text, highlighting major points.

4. Analysis and Evaluation

    a. Analyze characters including their traits, relationships, feelings, and changes in text.

b. Distinguish between fact and opinion in nonfiction text.

c. Analyze the causes, motivations, sequences, and results of events from a text.

*5. Monitoring and Correction Strategies

a. Monitor own reading and modify strategies as needed (e.g., recognize when he or she is confused by a section of text, questions whether the text makes sense)

b. Predict, monitor, and check for understanding using semantic, syntactic, and graphophonic cues.

c. Clarify meaning by rereading, questioning, and modifying predictions.

Standard 5: Literature - The student will read to construct meaning and respond to a wide variety of literary forms.

*1. Literary Genres - Demonstrate knowledge of and appreciation for various forms (genres) of literature.

a. Recognize characteristics of literary genres and forms (e.g., contemporary realistic fiction, historical fiction, nonfiction, modern fantasy, poetry, drama, and traditional stories such as fairy tales and fables).

b. Read, understand, and discuss a variety of genres.

2. Literary Elements - Demonstrate knowledge of literary elements and techniques and how they affect the development of a literary work.

a. Compare and contrast plots, settings, or characters presented by different authors and the same author of multiple texts.

b. Recognize themes that occur across literary works.
Example: Read *Yoko* by Rosemary Wells and *You Are Special* by Max Lucado. Discuss the theme of "everyone is unique" that occurs in both stories.

3. Figurative Language and Sound Devices - The student will identify figurative language and sound devices in writing and how they affect the development of a literary work.
Example: Identify and discuss how certain words and rhythmic patterns can be used in a selection to imitate sounds (e.g., rhythm, rhyme, alliteration).

Standard 6: Research and Information - The student will conduct research and organize information.

1. Accessing Information - The student will select the best source for a given purpose.

a. Alphabetize to the third letter.

b. Use guide words to locate words in dictionaries and topics in encyclopedias.

c. Access information from charts, maps, graph, schedules, directions, and diagrams.

d. Use the title page, table of contents, glossary, chapter headings, and index to locate information.

e. Use text formats as an aid in constructing meaning from nonfiction (expository) text (e.g., heading, subheading, bold print, and italics).

*2. Interpreting Information - The student will analyze and evaluate information from a variety of sources.

a. Begin the research process by selecting a topic, formulating questions, and identifying key words.

b. Locate, organize, and synthesize information from a variety of print and nonprint and technological resources (e.g., dictionaries, reference books, atlases, magazines, informational texts, thesaurus, and technology/Internet).

c. Compile information into summaries of information.

d. Use test-taking strategies by answering different levels of questions, such as open-ended, literal, and interpretive, as well as multiple choice, true/false, and short answer.

Writing/Grammar/Usage and Mechanics. The student will express ideas effectively in written modes for a variety of purposes and audiences.
***Standard 1: Writing Process. The student will use the writing process to write coherently.**

1. Use a variety of prewriting activities such as brainstorming, clustering, illustrating, <u>using</u> graphic organizers, and webbing.

2. Understand and demonstrate familiarity with the writing process and format of main idea.

3. Compose coherent first drafts with clear focus of beginning, middle, and ending.

4. Revise drafts, changing or adding details and vivid, descriptive words.

5. Proofread/edit writing, using standard editing marks, with peers or teacher.

6. Publish and present writing to peers or adults.

***Standard 2: Modes and Forms of Writing. Communicate through a variety of written forms (modes), for various purposes, and to a specific audience or person.**

1. Communicate through a variety of written modes for various audiences and purposes to inform, entertain, –describe, persuade, and to reflect.

2. Write simple narrative, descriptive, persuasive, and creative paragraphs.

3. Write descriptive and creative stories and poems about people, places, things, or experiences that:

   a. develop a main idea.

   b. use details to support the main idea.

   c. have a clear beginning, middle, and ending.

4. Write informational pieces using one reference source and citing the title and author of the source.

5. Write personal, and formal letters, thank-you notes, and invitations including the date, greeting, body, closing, and signature.

6. Write various modes of simple poems.

7. Write narratives that:

   a. provide a context within which an action occurs.

   b. include details that develop the plot.

   c. provide a clear beginning, middle, and end that includes details that develop around a central idea.

8. Use descriptive language such as action verbs, vivid adjectives, and adverbs to make writing interesting.

***Standard 3: Grammar/Usage and Mechanics. The student will demonstrate appropriate practices in writing by applying standard English conventions to the revising and editing stages of writing.**

1. Grammar/Usage: Students are expected to recognize and correctly use nouns, pronouns, verbs, adjectives, adverbs, conjunctions, and contractions in their writing.

   a. Singular, plural, and possessive forms of nouns

   b. Common and proper nouns

   c. Subjective (Nominative), objective, and possessive pronouns

   d. Present, past, and future tense verbs

   e. Regular, irregular, and helping (auxiliary) verbs

   f. Past participle of verbs

   g. Subject-verb agreement

h. Positive, comparative, and superlative adjectives

i. Time, place, and manner adverbs

j. Coordinating conjunctions

2. Mechanics: Students are expected to demonstrate appropriate language mechanics in writing.

   a. Correctly capitalize geographical names, holidays, dates, proper nouns, book titles, titles of respect, sentences, and quotations.

   b. Correctly indent at the beginning of each paragraph.

   c. Observe left and right hand margins.

3. Punctuation: Students are expected to demonstrate appropriate punctuation in writing.

   a. Periods in abbreviations and sentence endings (terminal punctuation)

   b. Question and exclamation marks

   c. Commas in dates, addresses, locations, quotes, introductory words, words in a series, greetings, and closings in a letter

   d. Apostrophes in contractions and possessives

   e. Colon in notation of time, formal letter writing, and the introduction of words or concepts in a series, (e.g., bring the following supplies: glue, paper, scissors, etc.)

   f. Quotation marks around direct quotations, the titles of individual poems, and short stories

4. Sentence Structure: The student will demonstrate appropriate sentence structure in writing.

   a. Correctly write the four basic kinds of sentences (declarative, exclamatory, imperative, and interrogative) with terminal puncutation.

   b. Begin to use simple, compound, and complex sentences appropriately in writing.

5. Spelling: Students are expected to demonstrate appropriate application of spelling knowledge to the revising and editing stages of writing.

   a. Demonstrate recall of spelling patterns (e.g., grapheme or blend), consonant doubling (e.g., bat + ed = batted), changing the ending of a word from –y to –ies when forming the plural (e.g., carry = carries), and common homophones (e.g., hair/hare).

   b. Spell phonetically regular multisyllabic words, contractions, and compounds.

   c. Increase the number of high frequency words spelled correctly.

   d. Spell words ending in –tion and –sion correctly.

   e. Use various sources of materials to check and correct spelling.

6. Handwriting: Students are expected to demonstrate appropriate handwriting in the writing process.

   a. use handwriting/penmanship to copy and/or compose text using correct formation of letters.

   b. use correct spacing of letters and words in manuscript and cursive writing.

Oral Language/Listening and Speaking: The student will demonstrate thinking skills in listening and speaking.

***Standard 1: Listening: The student will listen for information and for pleasure.**

1. Listen critically for information and incorporate the information into other activities.

2. Listen actively for pleasure and respond appropriately.

***Standard 2: Speaking - The student will express ideas and opinions in group or individual situations.**

1. Speak articulately and audibly using appropriate grammar, enunciation, and volume.

2. Make brief narrative (story) presentations that:

   a. provide a context for an event that is the subject of the presentation.

   b. provide insight into why the selected event should be of interest to the audience.

   c. include well-chosen details to develop characters, setting, and plot.

3. Plan and present dramatic interpretations of experiences, stories, poems, or plays.

4. Organize ideas chronologically (in the order they happened) or around major points of information.

5. Use clear and specific vocabulary to communicate ideas and establish the tone of the message.

6. Provide a clear beginning, middle, and end when making oral presentations and include details that develop a central idea.

***Standard 3: Group Interaction - The student will use effective communication strategies in pairs and small group context.**

1. Show respect and consideration for others in verbal and physical communication.

2. Demonstrate thinking skills in listening, speaking, reading, and writing. For example, students are expected to gather information, organize and analyze it, and generate a

simple written or oral report.

Visual Literacy: The student will interpret, evaluate, and compose visual messages.

***Standard 1: Interpret Meaning - The student will interpret and evaluate the various ways visual image-makers, including graphic artists, illustrators, and news photographers, represent meaning.**

1. Distinguish fact, opinion, and fiction in print and nonprint media in literature and advertising.

2. Interpret and describe important events and ideas gathered from maps, charts and graphics.

***Standard 2: Evaluate Media - The student will evaluate visual and electronic media, such as film, as they compare with print messages.**

1. Make connections between illustrations and print.

2. Interpret important events and ideas gathered from maps, charts, graphics, video segments, or technology presentations.

3. Listen to, view, or read stories which tell of characters in American and other cultures.

***Standard 3: Compose Visual Messages - The student will create a visual message that effectively communicates an idea.**

Example: Create visual messages to communicate ideas (e.g., developing a product advertisement, creating cartoons to share information, or designing book posters).

Blueprints for each Criterion-Referenced Test reflect the degree of representation given on the test to each *PASS* standard and objective. To access the current blueprint (when available) go to the State Department of Education Web site at <http://sde.state.ok.us>, click on site index, then click "s" to go to student assessment, then click on "Student Tests & Materials" then scroll down to "alignment blueprints."

Language Arts

Grade 4

Reading/Literature: The student will apply a wide range of strategies to comprehend, interpret, evaluate, appreciate, and respond to a wide variety texts.

Standard 1: Vocabulary - The student will develop and expand knowledge of words and word meanings to increase vocabulary.

1. Words in Context - Use context clues (the meaning of the text around a word) to distinguish and interpret the meaning of multiple meaning words as well as other unfamiliar words.

2. Affixes, Roots, and Derivatives

   a. Interpret new words by analyzing the meaning of prefixes and suffixes.

   b. Use knowledge of root words (e.g., snow, snowbound, snowdrift) and word parts (therm = heat) derived from Greek and Latin to analyze the meaning of complex words (thermometer).

3. Synonyms, Antonyms, and Homonyms/Homophones - Apply knowledge of fourth grade level synonyms, antonyms, homonyms/homophones, multiple meaning words, and idioms to determine the meanings of words and phrases.

*4. Using Resource Materials

   a. Use a thesaurus to determine related words and concepts.

   b. Determine the meanings and pronunciations of unknown words by using a glossary and/or dictionary.

***Standard 2: Fluency - The student will identify words rapidly so that attention is directed at the meaning of the text.**

1. Read aloud regularly in independent-level texts (texts in which no more than 1 in 20 words is difficult for the reader) fluently and accurately, and with appropriate rate, change in voice, and expression.

2. Read aloud regularly in instructional-level texts that are challenging yet manageable (texts in which no more than 1 in 10 words is difficult for the reader).

3. Increase reading speed through daily independent reading practice as monitored by the instructor through peer discussions, teacher conferences, response journals, etc.

Standard 3: Comprehension/Critical Literacy - The student will interact with the words and concepts in a text to construct an appropriate meaning.

1. Literal Understanding

    a. Use prereading strategies independently to preview, activate prior knowledge, predict content of text, formulate questions that might be answered in the text, establish and adjust purposes for reading (e.g., to find out, to understand, to enjoy, to solve problems).

    b. Read and comprehend poetry, fiction, and nonfiction that is appropriately designed for fourth grade.

    c. Identify and explain the differences in fiction and nonfiction text.

2. Inferences and Interpretation

    a. Use prior knowledge and experience to make inferences and support them with information presented in text.

    b. Make interpretations and draw conclusions from fiction and nonfiction text beyond personal experience.

    c. Make inferences and draw conclusions about characters' qualities and actions (i.e., based on knowledge of plot, setting, characters' motives, characters' appearances, and other characters' responses to a character).

    *d. Participate in creative responses to text (i.e., art, drama, and oral presentation).

3. Summary and Generalization

    a. Paraphrase by recognizing main ideas, key concepts, key actions, and supporting details in fiction and nonfiction to recall, inform, or organize ideas.

    b. Support ideas, arguments, and generalizations by reference to evidence in the text.

    c. Represent text information in different ways such as in outline, timeline, or graphic organizer.

4. Analysis and Evaluation

    a. Evaluate new information and hypotheses by testing them against known information and ideas.

    b. Compare and contrast information on the same topic after reading several passages or articles.

    c. Identify fact/opinion and cause and effect in various texts.

    d. Analyze and explain the causes, motivations, sequences, and results of events from a text.

*5. Monitoring and Correction Strategies

a. Monitor own reading and modify strategies as needed (e.g., recognizes when he or she is confused by a section of text, questions whether the text makes sense, rereading).

b. Predict, monitor, and check for understanding using semantic, syntactic, and graphophonic cues.

Standard 4: Literature - The student will read to construct meaning and respond to a wide variety of literary forms.

*1. Literary Genres - Demonstrate knowledge of and appreciation for various forms (genres) of literature.

a. Identify the defining characteristics of a variety of literary genres and forms (e.g. contemporary realistic fiction, historical fiction, nonfiction, modern fantasy, poetry, drama, legends, myths, biography, autobiographies, and traditional stories such as fairy tales and fables).

b. Read and construct meaning from a variety of genres.

2. Literary Elements - Demonstrate knowledge of literary elements and techniques and how they affect the development of a literary work.

a. Identify the main events of the plot, including their causes and effects of each event on future actions, and the major theme from the story.

b. Identify the purposes of different types of texts (e.g., to inform, to explain, to entertain).

c. Identify themes that occur across literary works.

d. Use knowledge of the situation, setting, a character's traits, motivations, and feelings to determine the causes for that character's actions.

3. Figurative Language and Sound Devices - The student will identify figurative language and sound devices in writing and how they affect the development of a literary work.

a. Interpret poetry and recognize poetic styles (e.g., rhymed, free verse, and patterned [cinquain, diamante]).

b. Define figurative language, such as similes, metaphors, hyperboles, or personification, and identify its use in literary works.

- Simile: a comparison that uses like or as
- Metaphor: an implied comparison
- Hyperbole: an exaggeration for effect
- Personification: a description that represents a thing as a person

*4. Literary Works - The student will read and respond to historically and culturally significant works of literature, compare and contrast story elements from tales of different cultures (e.g., compare/contrast adventures of character types, setting, theme).

Standard 5: Research and Information - The student will conduct research and organize information.

1. Accessing Information - Select the best source for a given purpose.

   a. Understand the organization of and access information from a variety of sources including dictionaries, encyclopedias, atlases, almanacs, tables of contents, glossaries, and indexes.

   b. Identify key words to be used in searching for resources and information.

   c. Cite information sources appropriately.

   d. Use text formats and organization as an aid in constructing meaning from nonfiction (expository) text (e.g., heading, subheading, bold print, and italics).

   e. Locate information in reference texts by using organizational features, such as prefaces and appendixes.

   f. Continue to use test-taking strategies by answering different levels of questions, such as open-ended, literal, and interpretive, as well as multiple choice, true/false, and short answer,

*2. Interpreting Information - Analyze and evaluate information from a variety of sources.

   a. Identify a research question and appropriate sources to answer that question.

   b. Take notes to paraphrase or summarize information.

   c. Locate, organize, and synthesize information from a variety of print, nonprint and technological resources (e.g., dictionaries, reference books, atlases, magazines, informational texts, thesaurus, and technology/Internet).

   d. Report on the findings of research in a variety of formats including written, oral, and/or visual presentations.

Writing/grammar/usage and mechanics. The student will express ideas effectively in written modes for a variety of purposes and audiences.

*** Standard 1: Writing Process. The student will use the writing process to write coherently.**

1. Use a variety of prewriting activities such as brainstorming, clustering, illustrating, webbing, and using graphic organizers.

2. Understand and demonstrate faimilarity with writing process/format of beginning, middle, and ending.

3. Use common organizational structures for providing information in writing, such as chronological order (beginning, middle, and end), cause/effect, or similarity and difference, and posing and answering questions.

4. Select a focus and an organizational structure based upon purpose, audience, and required format.

5. Write one or more drafts by categorizing ideas, organizing them into paragraphs, and blending paragraphs in to longer text.

6. Revise selected drafts by adding, elaborating, deleting, combining, and rearranging text.

7. Edit/proofread drafts, using standard editing marks, to ensure standard usage, mechanics, spelling, and varied sentence structure.

8. Publish and present writing to peers and adults.

*** Standard 2: Modes and Forms of Writing. Communicate through a variety of written forms, for various purposes, and to a specific audience or person.**

1. Communicate through a variety of written modes and for various audiences to inform, persuade, entertain, and reflect.

2. Write narrative, creative, descriptive, expository, and persuasive paragraphs and longer compositions that:

   a. have topic sentences.

   b. use concrete sensory supporting details.

   c. provide a context to allow the reader to imagine the event.

   d. support a logical conclusion.

3. Write creative stories and poems using figurative language (alliteration, personification, simile, and metaphor) and varied word choice to make writing interesting and engaging to audience.

4. Write personal, and formal letters, thank-you notes, and invitations including, the date, greeting, body, closing, and signature.

5. Write informational pieces with multiple paragraphs that:

   a. provide an introductory paragraph that asks a central question about an idea or issue.

   b. establish and support a central theme or idea with a topic sentence.

c. include supporting paragraphs with simple facts, details, and explanations for focus.

d. present important ideas and events in sequence, chronological order, or order of importance.

e. provide details and transitions to link paragraphs.

f. conclude with a paragraph that summarizes the points.

g. use correct indention at the beginning of paragraphs and to indicate dialogue.

h. use more than one source of information, including speakers, books, newspapers, media sources, and online information citing source title, author, and page numbers, if applicable.

6. Write responses to literature that:

a. demonstrate an understanding of a literary work.

b. support judgments by referring to both the text and prior knowledge.

7. Write summaries based upon the main idea of a reading selection and its most significant details.

*** Standard 3: Grammar/Usage and Mechanics. The student will demonstrate appropriate practices in writing by applying Standard English conventions to the revising and editing stages of writing.**

1.Grammar/Usage: Students are expected to recognize and use nouns, pronouns, verbs, adjectives, adverbs, contractions, and conjunctions correctly in their writing.

a. Singular, plural, and possessive forms of nouns

b. Common and proper nouns

c. Nominative (subjective), objective, reflexive, intensive, and possessive pronouns

d. Subject, direct object, and object of prepositions

e. Present, past, future, past participle, and present perfect verbs tense

f. Regular, irregular, and auxiliary (helping) verbs

g. Simple and complete predicate

h. Positive, comparative, and superlative adjectives

i. Time, place, manner, and degree adverbs

j. Comparative forms of adverbs

k. Coordinating and correlating conjunctions

l. Restrictive (essential) and nonrestrictive (nonessential) clauses

m. prepositional and participial phrases

n. Subject-verb agreement

2. Mechanics: Students are expected to demonstrate appropriate language mechanics in writing.

   a. Correctly capitalize the first word of a sentence, the pronoun "I," geographical names, holidays, dates, proper nouns, book titles, titles of respect, sentences, and quotations.

   b. Capitalize correctly familial relations, proper adjectives, and conventions of letter writing.

   c. Indent correctly at the beginning of each paragraph.

   d. Observe left and right hand margins.

3. Punctuation: Students are expected to demonstrate appropriate punctuation in writing.

   a. Parentheses

   b. Quotation marks

   c. Terminal punctuation

   d. Punctuation in common abbreviations and after an initial

   e. Apostrophes in contractions and possessives

   f. Commas

   g. Colons, and semi-colons

   h. Hyphens and dashes

4. Sentence Structure: The student will demonstrate appropriate sentence structure in writing.

   a. Use simple, compound, and complex sentences appropriately in writing.

   b. Create interesting declarative, imperative, interrogative, and exclamatory sentences using words that describe, explain, or provide additional details and connections, such as adjectives, adverbs, appositives, participial phrases, direct objects, prepositional phrases, and conjunctions.

   c. Correct sentence fragments and run-ons.

   d. Create sentences with understood subject.

5. Spelling: Students are expected to demonstrate appropriate application of spelling knowledge to the revising and editing stages of writing.

a. Spell correctly roots, inflections (e.g., -s/es, -ing, -ly, -er), suffixes (e.g., -ment, -ness, -able, -sion, -tion), and prefixes (e.g., dis-, in-, un-, re-, mis-, pre-).

b. Spell homophones correctly according to usage (e.g., to, too, two; there, their, they're).

c. Use more complex patterns in producing conventional spellings (e.g., ought = brought, fought; urse = nurse, purse).

d. Use word reference materials including glossary, dictionary, and technology to check correct spelling.

6. Handwriting: Students are expected to demonstrate appropriate, legible cursive handwriting in the writing process.

Oral Language/Listening and Speaking: The student will demonstrate thinking skills in listening and speaking.

***Standard 1: Listening: The student will listen for information and for pleasure.**

1. Listen to directions and questions and respond appropriately.

2. Listen critically and respond appropriately to oral communication.

3. Listen and respond to teacher-read stories.

***Standard 2: Speaking - The student will express ideas and opinions in group or individual situations.**

1. Speak articulately and audibly before a group using appropriate delivery (enunciation, volume, and movement) and language skills (pronunciation, word choice, and usage).

2. Present effective introductions and conclusions that guide and inform the listener's understanding of important ideas and details.

3. Use traditional structures for conveying information, including cause and effect, similarity and difference, and posing and answering a question.

4. Emphasize points in ways that help the listener or viewer to follow important ideas and concepts (e.g., pausing, hand gestures, inflection volume, body language).

5. Engage the audience with appropriate words, facial expressions, gestures, and eye contact.

***Standard 3: Group Interaction - The student will use effective communication strategies in pairs and small group context.**

1. Show respect and consideration for others in verbal and physical communication.

2. Demonstrate thinking skills in listening, speaking, reading, and writing. For example, students are expected to gather information, organize and analyze it, and generate a

simple written or oral report.

3. Participate in story telling, give oral book reports, and present poems, stories, plays, and pantomime.

Visual Literacy: The student will interpret, evaluate, and compose visual messages.

***Standard 1: Interpret Meaning - The student will interpret and evaluate the various ways visual image-makers, including graphic artists, illustrators, and news photographers, represent meaning and distinguish fact, opinion, and fiction in print and nonprint media.**

***Standard 2: Evaluate Media - The student will evaluate visual and electronic media, such as film, as compared with print messages.**

1. Interpret and describe important events and ideas gathered from maps, charts, graphics, video segments, or technology presentations.

2. Compare and contrast print, visual, and electronic media, such as film, with a written story.

3. Listen to, view, or read literature which tells of characters in American and other cultures.

4. Make connections between illustrations and print.

***Standard 3: Compose Visual Messages - The student will create a visual message that effectively communicates an idea, selects, organizes, or produces visuals to complement and extend ideas (e.g., book posters, multimedia projects, books, or advertisements).**

Blueprints for each Criterion-Referenced Test reflect the degree of representation given on the test to each *PASS* standard and objective. To access the current blueprint (when available) go to the State Department of Education Web site at <http://sde.state.ok.us>, click on site index, then click "s" to go to student assessment, then click on "Student Tests & Materials" then scroll down to "alignment blueprints."

LANGUAGE ARTS

Grade 5

Reading/Literature: The student will apply a wide range of strategies to comprehend, interpret, evaluate, appreciate, and respond to a wide variety of texts.

Standard 1: Vocabulary - The student will develop and expand knowledge of words and word meanings to increase their vocabulary.

1. Words in Context

   a. Use knowledge of word parts and word relationships, as well as context clues (the meaning of the text around a word), to determine the meaning of specialized vocabulary and to understand the precise meaning of grade-level-appropriate words.

   b. Use prior experience and context to understand and explain the figurative use of words such as similes (comparisons that use *like* or *as: His feet were as big as boats),* and metaphors (implied comparisons: *The giants steps were thunderous).*

2. Affixes, Roots, and Stems

   a. Interpret new words by analyzing the meaning of prefixes and suffixes.

   b. Apply knowledge of root words to determine the meaning of unknown words within a passage.

   c. Use word origins, including knowledge of less common roots (*graph = writing, terras = earth)* and word parts *(hemi = half, bio = life)* from Greek and Latin to analyze the meaning of complex words *(terrain, hemisphere, biography).*

3. Synonyms, Antonyms, and Homonyms/Homophones - Apply knowledge of fifth grade level synonyms, antonyms, homonym/homophones, and multiple meaning words to determine the meaning of words and phrases.

*4. Using Resource Materials and Aids

   a. Use a thesaurus to determine related words and concepts.

   b. Determine the meanings, pronunciation, and derivations of unknown words by using a glossary and/or dictionary.

***Standard 2: Fluency - The student will identify words rapidly so that attention is directed at the meaning of the text.**

1. Read regularly in independent-level texts (texts in which no more than approximately 1 in 20 words is difficult for the reader) fluently and accurately, and with appropriate

timing, change in voice, and expression.

2. Read regularly in instructional-level texts (texts in which no more than approximately 1 in 10 words is difficult for the reader).

3. Read silently for increased periods of time.

4. Increase reading through daily independent reading practice as monitored by the instructor through peer discussions, teacher conferences, response journals, etc.

Standard 3: Comprehension/Critical Literacy - The student will interact with the words and concepts in the text to construct an appropriate meaning.

1. Literal Understanding

   a. Use prereading strategies independently (to preview, activate prior knowledge, predict content of text, formulate questions that might be answered by the text, and establish purpose for reading).

   b. Read and comprehend both fiction and nonfiction that is appropriately designed for fifth grade.

   c. Recognize main ideas presented in a particular segment of text; identify evidence that supports those ideas.

   d. Use the text's structure or progression of ideas such as cause and effect or chronology to organize or recall information.

2. Inferences and Interpretation

   a. Apply prior knowledge and experience to make inferences and respond to new information presented in text.

   b. Draw inferences and conclusions about text and support them with textual evidence and prior knowledge.

   c. Describe elements of character development in written works (e.g., differences between main and minor characters; changes that characters undergo; the importance of a character’s actions, motives, stereotypes, and appearance to plot and theme).

   d. Make inferences or draw conclusions about characters’ qualities and actions (e.g., based on knowledge of plot, setting, characters’ motives, characters’ appearances, stereotypes and other characters’ responses to a character).

   *e. Participate in creative response to text (e.g., art, drama, and oral presentation).

3. Summary and Generalization

a. Summarize and paraphrase information from entire reading selection including the main idea and significant supporting details.

b. Make generalizations with information gleaned from text.

c. Support ideas and arguments by reference to relevant aspects of text and issues across texts.

d. Organize text information in different ways (e.g., timeline, outline, graphic organizer) to support and explain ideas.

4. Analysis and Evaluation

a. Identify and analyze the characteristics of poetry, drama, fiction, and nonfiction and explain the appropriateness of the literary form chosen by an author for a specific purpose.

b. Identify the main problem or conflict of the plot and explain how it is resolved.

c. Contrast the actions, motives, and appearances of characters in a work of fiction and discuss the importance of the contrasts to the plot or theme.

d. Make observations and connections, react, speculate, interpret, and raise questions in analysis of texts.

e. Recognize structural patterns found in information text (e.g., cause and effect, problem/solution, sequential order).

f. Distinguish among facts/inferences supported by evidence and opinions in text.

*5. Monitoring and Correction Strategies

a. Monitor own reading and modify strategies as needed when understanding breaks down (e.g., rereading a portion aloud, using reference aids, searching for clues, and asking questions).

b. Predict, monitor, and check for understanding using semantic, syntactic, and graphophonic cues.

c. Monitor and adjust reading rate according to the purpose for reading and the difficulty of the text.

Standard 4: Literature - The student will read to contrast meaning and respond to a wide variety of literary forms.

1. Literary Genres - Demonstrate knowledge of and appreciation for various forms (genres) of literature.

a. Recognize characteristics of literary genres and forms (e.g., contemporary realistic fiction, historical fiction, nonfiction, modern fantasy, poetry, drama, and traditional stories such as fairy tales, fables, myths, and legends).

b. Read and construct meaning from a variety of genres.

c. Demonstrate an understanding of similarities and differences within and among literary works of various genre and cultures (e.g., in terms of settings, character types, events, and role of natural phenomena).

2. Literary Elements - Demonstrate knowledge of literary elements and techniques and how they affect the development of a literary work.

a. Develop a knowledge of the literary elements of fiction (plot, problems, attempts to resolve conflicts, resolution, etc.) and the text structure of nonfiction (compare/contrast, cause/effect, sequence, main idea, and details).

b. Compare/contrast genres, themes, ideas, and story elements across texts read, listened to, or viewed.

c. Identify the author's purpose (persuade, inform, or entertain).

d. Recognize and identify the writer's perspective or point of view in a literary selection (e.g., first person, second person) and how it affects the text.

3. Figurative Language and Sound Devices - Identify figurative language and sound devices in writing and how they affect the development of a literary work.

a. Identify and discuss certain words and rhythmic patterns that can be used in a selection to imitate sounds (e.g., rhythm, rhyme, alliteration).

b. Evaluate and identify figurative language, such as simile, metaphors, hyperbole, personification, and idioms.
Example: Simile - a comparison that uses like or as
Example: Metaphor - an implied comparison
Example: Hyperbole – an exaggeration for effect
Example: Personification – a description that represents a thing as a person
Example: Idioms – an expression that does not mean what it literally says

c. Identify the function and effect of common literary devices, such as imagery, metaphor, and symbolism.

Symbolism: the use of an object to represent something else; for example, a dove might symbolize peace.

Imagery: the use of language to create vivid pictures in the reader's mind.

Metaphor: an implied comparison in which a word or phrase is used in place of another, such as *He was drowning in money.*

d. Interpret poetry and recognize poetic styles (e.g., rhymed, free verse, and patterned [cinquain, diamante]).

*4. Literary Works - Read and respond to historically and culturally significant works of literature.

Example: Compare and analyze literary works from various cultures.

Standard 5: Research and Information: The student will conduct research and organize information.

1. Accessing Information - Select the best source for a given purpose.

a. Determine and use appropriate sources for accessing information including, dictionaries, thesaurus, library catalogs and databases, magazines, newspapers, technology/Internet, encyclopedias, atlases, almanacs, tables of contents, glossaries, and indexes.

b. Identify and credit the sources used to gain information.

c. Use text features to access information (e.g., format, italics, heading, subheadings, graphics, sequence, diagrams, illustrations, charts, and maps).

d. Use reference features of printed text, such as citations, endnotes, and bibliographies to locate relevant information about a topic.

e. Use the features of informational texts, such as formats, graphics, diagrams, illustrations, charts, maps, and organization, to find information and support understanding.

Example: Locate specific information in a social studies textbook by using its organization, sections on different world regions, and textual features, such as headers, maps, and charts.

f. Recognize and apply test-taking strategies by answering different levels of questions, such as literal, as well as multiple choice, true/false, short answer, inferential, evaluative, or open-ended.

2. Interpreting Information - Analyze and evaluate information from a variety of sources.

a. Follow multistep directions to accomplish a task (e.g., video games, computer programs, recipes).

b. Select a topic, formulate questions, and synthesize information from a variety of print, nonprint and technological resources (e.g., dictionaries, reference books, atlases, magazines, informational texts, thesaurus, and technology/Internet).

c. Develop notes that include important information on a selected topic.

d. Summarize information from multiple sources into a written report or summary.

e. Create simple documents using a computer and employing organizational features, such as passwords, entry and pull-down menus, word searches, the thesaurus, and spell checks.

Writing/Grammar/Usage and Mechanics. The student will express ideas effectively in written modes for a variety of purposes and audiences.

Standard 1: Writing Process. The student will use the writing process to write coherently.

1. Use the writing process to develop, extend, and refine composition skills by using a variety of prewriting strategies, such as brainstorming, clustering, illustrating, webbing, using graphic organizers, notes, and logs.

2. Understand and demonstrate familiartiy with the writing process and format (beginning, middle, and ending) and structure of main idea, exposition, body, and conclusion).

3. Use common organizational structures for providing information in writing, such as chronological/sequential order, cause and effect, or similarity and difference, and posing and answering questions.
4. Select a focus and an organizational structure based upon purpose/mode, audience, and required format.

   a. Write one or more drafts by categorizing ideas and organizing them into paragraphs.

   b. Blend paragraphs with effective transitions into longer compositions.

5. Edit/proofread drafts, using standard editing marks, to ensure standard usage, mechanics, spelling, and varied sentence structure to improve meaning and clarity.

6. Review, evaluate, and revise selected drafts by adding, elaborating, deleting, combining, and rearranging text for meaning and clarity.

7. Publish and present writing to peers and adults.

Standard 2: Modes and Forms of Writing. Communicate through a variety of written forms, for various purposes, and to a specific audience or person.

1. Communicate through a variety of written forms and for various audiences to inform, persuade, entertain, describe and reflect, while adjusting tone and style as appropriate.

2. Write narratives that establish a plot, point of view, setting, conflict, and are written to allow a reader to picture the events of a story. Example: Select a type of narrative to write that is modeled after a genre of literature that has been shared in the classroom such as folktale, myth, science fiction, or mystery. Be sure to include an interesting beginning, develop the central conflict of the story, and establish an ending that resolves the conflict.

3. With creative narratives and poems, use varied word choice, dialogue, and figurative language when appropriate (alliteration, personification, simile, and

metaphor) to make writing engaging to the audience (e.g., inquired or requested instead of asked).

4. Write personal, persuasive, formal letters, thank-you notes, and invitations, including the date, greeting, body, closing, and signature.

5. Write expository (informational) pieces with multiple paragraphs that:

   a. provide an introductory paragraph.

   b. establish and support a central theme or idea with a thesis statement.

   c. include supporting paragraphs with simple facts, details, and explanations.

   d. present important ideas and events in sequence or in chronological order.

   e. provide details and transitions to link paragraphs.

   f. conclude with a paragraph that summarizes the points.

   g. use correct indention at the beginning of paragraphs.

   h. use at least three sources of valid and reliable information including books, newspapers, periodicals, online, and media sources.

6. Write research reports about important ideas, issues, or events that:

   a. frame questions about an idea or issue to direct the investigation.

   b. a main idea or topic.

   c. develop the topic with simple facts, details, examples, and explanations to support the main idea.

   d. use at least three different types information sources, including speakers, firsthand interviews, reference materials, and online information.

7. Write responses to literature that:

   a. demonstrate an understanding of a designated literary work.

   b. support judgments by referring and connecting to prior knowledge.

   c. develop interpretations and evaluations that exhibit careful reading and understanding.

8. Write persuasive compositions or letters that:

   a. state a clear position in support of a proposal.

   b. support a position with relevant evidence and effective emotional appeals in order to persuade.

   c. organize supporting statements from the most appealing to the least powerful

d. include and address reader/audience concerns. Example: Interview several students in varying grades about the changes they would like to see in the monthly cafeteria menu choices. Compile the opinions and ideas to compose a persuasive article for the school newspaper.

Standard 3: Grammar/Usage and Mechanics. The student will demonstrate appropriate practices in writing by applying Standard English conventions to the revising and editing stages of writing.

1. Grammar/Usage: Students are expected to recognize and use nouns, pronouns, verbs, adjectives, adverbs, and conjunctions in their writing.

    a. Singular and plural forms of nouns and pronouns

    b. Nominative (subjective), objective, reflexive, and possessive pronouns

    c. Relative, intensive, and intensive pronouns

    d. Subject, indirect, direct object, and object of prepositions

    e. Transitive and intransitive verbs

    f. Present, past, future, and present perfect verbs tense

    g. Positive, comparative, and superlative adjectives

    h. Time, place, manner, and degree adverbs

    i. Comparative forms of adverbs

    j. Subject-verb agreement

    k. Restrictive (essential) and nonrestrictive (nonessential) clauses and phrases

    l. Subordinate adverb, adjective, and noun clauses

    m. Pronoun antecedents and reference

    n. Coordinating, correlating, and subordinating conjunctions

2. Mechanics: Students are expected to demonstrate appropriate language mechanics in writing.

    a. Capitalize correctly proper nouns such as titles of books, magazines, newspapers, stories, titles of respect, works of art, regions of the country, political parties, organizations, state colleges universities, languages, races, nationalities, and religions.

    b. Capitalize correctly proper adjectives.

    c. Capitalize correctly conventions of letter writing.

    d. Indent beginning lines of paragraphs.

3. Punctuation: Students are expected to demonstrate appropriate punctuation in writing.

   a. Parentheses

   b. Quotation marks

   c. Terminal punctuation (period, exclamation point, or question mark)

   d. Punctuation after initials

   e. Apostrophes in contractions and possessives

   f. Conventions of letter writing

   g. Colons, semi-colons, and commas

   h. Hyphens and dashes

4. Sentence Structure: The student will demonstrate appropriate sentence structure in writing declarative, imperative, exclamatory, and interrogative sentences.

   a. Create interesting simple, complete, compound, and complex sentences that describe, explain, or provide additional details and connections, such as adjectives, adverbs, appositives, participial phrases, prepositional phrases, simple, complete, and compound predicates, modifiers, pronouns, and conjunctions.

   b. Create sentences with an understood subject.

   c. Correct sentence fragments and run-ons.

5. Spelling: Students are expected to demonstrate appropriate application of spelling knowledge to the revising and editing stages of writing.

   a. Spell previously misspelled words correctly in final writing products.

   b. Spell correctly roots, inflections (e.g., -s/es, -ing, -ly, -en -er), suffixes (e.g., -ment, -ture, -ate, -able, -sion, -tion), and prefixes (e.g., dis-, in-, un-, re-, mis-, pre-), and syllable constructions (e.g., grad.u.a.tion).

   c. Spell homophones correctly according to usage (e.g., to, too, two; there, their, they're) and other words that are commonly misspelled in the English language (e.g., until, our)

   d. Use word reference materials including glossary, dictionary, thesaurus, encyclopedia, and technology to check and correct spelling.

6. Handwriting: Students are expected to demonstrate appropriate, legible handwriting in the writing process.

Oral Language/Listening and Speaking: The student will demonstrate thinking skills in listening and speaking.

***Standard 1: Listening: The student will listen for information and for pleasure.**

1. Interpret a speaker's verbal and nonverbal message, purpose, and perspective.

2. Listen critically and respond appropriately to oral communication to seek information not already discussed.

***Standard 2: Speaking - The student will express ideas and opinions in group or individual situations.**

1. Speak articulately and audibly before a group using appropriate delivery (enunciation, volume, timing, and gestures) and language skills (pronunciation, word choice, and usage).

2. Present effective introductions and conclusions that guide and inform the listener's understanding of important ideas and details by clarifying and supporting spoken ideas with evidence and examples.

3. Use traditional structures for conveying information, including cause and effect, similarity and difference, and posing and answering a question.

4. Engage the audience with appropriate words, phrasing, facial expressions, and gestures.

5. Deliver narrative (story) presentations that establish a situation, develop a plot, point of view, and setting with descriptive words and phrases.

6. Deliver informative presentations about an important topic, issue, or event that frames a question to guide the investigation, establishes a central idea or topic, and develops that topic appropriately.

7. Deliver oral responses to literature that summarizes important events and details, demonstrates an understanding of several ideas communicated in the work, and uses examples from the literature to support conclusions.

***Standard 3: Group Interaction - The student will use effective communication strategies in pairs and small group context.**

1. Show respect and consideration for others in verbal and physical communication.

2. Demonstrate thinking skills in listening, speaking, reading, and writing. For example, students are expected to gather information, organize and analyze it, and generate a written or oral report that conveys ideas clearly and relates to the background and interest of the audience.

Visual Literacy: The student will interpret, evaluate, and compose visual messages.

***Standard 1: Interpret Meaning - The student will interpret and evaluate the various ways visual image-makers, including graphic artists, illustrators, and news photographers, represent meaning.**

1. Distinguish fact, opinion, and fiction in print and nonprint media.

2. Interpret and describe important events and ideas gathered from maps, charts, graphics, video segments, or technology presentation.

***Standard 2: Evaluate Media - The student will evaluate visual and electronic media, such as film, as compared with print messages.**

1. Interpret and evaluate the various ways visual image-makers, such as graphic artists, illustrators, and news photographers represent meaning.

2. Compare and contrast print, visual, and electronic media, such as film, with a written story.

3. Listen to, view, or read literature which tells of characters in American and other cultures.

4. Analyze media as sources for information, entertainment, persuasion, interpretation of events, and transmission of culture.

***Standard 3: Compose Visual Messages - The student will create a visual message that effectively communicates an idea and produce communications using appropriate technology or media (e.g., developing a class newspaper, videos, or multimedia projects).**

Blueprints for each Criterion-Referenced Test reflect the degree of representation given on the test to each *PASS* standard and objective. To access the current blueprint (when available) go to the State Department of Education Web site at <http://sde.state.ok.us>, click on site index, then click "s" to go to student assessment, then click on "Student Tests & Materials" then scroll down to "alignment blueprints."

LANGUAGE ARTS
Grade 6

Reading/Literature: **The student will apply a wide range of strategies to comprehend, interpret, evaluate, appreciate, and respond to a wide variety of texts.**

Standard 1: Vocabulary - The student will develop and expand knowledge of words and word meanings to increase vocabulary.

1. Words in Context

   a. Use knowledge of word parts and word relationships, as well as context clues (the meaning of the text around a word), to determine the meaning of technical and specialized vocabulary and to understand the precise meaning of grade-level-appropriate words in fiction and nonfiction texts.

   b. Use prior experience and context to analyze and explain the figurative use of words, similes (comparisons that use *like* or *as*: *The Snowplow Reared Up Like a Stallion)*, metaphors (implied comparisons: *Peace is a Sunrise)*, and multiple meaning words.

2. Word Origins

   a. Recognize the origins and meanings of foreign words frequently used in English. Example: Understand foreign words that are often used in English such as spaghetti (Italian) and rodeo (Spanish).

   b. Apply knowledge of root words to determine the meaning of unknown words within a passage.

   c. Use word origins, including knowledge of less common roots (*graph = writing, logos = the study of)* and word parts *(auto = self, bio = life)* from Greek and Latin to analyze the meaning of complex words *(autograph, autobiography, biology)*.

*3. Using Resource Materials and Aids

   a. Determine the meanings, pronunciation, and derivations of unknown words by using a glossary, dictionary, and/or thesaurus.

   b. Relate dictionary definitions to context of the reading in order to aid understanding.

***Standard 2: Fluency - The student will identify words rapidly so that attention is directed at the meaning of the text.**

1. Read regularly in independent-level texts (texts in which no more than approximately 1 in 10 words is difficult for the reader) fluently and accurately, and with appropriate timing, change in voice, and expression.

2. Read regularly in instructional-level texts (texts in which no more than approximately 1 in 10 words is difficult for the reader; a "typical" sixth grader reads approximately 120 words per minute).

3. Increase silent reading speed through daily independent reading.

4. Read silently for increased periods of time.

Standard 3: Comprehension/Critical Literacy - The student will interact with the words and concepts in the text to construct an appropriate meaning.

Read and understand grade-level-appropriate material. Describe and connect the essential ideas, arguments, and perspectives of the text by using the knowledge of text structure, organization, and purpose. At Grade 6, in addition to regular classroom reading, students read a variety of grade-level-appropriate narrative (story) and expository (informational and technical) texts, including classic and contemporary literature, poetry, magazines, newspapers, reference materials, and online information as well as expository (informational and technical) text.

1. Literal Understanding

    a. Use prereading strategies independently (to preview, activate prior knowledge, predict content of text, formulate questions that might be answered by the text, establish purpose for reading).

    b. Read and comprehend both fiction and nonfiction that is appropriately designed for sixth grade.

    c. Recognize main ideas presented in a particular segment of text; identify and assess evidence that supports those ideas.
    Example: Use a graphic organizer to compare an advertisement to the actual product label.

    d. Use the text's structure or progression of ideas, such as cause and effect or chronology to locate or recall information.

2. Inferences and Interpretation

    a. Draw inferences and conclusions about text and support them with textual evidence and prior knowledge.

    b. Make inferences or draw conclusions about characters' qualities and actions (i.e., based on knowledge of plot, setting, characters' motives, characters' appearances, other characters' responses to a character).

    *c. Interpret and respond creatively to literature (e.g., art, drama, oral presentations, and Reader's Theater).

3. Summary and Generalization

a. Summarize and paraphrase information including the main idea and significant supporting details of a reading selection.

b. Make generalizations based on information gleaned from text.

c. Support reasonable statements and conclusions by reference to relevant aspects of text and examples.

d. Clarify understanding of text information in different ways (e.g., timelines, outlines, graphic organizer) to support and explain ideas.

4. Analysis and Evaluation

a. Evaluate the believability of a character and the impact they have on the plot.

b. Analyze the main problem or conflict of the plot; the effect of the qualities of the characters and explain how the conflict is resolved.

c. Contrast the actions, motives, and appearances of characters in a work of fiction and discuss the importance of the contrasts to the plot or theme.

d. Make observations, connections, and react, speculate, interpret, and raise questions in analysis of texts.

e. Recognize and evaluate structural patterns found in a literary work (e.g., cause/effect, problem/solution, sequential order).

f. Distinguish among stated facts, inferences supported by evidence, and opinions in text.

*5. Monitoring and Correction Strategies

a. Monitor own reading and modify strategies as needed when understanding breaks down (e.g., rereading a portion aloud, using reference aids, trying an alternate pronunciation, searching for clues, and asking questions).

b. Clarify meaning by questioning and rereading; confirm and revise predictions as needed when reading.

c. Adjust reading rate and determine appropriate strategies according to the purpose for reading, the difficulty of the text, and characteristics of the text.

Standard 4: Literature - The student will read, construct meaning, and respond to a wide variety of literary forms.

Read and respond to grade-level-appropriate historically or culturally significant works of literature that reflect and enhance a study of history and social science. Clarify ideas and connect them to other literary works. Participate productively in self-directed work teams to create observable products.

1. Literary Genres - The student will demonstrate a knowledge of and an appreciation for various forms of literature.

   a. Analyze the characteristics of genres, including short story, novel, drama, poetry, and nonfiction.

   b. Analyze characteristics of subgenres, including autobiography, biography, fable, folk tale, mystery, and myth.

2. Literary Elements - The student will demonstrate knowledge of literary elements and techniques and how they affect the development of a literary work.

   a. Identify and explain elements of fiction, including plot, conflict, character, setting, and theme.

   b. Identify and explain internal and external conflict in the development of a story.

   c. Determine the author's purpose (persuade, inform, entertain) and point of view, whether explicitly or implicitly stated and how it affects the text.

   d. Connect, compare, and contrast ideas, themes, and issues across texts.

3. Figurative Language and Sound Devices - The student will identify figurative language and sound devices and will analyze how they affect the development of a literary work.

   a. Identify and explain figurative language, including symbolism, imagery, metaphor, personification, simile, and idioms.

   b. Identify and explain sound devices, including alliteration, onomatopoeia, and rhyme.

   c. Interpret poetry and recognize poetic styles (e.g., rhymed, free verse, and patterned [cinquain, diamante]).

   d. Identify and describe the function and effect of common literary devices, such as imagery and symbolism.

      - Imagery: the use of language to create vivid pictures in the reader's mind.

      - Symbolism: the use of an object to represent something else; for example, a dove might symbolize peace.

*4. Literary Works - The student will read and respond to historically and culturally significant works of literature.

   a. Analyze and evaluate works of literature and the historical context in which they were written.

b. Analyze and evaluate literature from various cultures to broaden cultural awareness.

c. Compare similar characters, settings, and themes from varied literary traditions.

Standard 5: Research and Information - The student will conduct research and organize information.

1. Accessing Information - The student will select the best source for a given purpose.

   a. Use library catalogs and computer databases to locate sources for research topics.

   b. Access information from a variety of primary and secondary sources to gather information for research topics

   c. Use organizational strategies as an aid to comprehend increasingly difficult content material.

   d. Note instances of persuasion, propaganda, faulty reasoning, or misleading information in text.

   e. Use reference features of printed text, such as citations, endnotes, and bibliographies, to locate relevant information about a topic.

2. Interpreting Information - The student will analyze and evaluate information from a variety of sources.

   a. Record, organize, and display relevant information from multiple sources in systemic ways (e.g., outlines, graphic organizers, or note cards).

   b. Identify and credit the reference sources used to gain information.

   c. Determine the appropriateness of an information source for a research topic.

   d. Summarize information from multiple sources into a research paper.

Writing/Grammar/Usage and Mechanics. The student will express ideas effectively in written modes for a variety of purposes and audiences, discuss and keep a list of writing ideas, and use graphic organizers to plan writing. The student will write clear, coherent, and focused papers, and progress through the stages of the writing process. The student will work independently and in self-directed writing teams to edit and revise.

***Standard 1: Writing Process. The student will use the writing process to write coherently.**

1. Use a variety of prewriting strategies such as brainstorming, webbing, or using other graphic organizers to develop an idea appropriate for the intended audience, purpose, and topic.

2. Add details, examples, reasons, and evidence to develop and support an idea.

3. Use organizational patterns such as spatial, chronological/sequential, cause and effect or climactic as appropriate to purpose.

4. Use effective transitions for effective blending of sentences and paragraphs.

5. Use precise and vivid word choices, including figurative language, that convey specific meaning and tone.

6. Use a variety of sentence types and lengths to contribute to fluency and interest.

7. Using standard editing marks, edit for errors in Standard English usage, sentence structure, mechanics, and spelling.

8. Publish and present to peers and adults.

***(2) Standard - modes and forms of writing. The student will write for a variety of purposes and audiences using narrative, descriptive, expository, persuasive, and reflective modes. At Grade 6, write narrative, expository, persuasive, argumentative, reflective, and descriptive modes of at least 500 to 700 words, demonstrating a command of Standard English and the research, organization, and drafting strategies outlined in the writing process. Writing demonstrates an awareness of the audience (intended reader) and purpose for writing.**

1. Compose fictional, biographical, and autobiographical narratives that:

   a. establish and develop a plot and setting with a distinct beginning, middle, and ending.

   b. establish and develop a setting, characters, and point of view appropriate for the narrative.

   c. use a range of narrative devices, such as dialogue or suspense.

   d. adjust tone and style as necessary to make writing interesting and engaging to the audience.

2. Compose expository test including descriptions, explanations, comparison and contrast, and problem and solution compositions that:

   a. state the thesis (position on the topic), main idea, or purpose.

   b. explain the situation including supporting paragraphs with facts, details, and explanations.

   c. organize the composition clearly and appropriately for the purpose of the writing.

   d. include evidence and supporting details by paraphrasing from speakers, newspapers, magazines, media sources, or referencebooks to support arguments and conclusions. Example: Write successive drafts of a one or two page newspaper article about school carnival activities, including details to support the main topic and allow the reader to compare and contrast the different carnival activities described or a description of a school event including details to support the main idea.)

3. Compose persuasive/argumentative compositions that:

   a. state a clear position on a proposition or proposal.

   b. support the position with organized and relevant evidence and effective emotional appeals.

   c. predict, identify, and address reader concerns and counterarguments. Example: Write a persuasive paper on how the class should celebrate the end of the school year, including adequate reasons for why the class should participate in the activity described.

   d. Create an advertisement for a product to try to convince readers to buy the product.

4. Compose reflective papers that may address one of the following purposes:

   a. express the individual's insight into conditions or situations.

   b. compare a scene from a work of fiction with a lesson learned from experience.

   c. complete a self-evaluation.

   Example: Write a self-evaluation on a personal strength.

5. Write responses to literature, including poetry, that:

   a. include an interpretation that shows careful reading, understanding, and insight.

   b. organize the interpretation around several clear ideas.

   c. develop and justify the interpretation through the use of examples and evidence from the text. Example: After reading a novel, write a final chapter to the book describing what happens to the main character after the point where the book ends and how it is supported by the rest of the narrative.

6. Write for different purposes and to a specific audience or person, adjusting tone and style as necessary to make writing interesting. Example: Write stories, reports, and letters showing a variety of word choices, or review a favorite book or film.

7. Compose summaries of reading material that:

   a. include the main idea and most significant details.

   b. use the student’s own words except for direct quotations.

8. Compose friendly and formal letters, and emails; continue to produce other writing forms introduced in earlier grades. Example: Write a formal letter requesting a catalog.

9. Use appropriate essay test-taking and time-writing strategies that:
   a. address and analyze the question (prompt).

   b. use organizational methods required by the prompt.

   c. utilize an editing checklist or assessment rubric, if provided.

10. Use handwriting/penmanship to copy and/or compose text, in manuscript or cursive, using correct spacing and formation of letters.

*** Standard 3: Grammar/Usage and Mechanics. The student will demonstrate appropriate practices in writing by applying Standard English conventions to the revising and editing stages of writing.**

1. Standard English Usage - Demonstrate correct use of Standard English in speaking and writingas appropriate to sixth grade.

   a. Identify concrete, abstract, and collective nouns.

   b. Identify the principal parts of verbs to form verb tenses.

   c. Identify linking, transitive, and intransitive verbs.

   d. Identify nominative, objective, and possessive pronouns correctly.

   e. Correctly use pronoun reference, and make pronouns agree with their antecedents.

   f. Correctly form and use the positive, comparative, and superlative forms of adjectives.

   g. Correctly form and use adverb clauses.

   h. Identify and correctly use appositives, restrictive (essential) and nonrestrictive (nonessential) clauses and phrases.

   i. Identify direct objects, indirect objects, objects of prepositions, predicate nominatives and predicate adjectives.

   j. Use prepositional phrases to elaborate written ideas.

   k. Correctly use all conjunctions.

   l. Correctly identify and use interjections

   m. Distinguish commonly confused words (e.g., there, their, they're; two, to, too; accept, except; affect, effect).

   n. Form regular and irregular plurals correctly.

   o. Make subjects and verbs agree.

2. Sentence Structure - Demonstrate appropriate sentence structure in writing all forms of sentences (declarative, imperative, exclamatory and interrogative).

   a. Correct sentence run-ons and fragments.

   b. Correct dangling and misplaced modifiers.

   c. Differentiate between dependent, independent, restrictive (essential), and nonrestrictive (nonessential) clauses.

   d. Write simple and compound sentences.

   e. compose sentences with simple, complete, and compound predicate.

   f. Indent paragraphs as needed for specified format.

3. Mechanics and Spelling - Demonstrate appropriate language mechanics in writing.

   a. Apply the capitalization rules appropriately in writing.

   b. Punctuate correctly in writing

      - End punctuation

      - Commas to separate words in a series, city and state, quotation, and sentence and to set off nonrestrictive phrases

      - Quotation marks

      - Apostrophes in contractions, possessives, indefinite pronouns, and quotations inside a quotation

      - Conventions of letter writing

   c. Distinguish correct spelling of commonly misspelled words and homonyms.

Oral Language/Listening and Speaking: The student will demonstrate thinking skills in listening and speaking.

Deliver focused, coherent presentations that convey ideas and relate to the background and interests of the audience. Evaluate the content of oral communication. Deliver well-organized formal presentations using traditional speech strategies, including narration, exposition, persuasion, and description. Use the same Standard English conventions for oral speech that are used in writing. Participate independently and in groups to create oral presentations.

***Standard 1: Listening - The student will listen for information and for pleasure.**

1. Identify the major ideas and supporting evidence in informative and persuasive messages.

2. Determine the purpose for listening (i.e., gaining information, solving problems; or for enjoying, appreciating, recalling, interpreting, applying, analyzing, evaluating, receiving directions, or learning concepts).

3. Recognize and understand barriers to effective listening (i.e., internal and external distractions, personal biases, and conflicting demands).

4. Evaluate the spoken message in terms of content, credibility, and delivery.

***Standard 2: Speaking - The student will express ideas and opinions in group or individual situations.**

1. Analyze purpose, audience, and occasion and consider this information in planning an effective presentation or response.

2. Compose a presentation with a well-organized introduction, body, and conclusion that is appropriate for different purposes, audiences, and occasions.

3. Communicate using appropriate delivery (volume, rate, enunciation, and movement).

Visual Literacy: The student will interpret, evaluate, and compose visual messages.

***Standard 1: Interpret Meaning - The student will interpret and evaluate the various ways visual image-makers, including graphic artists, illustrators, and news photographers, represent meaning.**

1. Interpret a variety of messages conveyed by visual images (e.g., main concept, details, themes, lessons, or viewpoints).

2. Identify film and television features that characterize different style of dress and genres (e.g., setting in a western or a drama).

***Standard 2: Evaluate Media - The student will evaluate visual and electronic media, such as film, as compared with print messages.**

1. Identify the different ways in which people are stereotyped in visual media and consider alternative representations (e.g., clever people wear glasses, super heroes wear capes, scientists wear white coats).

2. Identify basic elements of advertising in visual media (e.g., sales approaches and techniques aimed at children).

3. Evaluate how different media forms influence and inform viewers.

4. Assess how language, medium, and presentation contribute to the message.

***Standard 3: Compose Visual Messages - The student will create a visual message that**

effectively communicates an idea and produces communication using technology or appropriate media, such as developing a class newspaper, multimedia reports, or video reports.

Blueprints for each Criterion-Referenced Test reflect the degree of representation given on the test to each *PASS* standard and objective. To access the current blueprint (when available) go to the State Department of Education Web site at <http://sde.state.ok.us>, click on site index, then click "s" to go to student assessment, then click on "Student Tests & Materials" then scroll down to "alignment blueprints."

LANGUAGE ARTS
Grade 7

Reading/Literature: The student will apply a wide range of strategies to comprehend, interpret, evaluate, appreciate, and respond to a wide variety of texts.

Standard 1: Vocabulary - The student will expand vocabulary through word study, literature, and class discussion.

Use a knowledge of word parts and word relationships, as well as context clues (the meaning of the text around a word), to determine the meaning of specialized vocabulary and to understand the precise meaning of grade-level-appropriate words.

1. Words in Context - Verify the meaning of a word in its context, even when its meaning is not directly stated, through the use of definitions, restatement, example, comparison, or contrast.

2. Word Origins

   a. Identify the origins and meanings of foreign words frequently used in English and use these words accurately in speaking and writing.
   Example: Understand and use in speaking and writing foreign words that are often used in English such as lasagne (Italian), sauerkraut (German), and déjà vu (French).

   b. Use knowledge of Greek and Latin word parts and roots to determine the meaning of subject area vocabulary.
   Example: Analyze the roots, prefixes, and suffixes of subject-area words such as telescope, geography, and quadrant.

3. Idioms and Comparisons - Identify and explain idioms and comparisons, such as analogies, metaphors, and similes, to infer the literal and figurative meanings of phrases.

   a. Idioms: expressions that cannot be understood just by knowing the meanings of the words in the expression, such as *the apple of his eye* or *beat around the bush.*

   b. Analogies: comparisons of the similar aspects of two different things

   c. Metaphors: implies comparisons, such as, *The street light was my security guard.*

   d. Similes: comparisons that use *like* or *as*, such as *A gentle summer breeze feels like a soft cotton sheet.*

***Standard 2: Fluency - The student will identify words rapidly so that attention is directed to the meaning of the text.**

1. Read regularly in independent-level materials (texts in which no more than 1 in 20 words is difficult for the reader) fluently and accurately, and with appropriate time,

change in voice, and expression.

2. Read regularly in instructional-level materials that are challenging but manageable (text in which no more than approximately 1 in 10 words is difficult for the reader; a "typical" seventh grader reads 135 words per minute).

3. Increase silent reading speed and comprehension through daily, independent reading.

4. Read silently for increased periods of time.

5. Use punctuation as a cue for pausing and characterization while reading.

Standard 3: Comprehension - The student will interact with the words and concepts in a text to construct an appropriate meaning.

Read and understand grade-level-appropriate material. Describe and connect the essential ideas, arguments, and perspectives of the text by using a knowledge of text structure, organization, and purpose. At Grade 7, in addition to regular classroom reading, read a variety of grade-level-appropriate narrative (story) and expository (informational and technical) texts, including classic and contemporary literature, poetry, magazines, newspapers, reference materials, and online information as well as expository (informational and technical) texts.

1. Literal Understanding

    a. Apply prereading strategies when reading both fiction and nonfiction that is appropriately designed for grade level.

        Determine the purpose for reading such as to be informed, entertained, or persuaded.

        Preview the material and use prior knowledge to make connections between text and personal experience.

    b. Recognize transition words to guide understanding of the text (e.g., as a result, first of all, furthermore).

    c. Show understanding by asking questions and supporting answers with literal information from text.

2. Inference and Interpretation

    a. Make inferences and draw conclusions with evidence drawn from the text and/or student experiences.

    b. Make inferences supported by a character's thoughts, words, and actions or the narrator's description.

3. Summary and Generalization

a. Summarize the main idea and how it is supported with specific details.

b. Recall major points in the text and make and revise predictions.

c. Recognize the importance and relevance of details on the development of the plot.

d. Support reasonable statements by reference to relevant aspects of text and examples.

4. Analysis and Evaluation

a. Compare and contrast points of view, such as first person, third person, limited and omniscient, and explain their effect on the overall theme of a literary work.

b. Evaluate events that advance the plot of a literary work and how those events relate to past, present, or future actions.

c. Analyze character traits, conflicts, motivations, points of view, and changes that occur within the story and discuss the importance to the plot or theme.

d. Evaluate the accuracy or appropriateness of the evidence used by the author to support claims and assertions.

e. Distinguish between stated fact, reasoned judgment, and opinion in text.

*5. Monitoring and Correction Strategies

a. Monitor the understanding of text and use correcting strategies, such as rereading a portion, using reference aids, or searching for content when needed.

b. Make, confirm, and revise predictions when reading.

c. Adjust reading rate and determine appropriate strategies to match the purpose, difficulty, and characteristics of the text.

Standard 4: Literature - The student will read, construct meaning, and respond to a wide variety of literary forms.

Read and respond to grade-level-appropriate historically or culturally significant works of literature that reflect and enhance a study of history and social science. Clarify the ideas and connect them to other literary works. Participate productively in self-directed work teams to create observable products.

1. Literary Genres - Demonstrate a knowledge of and an appreciation for various forms of literature.

a. Analyze the characteristics of genres, including short story, novel, drama, poetry, and nonfiction.

b. Analyze characteristics of subgenres, including autobiography, biography, fable, folk tale, mystery, and myth.

2. Literary Elements - Demonstrate knowledge of literary elements and techniques and how they affect the development of a literary work.

a. Analyze and explain elements of fiction, including plot, conflict, resolution, character, setting, theme, and point of view.

b. Identify and explain techniques of direct and indirect characterization in fiction.

c. Describe how the author's perspective, argument, or point of view affects the text.

d. Analyze inferred and recurring themes in literary works (e.g., bravery, loyalty, historical).

3. Figurative Language and Sound Devices: The student will identify figurative language and sound devices and will analyze how they affect the development of a literary work.

a. Identify and explain the use of figurative language in literary works to convey mood, images, and meaning, including metaphor, personification, and simile.

b. Identify and explain the use of sound devices in literary works to convey mood, images, and meaning, including alliteration, onomatopoeia, and rhyme.

c. Analyze poetry and evaluate poetic styles (e.g., rhymed, free verse, and patterned [cinquain, diamante]).

*4. Literary Works - The student will read and respond to historically and culturally significant works of literature.

a. Analyze and evaluate works of literature and the historical context in which they were written.

b. Analyze and evaluate literature from various cultures to broaden cultural awareness.

c. Compare similar characters, settings, and themes from varied literary traditions.

Standard 5: Research and Information - The student will conduct research and organize information.

1. Accessing Information - Select the best source for a given purpose.

a. Use library catalogs and computer databases to locate sources for research topics.

b. Access a variety of primary and secondary sources to locate information relevant to research questions.

c. Gather data for research purposes through interviews (e.g., prepare and organize relevant questions, make notes of responses, and compile the information).

d. Use organizational strategies as an aid to comprehend increasingly difficult content material.

e. Note instances of persuasion, propaganda, and faulty reasoning in text.

f. Use reference features of printed text, such as citations, endnotes, and bibliographies to locate relevant information about a topic.

2. Interpreting Information - The student will analyze and evaluate information from a variety of sources. a. Record, organize, and display relevant information from multiple sources in systematic ways (e.g., outlines, graphic organizers, or note cards).

b. Interpret and use graphic sources of information such as graphs, maps, timelines, or tables, to address research questions.

c. Analyze and paraphrase or summarize information gathered from a variety of sources into a research paper.

d. Determine the appropriateness of an information source for a research topic.

e. Identify and credit the sources used to gain information for both quoted and paraphrased information in a bibliography using a consistent format.

Writing/Grammar/Usage and Mechanics. The student will express ideas effectively in written modes for a variety of purposes and audiences. Discuss and keep a list of writing ideas. Write clear, coherent, and focused papers, progressing through the stages of the writing process. Work independently and in self-directed writing teams to edit and revise.

Standard 1: writing process. The student will use the writing process to write coherently.

1. Use a writing process to develop composition skills. Students are expected to use prewriting strategies, write and revise multiple drafts, edit, and share their compositions.

2. Use details, examples, reasons, and evidence to develop an idea.

3. Use spatial, chronological, and climactic organizational patterns as appropriate to purpose.

4. Use effective transitions between sentences and paragraphs.

5. Use precise word choices, including figurative language, that convey specific meaning and tone.

6. Use a variety of sentence structures, types, and lengths to contribute to fluency and interest.

7. Edit for errors in Standard English usage, sentence structure, mechanics, and spelling.

8. Publish and present writing to peers and adults.

***Standard 2: Modes and Forms of Writing. The student will write for a variety of purposes and audiences using narrative, descriptive, expository, persuasive, and reflective modes. At Grade 7, write narrative, expository, persuasive, argumentative, reflective, and descriptive modes of at least 500 to 750 words. Introduce biographical and autobiographical narratives and write summaries of grade-level-appropriate reading material. The writing demonstrates a command of Standard English and the research, organization, and drafting strategies outlined in the writing process as well as an awareness of the audience (intended reader) and purpose for writing.**

1. Compose fictional, biographical or autobiographical narratives that:

   a. establish a plot using an action segment to create an effective sequence of events.

   b. establish and develop character(s) and setting.

   c. maintain a consistent point of view.

   d. use a range of narrative devices including dialogue, suspense, anecdotes, or foreshadowing.

   e. adjust tone and style as necessary to make writing interesting and engaging to the audience.

   Example: After reading a biography or an autobiography of someone who has had special influence on others, use the structure to compose an autobiography of your own.

2. Compose expository text to include research reports that:

   a. state the thesis and include relevant and focused questions about the topic.

   b. communicate clear and accurate perspectives on the subject.

   c. include paraphased evidence and supporting details compiled through the formal research process, including use of a library catalog, , magazines, newspapers, dictionaries, online sources, and other reference materials.

   d. document sources with reference notes and a bibliography. Example: Write a research report on the impact that television has had on American society. Take a position on the topic, whether positive or negative, and support this view by citing a variety of reference sources.

3. Compose persuasive/argumentative compositions that:

   a. state a clear position or perspective in support of a proposition or proposal.

   b. describe the points in support of the proposition, employing well-articulated evidence, and effective emotional appeal.

   c. predict, identify, and address reader concerns and counterarguments. Example: In preparation for an upcoming student election, choose a candidate and write speeches and make posters that will make this candidate especially appealing to the other students (the voters).

4. Compose reflective papers that accomplish one of the purposes:

   a. express the individual's insight into conditions or situations.

   b. compare a scene from a work of fiction with a lesson learned from experience.

   c. complete a self-evaluation on a class performance. Example: Compose a reflective essay describing how the student relates to a character in a narrative by comparing personal circumstances and background

5. Write responses to literature, including poetry, that:

   a. develop interpretations that show careful reading, understanding, and insight.

   b. organize the interpretation around several clear ideas, premises, or images for the literary work.

   c. justify interpretation through sustained use of examples and evidence from the text. Example: After reading folk tales from the United States and other countries, write a response to the narratives. Identify the beliefs and values that are highlighted in each folk tale, and develop a theory to explain why similar tales appear in many different cultures.

6. Compose summaries of reading material that:

   a. include the main ideas and most significant details.

   b. use the student's own words, except for quotations.

   c. reflect underlying meaning, not just the superficial details. Example: Demonstrate comprehension of the main idea and details of a subject-specific text and write a summary of a text read from another content area. Make the summary clear enough that it would provide another student with the important information from the chapter.

7. Write for different purposes and to a specific audience or person, adjusting tone and style as necessary to make writing interesting. Example: Write stories and reports showing a variety of word choices, or review a favorite book or film.

8. Write friendly, formal letters, and emails; continue to produce other writing forms introduced in earlier grades.

9. Use appropriate essay test-taking and time-writing strategies that:

   a. address and analyze the question (prompt).

   b. use organizational methods required by the prompt.

   c. utilize an editing checklist or assessment rubric, if provided.

10. Use legible handwriting/penmanship to copy and/or compose text, in manuscript or cursive, using correct spacing and formation of letters.

***Standard 3: Grammar/Usage and Mechanics. The student will demonstrate appropriate practices in writing by applying grammatical knowledge to the revising and editing stages of writing.**

1. Standard English Usage - Demonstrate correct use of Standard English in speaking and writing.

   a. Recognize nominative, possessive, and objective nouns.

   b. Recognize abstract, concrete, and collective nouns.

   c. Recognize the principal parts of regular and irregular verbs.

   d. Use the principal parts of verbs to form verb tenses.

   e. Identify transitive, intransitive, and linking verbs.

   f. Make subject and verbs agree.

   g. Identify direct objects, indirect objects, objects of prepositions, predicate nominatives, predicate adjectives, and object complements.

   h. Use nominative, objective, and possessive pronouns correctly.

   i. Make pronouns agree with their antecedents.

   j. Use correct pronoun reference.

   k. Correctly form and use the positive, comparative, and superlative forms of adjectives.

   l. Correctly identify and use interjections.

   m. Correctly identify and use restrictive (essential) and nonrestrictive (nonessential) clauses, appositives, appositive, participial, and prepositional phrases.

   n. Correctly use all conjunctions.

   o. Distinguish commonly confused words (e.g., there, their, they're; two, to, too; accept, except; affect, effect).

2. Sentence Structure - Demonstrate appropriate sentence structure in writing.

   a. Correct sentence run-ons and fragments.

   b. Correct dangling and misplaced modifiers.

   c. Differentiate between dependent and independent clauses.

   d. Write simple, compound, complete,and complex sentences of varying lengths.

   e. Write sentences with simple, complete, and compound predicates.

   f. Indent paragraphs as necessary to conform to specified format.

3. Mechanics and Spelling - Demonstrate appropriate language mechanics in writing.

a. Apply the capitalization rules appropriately in writing.

b. Punctuate correctly in writing, including:

- end punctuation.
- commas to separate words in a series, city and state, quotation and sentence, and to set off nonrestrictive phrases.
- quotation marks.
- colon and semicolon.
- apostrophes in contractions and possessives.
- hyphens and dashes
- conventions of letter writing.

c. Distinguish correct spelling of commonly misspelled words and homonyms.

Oral Language/Listening and Speaking: The student will demonstrate thinking skills in listening and speaking.

Deliver focused, coherent presentations that convey ideas and relate to the background and interests of the audience. Evaluate the content of oral communication and deliver well-organized formal presentations using traditional speech strategies, including narration, exposition, persuasion, and description. Use the same Standard English conventions for oral speech that is used in writing. Participate independently and in groups to create oral presentations.

***Standard 1: Listening - The student will listen for information and for pleasure.**

1. Identify the major ideas and supporting evidence in informative and persuasive messages.

2. Listen in order to identify and discuss topic, purpose, and perspective.

3. Recognize and understand barriers to effective listening (i.e., internal and external distractions, personal biases, and conflicting demands).

4. Evaluate the spoken message in terms of content, credibility, and delivery.

***Standard 2: Speaking - The student will express ideas and opinions in group or individual situations.**

1. Analyze purpose, audience, and occasion and consider this information in planning an effective presentation or response.

2. Compose a presentation with a well-organized introduction, body, and conclusion that is appropriate for different purposes, audiences, and occasions..

3. Communicate oral presentations to the class using appropriate delivery (volume, rate, enunciation, and movement).

4. Use level-appropriate vocabulary in speech (e.g., metaphorical language, sensory details, or specialized vocabulary).

Visual Literacy: The student will interpret, evaluate, and compose visual messages.

***Standard 1: Interpret Meaning - The student will interpret and evaluate the various ways visual image-makers, including graphic artists, illustrators, and news photographers, represent meaning.**

1. Interpret a variety of messages conveyed by visual images.

2. Identify film and television features that characterize different style of dress and genres (e.g., setting in a western or a drama).

***Standard 2: Evaluate Media - The student will evaluate visual and electronic media, such as film, as compared with print messages.**

1. Identify the different ways in which people are stereotyped in visual media and consider alternative representations (e.g., clever people wear glasses, super heroes wear capes, scientists wear white coats).

2. Identify basic elements of advertising in visual media (e.g., sales approaches and techniques aimed at children).

3. Analyze the effect on the viewer of text, sound, images, and organization in electronic media and discuss the techniques used to create the effects.

***Standard 3: Compose Visual Messages - The student will create a visual message that effectively communicates an idea.**

1. Select, organize, or produce visuals such as maps, charts, graphics, video segments, or technology presentations to complement and extend meaning for a selected topic.

2. Use media forms to create a visual message that will compare and contrast ideas and points of view.

Blueprints for each Criterion-Referenced Test reflect the degree of representation given on the test to each *PASS* standard and objective. To access the current blueprint (when available) go to the State Department of Education Web site at <http://sde.state.ok.us>, click on site index, then click "s" to go to student assessment, then click on "Student Tests & Materials" then scroll down to "alignment blueprints."

LANGUAGE ARTS

Grade 8

Reading/Literature: The student will apply a wide range of strategies to comprehend, interpret, evaluate, appreciate, and respond to a wide variety of texts. Participate productively in self-directed work teams to create observable products.

Standard 1: Vocabulary - The student will expand vocabulary through word study, literature, and class discussion.

Use a knowledge of word parts and word relationships, as well as context clues (the meaning of the text around a word), to determine the meaning of specialized vocabulary and to understand the precise meaning of grade-level-appropriate words.

1. Words in Context - Verify the meaning of a word in its context, even when its meaning is not directly stated, through the use of definitions, restatement, example, comparison, or contrast.

2. Word Origins - Recognize and analyze the influence of historical events on English word meaning and vocabulary expansion.

   Example: Identify how the early influences of Spanish explorers in North America impacted American English vocabulary by adding words such as *lasso, tortilla,* and *patio* and investigate why these particular words were adopted from the Spanish.

3. Idioms and Comparisons - Analyze idioms and comparisons, such as analogies, metaphors, and similes, to infer the literal and figurative meanings of phrases.

   a. Idioms: expressions that cannot be understood just by knowing the meanings of the words in the expression, such as *Rush hour traffic moves at a snail's pace* or *as plain as day.*

   b. Analogies: comparisons of the similar aspects of two different things.

   c. Metaphors: implies comparisons, such as, *The cup of hot tea was the best medicine for my cold.*

   d. Similes: comparisons that use *like* or *as*, such as, *The ice was smooth as glass before the skaters entered the rink.*

***Standard 2: Fluency - The student will identify words rapidly so that attention is directed to the meaning of the text.**

1. Read regularly in independent-level materials (texts in which no more than 1 in 20 words is difficult for the reader) fluently and accurately, and with appropriate time, change in voice, and expression.

2. Read regularly in instructional-level materials that are challenging but manageable (text in which no more than approximately 1 in 10 words is difficult for the reader; a "typical" eighth grader reads 150 words per minute).

3. Increase reading speed and comprehension through daily, independent reading.

4. Read silently for increased periods of time.

5. Use punctuation as a cue for pausing and characterization while reading.

Standard 3: Comprehension - The student will interact with the words and concepts in the text to construct an appropriate meaning.

Read and understand grade-level-appropriate material. Describe and connect the essential ideas, arguments, and perspectives of the text by using a knowledge of text structure, organization, and purpose. At Grade 8, in addition to regular classroom reading, read a variety of grade-level-appropriate narrative (story) and expository (informational and technical) texts, including classic and contemporary literature, poetry, magazines, newspapers, reference materials, and online information

1. Literal Understanding

   a. Apply prereading strategies when reading both fiction and nonfiction that is appropriately designed for grade level.

      Determine the purpose for reading such as to be informed, entertained, persuaded, or to understand.

      Preview the text and use prior knowledge and experience to make connections to text.

   b. Show understanding by asking questions and supporting answers with literal information from text.

2. Inferences and Interpreting

   a. Make inferences and draw conclusions supported by text evidence and student experiences.

   b. Connect, compare, and contrast ideas, themes, and issues across texts.
   Example: Use graphic organizer to show comparisons.

3. Summary and Generalization

   a. Determine the main (or major) idea and how those ideas are supported with specific details.

   b. Paraphrase and summarize text to recall, inform, or organize ideas.

4. Analysis and Evaluation

    a. Distinguish between stated fact, reasoned judgment, and opinion in various texts.

    b. Use text's structure or progression of ideas, such as cause and effect or chronology (sequential order).

    c. Compare/contrast to determine similarities and differences in treatment, scope, or organization.

    d. Problem/solution - offer observations, make connections, react, speculate, interpret, and raise questions in response to text.

    e. Analyze character traits, conflicts, motivations, points of view, and changes that occur within the story.

    f. Analyze the structural elements of the plot, subplot, and climax and explain the way in which conflicts are or are not resolved.

*5. Monitoring and Correction Strategies

    a. Monitor the understanding of text and use correcting strategies, such as rereading a portion, using reference aids, or searching for content when needed.

    b. Make, confirm, and revise predictions when reading.

    c. Adjust reading rate and determine appropriate strategies to match the purpose, difficulty, and characteristics of the text.

Standard 4: Literature: The student will read, construct meaning, and respond to a wide variety of literary forms.

Read and respond to grade-level-appropriate historically or culturally significant works of literature that reflect and enhance a study of history and social science. Clarify the ideas and connect them to other literary works. Participate in self-directed work teams to create observable products.

1. Literary Genres - The student will demonstrate a knowledge of and an appreciation for various forms of literature.

    a. Analyze the characteristics of genres, including short story, novel, drama, lyric poetry, nonfiction, historical fiction, and informational texts.

    b. Identify and distinguish characteristics of subgenres, including autobiography, biography, fable, folk tale, mystery, myth, limericks, tall tales, and plays.

2. Literary Elements - Demonstrate knowledge of literary elements and techniques and how they affect the development of a literary work.

a. Analyze and explain elements of fiction including plot, conflict, character, mood, setting, theme, point of view, and author's purpose.

b. Identify and explain various points of view and how they affect a story's interpretation.

3. Figurative Language and Sound Devices - Identify figurative language and sound devices and analyze how they affect the development of a literary work.

a. Identify and explain the use of figurative language, in literary works to convey mood, images, and meaning, including metaphor, personification, and simile.

b. Identify and explain the use of sound devices in literary works to convey mood, images, and meaning, including alliteration, onomatopoeia, and rhyme.

c. Identify and interpret literary devices such as flashback, foreshadowing, symbolism, and imagery.

*4. Literary Works - The student will read and respond to historically and culturally significant works of literature.

a. Analyze and evaluate works of literature and the historical context in which they were written.

b. Analyze and determine distinctive and common characteristics of literature from various cultures to broaden cultural awareness.

c. Compare similar characters, settings, and themes from varied literary traditions that cross cultures.

Standard 5: Research and Information: The student will conduct research and organize information.

1. Accessing Information - Select the best source for a given purpose, locate information relevant to research questioning.

a. Access information from a variety of primary and secondary sources, including electronic text, experts, and prime resources, to locate information relevant to research questioning.

b. Use text organizers, including headings, graphic features (e.g., boldface, italic type), and tables of contents, to locate and organize information.

c. Use organizational strategies to learn and recall important ideas from texts, such as preview, questions, reread, and record, as an aid to comprehend increasingly difficult content material.

d. Note instances of persuasion, propaganda, and faulty reasoning in text.

2. Interpreting Information - Analyze and evaluate information from a variety of sources.

a. Record, organize, and display relevant information from multiple sources in systematic ways (e.g., outlines, timelines, graphic organizers, or note cards).

b. Analyze and paraphrase or summarize information from a variety of sources into a research paper.

c. Identify and credit the sources used to gain information (e.g., bibliographies, footnotes, appendix).

d. Identify and apply test-taking strategies by answering different types and levels of questions, such as open-ended, literal, and interpretive as well as test-like questions, such as multiple choice, true/false, and short answer.

e. Interpret and use graphic sources of information such as maps, graphs, timelines, or tables to address research questions.

Writing/Grammar/Usage and Mechanics: The student will express ideas effectively in written modes for a variety of purposes and audiences.

Discuss and keep a list of writing ideas. Write clear, coherent, and focused papers progressing through the stages of the writing process. Work independently and in self-directed writing teams to edit and revise.

Standard 1: Writing Process - The student will use the writing process to write coherently.

1. Use a writing process to develop and refine composition skills. Students are expected to use a variety of prewriting strategies such as brainstorming, outlining, free writing, discussing, clustering, webbing, using graphic organizers, notes, logs, and reading to generate ideas and gather information.

2. Develop a main idea/thesis through use of details, examples, reasons, anecdotes, and use patterns as appropriate to purpose such as spatial, chronological, and climactic.

3. Blend paragraphs, with effective transitions, into larger text.

4. Use precise word choices, including figurative language, that convey specific meaning and tone.

5. Use a variety of sentence structures, types, and lengths to contribute to fluency and interest

6. Revise multiple drafts individually and with peers.

7. Edit for errors in Standard English usage, sentence structure, word choice, mechanics, and spelling.

Standard 2: Modes and Forms of Writing - The student will write for a variety of purposes and audiences using creative, narrative, descriptive, expository, argumentative, persuasive, and reflective modes.

At Grade 8, write creative, narrative, expository, argumentative, persuasive, reflective, and descriptive papers of at least 500 to 750 words and introduce technical documents. Demonstrate a command of Standard English and the research, organization, and drafting strategies outlined in the writing process. Writing demonstrates an awareness of the audience (intended reader) and purpose for writing.

1. Compose narrative text to include short stories, fictional, biographical or autobiographical narratives that:

    a. create and develop a plot or sequence of events using well-chosen details that reveal the significance of each event.

    b. create and develop a character (s), including comparisons, that show the character's (s') beliefs and qualities.

    c. create and develop an appropriate point of view (e.g., third person limited or first person point of view).

    d. create and maintain a setting that enhances the narration.

    e. adjust tone and style to make writing more interesting and engaging to the audience.

    f. use a range of narrative devices including dialogue, internal monologue, suspense, specific action, physical and background descriptions, and foreshadowing.

    g. reveal the writer's attitude about the subject.

    h. use sensory details and precise word choice.

Example: Write an autobiographical account of one of your most memorable first days of school. Describe the day and its importance clearly enough so the reader can see and feel the day from your perspective.

2. Compose expository texts including research reports, technical documents, and other informational texts that:

    a. define a research thesis (a statement of position on the topic).

    b. integrate important ideas, concepts, or direct quotations from significant information sources.

    c. identifies a variety of primary and secondary sources and distinguish the nature and value of each.

    d. organizes and displays information on charts, tables, maps, and graphs.

    e. document sources as appropriate to style.

f. create technical documents using appropriate style and format that identify the necessary sequence or process. Example: using research compiled on public transportation in Oklahoma, compose a documented paper with illustrations and bibliography (works cited).

3. Compose persuasive/argumentative compositions that:

    a. include a well-defined thesis that makes a clear and knowledgeable appeal.

    b. present detailed evidence, examples, and reasoning to support effective arguments and emotional appeal.

    c. provide details, reasons, and examples, arranging them effectively by predicting, identifying, and addressing reader concerns and counter-arguments. Example: Using the research completed on public transportation, compose a persuasive letter to the mayor on why the community should or should not invest more resources into public transportation.

4. Compose reflective papers to:

    a. express the individual's insight into conditions or situations.

    b. compare a scene from a work of fiction with a lesson learned from experience.

    c. complete a self-evaluation on a class performance. Example: Write a reflective paper that analyzes reasons for selections used in a portfolio of works that demonstrate skills in different subjects.

5. Compose responses to literature, including poetry, that:

    a. demonstrate careful reading and insight into interpretations.

    b. connect responses to the writer's techniques and to specific textual references.

    c. make supported inferences about the effects of a literary work on its audience.

    d. support judgments with references to the text, other works, other authors, or to personal knowledge. Example: After reading a novel, compose an essay describing the different ways the characters speak (slang words or regional dialect) and analyze how this enhances or detracts from the narrative.

6. Write for different purposes and to a specific audience or person, adjusting tone and style as necessary to make writing interesting. Example: Write stories, poetry, and reports, showing a variety of word choices, or review a favorite book or film.

7. Write friendly, formal letters, emails, memos, proposals for change, and continue to produce other writing forms introduced in earlier grades.

8. Use appropriate essay test-taking and time-writing strategies that:

    a. budget time for prewriting, drafting, revising, and editing.

    b. prioritize the question/prompt.

c. identify the common directives from the prompt (Identify command verbs: *explain, compare, evaluate, define, and develop,* etc.).

d. analyze the question or prompt and determine the appropriate mode of writing.

e. apply appropriate organizational methods to thoroughly address the prompt.

f. utilize an editing checklist or assessment rubric, if provided.

9. Use legible handwriting/penmanship to copy and/or compose text, in manuscript or cursive, using correct spacing and formation of letters.

Standard 3: Grammar/Usage and Mechanics. The student will demonstrate appropriate practices in writing by applying grammatical knowledge to the revising and editing stages of writing.

1. Standard English Usage - Demonstrate correct use of Standard English in speaking and writing as appropriate to eighth grade.

   a. Use the principal parts of verbs and progressive verb forms.

   b. Identify and correctly use transitive and intransitive verbs.

   c. Identify and correctly use linking verbs.

   d. Make subject and verbs agree.

   e. Identify personal, reflexive, and intensive pronouns.

   f. Use nominative, objective, and possessive nouns and pronouns correctly.

   g. Use correct pronoun reference and make pronouns agree with their antecedents.

   h. Identify and use abstract, concrete, and collective nouns.

   i. Correctly form and use the positive, comparative, and superlative forms of adjectives.

   j. Identify and use appositives and appositive phrases.

   k. Use verbals (infinitives, gerunds, and participles) to vary sentence structure in writing.

   l. Correctly identify and use independent, dependent, restrictive (essential) and nonrestrictive (nonessential) clauses and phrases

   m. Correctly use all conjunctions.

   n. Distinguish commonly confused words (e.g., there, their, they're; two, to, too; accept, except; affect, effect).

2. Mechanics and Spelling - Demonstrate appropriate language mechanics in writing.

   a. Apply the capitalization rules appropriately in writing.

   b. Punctuate correctly in writing, including:

i. Commas

ii. Quotation marks

iii. Apostrophes

iv. Colons and semicolons

v. Conventions of letter writing

vi. Hyphens, dashes, parentheses

c. Distinguish correct spelling of commonly misspelled words and homonyms.

3. Sentence Structure - Demonstrate appropriate sentence structure in writing.

a. Correct sentence run-ons and fragments.

b. Correct dangling and misplaced modifiers.

c. Differentiate between dependent, independent restrictive (essential) and nonrestrictive (nonessential) clauses.

d. Simple, compound, complex, and compound-complex sentences.

e. Compose sentences with simple, complete, and compound predicates.

Oral Language/Listening and Speaking: The student will demonstrate thinking skills in listening and speaking.

Deliver focused, coherent presentations that convey ideas and relate to the background and interests of the audience. Evaluate the content of oral communication and deliver well-organized formal presentations using traditional speech strategies, including narration, exposition, persuasion, and description. Use the same Standard English conventions for oral speech that is used in writing. Participate independently and in groups to create oral presentations.

***Standard 1: Listening - The student will listen for information and for pleasure.**

1. Identify the major ideas and supporting evidence in informative and persuasive messages.

2. Listen in order to identify and discuss topic, purpose, and perspective.

3. Recognize and understand barriers to effective listening (i.e., internal and external distractions, personal biases, and conflicting demands).

4. Evaluate the spoken message in terms of content, credibility, and delivery.

***Standard 2: Speaking - The student will express ideas and opinions in group or individual situations.**

1. Analyze purpose, audience, and occasion and consider this information in planning an effective presentation or response.

2. Compose a presentation with a well-organized introduction, body, and conclusion that is appropriate for different purposes, audiences, and occasions.

3. Communicate oral presentations to the class using appropriate delivery (volume, rate, enunciation, and movement).

4. Use level-appropriate vocabulary in speech (e.g., metaphorical language, sensory details, or specialized vocabulary.

5. Adjust message wording and delivery according to particular audience and purpose.

Visual Literacy: The student will interpret, evaluate, and compose visual messages.

***Standard 1: Interpret Meaning - The student will interpret and evaluate the various ways visual image-makers, including graphic artists, illustrators, and news photographers, represent meaning.**

1. Interpret how language choice is used to enhance visual media (e.g., language or particular television or film genre, the use of emotional or logical arguments in commercials).

2. Identify and explain reasons for varied interpretations of visual media (e.g., different purposes or circumstances while viewing, influence of personal knowledge and experiences, focusing on different stylistic features).

***Standard 2: Evaluate Media - The student will evaluate visual and electronic media, such as film, as compared with print messages.**

1. Use a variety of criteria to evaluate and form viewpoints of visual media (e.g., evaluates the effectiveness of informational media, such as Web sites, documentaries, news programs, and recognizes a range of viewpoints and arguments).

2. Establish criteria for selecting or avoiding specific programs.

3. Assess how language medium and presentation contribute to the message.

***Standard 3: Compose Visual Messages - The student will create a visual message that effectively communicates an idea.**

1. Produce visual images, messages, and meanings that communicate with others.

2. Use media forms to create a visual message that will compare and contrast ideas and points of view.

Blueprints for each Criterion-Referenced Test reflect the degree of representation given on the test to each *PASS* standard and objective. To access the current blueprint (when available) go to the State Department of Education Web site at <http://sde.state.ok.us>, click on site index, then click "s" to go to student assessment, then click on "Student Tests & Materials" then scroll down to "alignment blueprints."

LANGUAGE ARTS

Grade 9

Reading/Literature: The student will apply a wide range of strategies to comprehend, interpret, evaluate, appreciate, and respond to a variety of texts.

Apply knowledge of word origins (words from other languages, history, or literature) to determine the meaning of new words encountered in reading and use of those words accurately.

Standard 1: Vocabulary - The student will expand vocabulary through word study, literature, and class discussion.

1. Apply a knowledge of Greek (e.g., tele/phone, micro/phone), Latin (e.g., flex/ible), and Anglo-Saxon (e.g., un/friend/ly) roots, prefixes, and suffixes to determine word meanings.

2. Use word meanings within the appropriate context and verify those meanings by definition, restatement, example, and analogy.

3. Expand vocabulary through wide reading, listening, and discussing.

4. Use reference material such as glossary, dictionary, thesaurus, and available technology to determine precise meaning and usage.

5. Identify the relation of word meanings in analogies, homonyms, synonyms/antonyms, and connotations and denotations.

Standard 2: Comprehension: The student will interact with the words to construct an appropriate meaning.

Read and understand grade-level-appropriate material. Analyze the organizational patterns and evaluate author's argument and positions. At Grade 9, in addition to regular classroom reading, read a wide variety of classic and contemporary literature, poetry, magazines, newspapers, reference materials, and online information as well as expository (informational and technical) texts.

1. Literal Understanding

    a. Examine the structures and format of functional workplace documents, including graphics and headers, and explain how authors use the features to achieve their purpose.

    b. Draw upon own background to provide connections to text.

    c. Monitor reading strategies and modify them when understanding breaks down such as rereading, using resources, and questioning.

d. Recognize text structures such as compare and contrast, cause and effect, and chronological ordering.

e. Use study strategies such as skimming and scanning, note taking, outlining, and using study-guide questions to better understand texts.

2. Inferences and Interpretation

a. Analyze characteristics of text, including its structure, word choice, and intended audience.

b. Draw inferences such as conclusions, generalizations, and predictions, and support them with text evidence and personal experience.

c. Recognize influences on a reader's response to a text (e.g., personal experience and values; perspective shaped by age, gender, class, or nationality).

3. Summary and Generalization

a. Identify the main idea and supporting details by producing summaries of text.

b. Use text features and elements to support inferences and generalizations about information.

c. Summarize and paraphrase complex, implicit hierarchic structures in informational texts, including relationships among concepts and details in those structures.

4. Analysis and Evaluation

a. Discriminate between fact and opinion and fiction and nonfiction.

b. Recognize deceptive and/or faulty arguments in persuasive texts.

c. Analyze the structure and format of informational and literary documents and explain how authors use the features to achieve their purposes.

d. Identify techniques (e.g., language, organization, tone, context) used to convey point of view or impressions.

Standard 3: Literature - The student will read, construct meaning, and respond to a wide variety of literary forms.

Read and respond to grade-level-appropriate historically or culturally significant works of British, American, and world literature. Conduct in-depth analysis of themes, styles, and trends of these works across historical periods. Participate productively in self-directed work teams to create observable products.

1. Literary Genres - Demonstrate a knowledge of and an appreciation for various forms of literature.

a. Analyze the characteristics of genres including short story, novel, drama, poetry, and essay.

b. Analyze the characteristics of subgenres including tragedy, sonnet, epic, lyric, and narrative poetry.

2. Literary Elements - Demonstrate knowledge of literary elements and techniques and show how they affect the development of a literary work.

a. Recognize the theme (general observation about life or human nature) within a text.

b. Explain how author's voice and/or choice of a narrator affect the characterization and the point of view, tone, plot, mood and credibility of a text.

c. Recognize and understand the significance of various literary devices, including figurative language, imagery, allegory (the use of fictional figures and actions to express truths about human experiences), and symbolism (the use of a symbol to represent an idea or theme), and explain their appeal.

d. Analyze interactions between characters in a literary text and explain the way those interactions affect the plot in narrative text.

e. Analyze characters and identify author's point of view.

f. Identify literary forms and terms such as author, drama, biography, autobiography, myth, tall tale, dialogue, tragedy and comedy, structure in poetry, epic, ballad, protagonist, antagonist, paradox, analogy, dialect, and comic relief as appropriate to the selections being read.

3. Figurative Language and Sound Devices - Identify figurative language and sound devices and analyze how they affect the development of a literary work.

a. Identify and explain figurative language including metaphor, personification, and simile.

b. Identify and explain sound devices including alliteration, onomatopoeia, and rhyme.

c. Identify the melodies of literary language, including its use of evocative words, rhythms and rhymes.

d. Recognize and interpret poetic elements such as metaphor, simile, personification, and the effect of sound on meaning.

4. Literary Works - The student will read and respond to historically and culturally significant works of literature.

a. Analyze and evaluate works of literature and the historical context in which they were written.

b. Analyze and evaluate literature from various cultures to broaden cultural awareness.

c. Compare works that express the recurrence of archetypal (universal modes or patterns) characters, settings, and themes in literature and provide evidence to support the ideas expressed in each work.

Standard 4: Research and Information: The student will conduct research and organize information.

1. Accessing Information - Select the best source for a given purpose.

a. Access information from a variety of primary and secondary sources.

b. Skim text for an overall impression and scan text for particular information.

c. Use organizational strategies as an aid to comprehend increasingly difficult content material (e.g., compare/contrast, cause/effect, problem/solution, sequential order).

2. Interpreting Information - The student will analyze and evaluate information from a variety of sources.

a. Summarize, paraphrase, and/or quote relevant information.

b. Determine the author's viewpoint to evaluate source credibility and reliability.

c. Organize and convert information into different forms such as charts, graphs and drawings to create multiple formats to interpret information for multiple audiences and purposes, and cite sources completely.

d. Identify complexities and inconsistencies in the information and the different perspectives found in each medium, including almanacs, microfiche news sources, in-depth field studies, speeches, journals, technical documents, or Internet sources.

e. Draw conclusions from information gathered.

Writing/Grammar/Usage and Mechanics. The student will express ideas effectively in written modes for a variety of purposes and audiences.

Discuss ideas for writing with other writers. Write coherent and focused essays that show a well-defined point of view and tightly reasoned argument. Use the stages of the writing process. Work independently and in self-directed writing teams to edit and revise.

Standard 1: Writing Process. The student will use the writing process to write coherently.

1.Use a writing process to develop and refine composition skills. Students are expected to:

a. use a variety of prewriting strategies such as brainstorming, outlining, free writing, discussing, clustering, webbing, using graphic organizers, notes, logs,or reading to generate ideas and gather information.
b. determine main idea by evaluating results of prewriting activities to select an appropriate topic.
c. identify audience and purpose for writing:
    i. consider specific purposes for writing (e.g., to reflect, inform, explain, persuade, or share an experience or emotion
    ii. understand the characteristics of a specific audience for the writing task.
d. identify appropriate mode/genre.
e. develop multiple drafts, individually and collaboratively, to categorize ideas, organize them into paragraphs, and blend paragraphs into larger text.
f. revise drafts.
g. edit for specific purposes to ensure standard usage, varied sentence structure, appropriate word choice, mechanics, and spelling.
h. refine selected pieces to publish for general and specific audiences.

2. Use elaboration to develop an idea:
    a. draft a text with a clear controlling idea or thesis.
    b. develop a coherent progression of ideas applying organizational strategies such as spatial, chronological, order of importance, compare/contrast, logical order, cause/effect, or classification/division.
    c. apply different methods of support, such as facts, reasons, examples, sensory details.
    d. apply a consistent and appropriate point of view.

3. Demonstrate organization, unity, and coherence by using transitions and sequencing:
    a. Read the draft from the intended audience's point of view to evaluate clarity of purpose.
    b. Evaluate whether ideas and organizational patterns are clear and support the overall purpose of the piece.
    c. Evaluate whether topic sentences, transitions within and between paragraphs, overall sequencing, and the progression of ideas is clear, focused, smooth and coherent.
    d. Evaluate whether ideas are adequately developed. Move, add, delete, or replace text for clarity, audience, and purpose.
    e. Evaluate whether word choice/figurative language is precise, compelling, effective, and appropriate.
    f. Evaluate whether sentence structures are varied in type, length, and complexity.

4. Editing, Proofreading, and Evaluating:
    a. Apply Standard English usage, correct spelling and usage in text. Correct errors in grammatical conventions (e.g., complete sentences, independent and dependent (restrictive/nonrestrictive) clauses, conjunctions for subordination, correlation, and coordination, subject verb agreement, consistent verb tense, pronoun-antecedent relationship, noun and pronoun agreement, use of prepositional phrases, adverbs, and adjectives).
    b. Employ specified proofreading strategies and consults resources (e.g., spell checks, personal spelling lists, or dictionaries) to correct errors in spelling, capitalization, and punctuation, including punctuation of quotations
    c. Use a specified format for in-text citation of source materials, for bibliographies, and for lists of works cited. Check against original source for accuracy
    d. Demonstrate an understanding of the ethics of writing by creating a document free from plagiarism.

5.Use a variety of sentence structures, types, and lengths to contribute to fluency and interest.

6.Evaluate own writing and others' writing (e.g., determine the best features of a piece of writing, determine how own writing achieves its purpose, ask for feedback, and respond to classmates' writing).

Standard 2: Modes and Forms of Writing. The student will write for a variety of purposes and audiences using narrative, descriptive, expository, persuasive, and reflective modes.

At Grade 9, combine the rhetorical strategies of narration, exposition, persuasion, reflection, and description to produce text of at least 500 to 750 words. Final drafts are formatted appropriately for the mode. Begin writing documents related to career development. Demonstrate a command of Standard English and the research, organization, and drafting strategies outlined in the writing process. Writing demonstrates an awareness of the audience (intended reader) and purpose for writing.

1. Compose fictional, biographical, or autobiographical narratives or short stories that:
   a. create and develop characters including character motiviation, gestures, and feelings.
   b. create and develop a plot utilizing the key elements: exposition, rising action, climax, falling action, resolution, and conclusion.
   c. create and develop an appropriate point of view.
   d. create and develop a setting with a narrative that is relevant to the overall meaning of the work.
   e. use a range of narrative devices such as dialogue, suspense, foreshadowing, characterization, and flashback.

2. Compose expository compositions, including analytical essays and research reports that:
   a. integrates evidence in support of a thesis including information on all relevant perspectives.
   b. quotes, summarizes, and paraphrases information and ideas from a variety of primary and secondary sources accurately and coherently.
   c. integrates a variety of suitable, valid reference sources, including word, pictorial, audio, and Internet sources, to locate information in support of topic.
   d. integrates visual aids by using technology to organize and record information on charts, data tables, maps, and graphs.
   e. identifies and addresses reader's potential misunderstandings, biases, and expectations.
   f. uses technical terms and notations accurately.

3. Compose persuasive/argumentative compositions that:
   a. include a well-defined thesis that makes a clear and knowledgeable appeal in a sustained and effective fashion.
   b. use exposition, narration, and description to support the main argument.
   c. clarify and defend positions with precise and relevant evidence, including facts, expert opinions, quotations, expressions of commonly accepted beliefs, and logical reasoning.
   d. effectively address reader's concerns, counterclaims, biases, and expectations

4. Create documents related to career development that:
   a. use a conventional format to write a formal letter, email, or memorandum.

b. present information purposefully and in brief to meet the need of the intended audience.
c. use appropriate vocabulary and professional writing etiquette (e.g. formal language, appropriate salutation, and closing, etc.).

5. Write reflective papers that may address one of the following purposes:
   a. express the individual's insight into conditions or situations, detailing the author's role in the outcome of the event.
   b. connect lessons from literature, history, current events, and movies/media to personal experiences and ideas.
   c. complete a self-evaluation on a class performance.

6. Write responses to literature that:

   a. demonstrate the significant ideas of literary works.

   b. support important ideas and viewpoints through accurate and detailed reference to the text or to other works.

   c. demonstrate awareness of author's style and an appreciation of the effects created.

   d. identify and assess the impact of ambiguities, nuances, and complexities within the text.

7. Write for different purposes and to a specific audience or person, adjusting tone and style as necessary to make writing interesting.

8. Write friendly, formal letters, emails, and memorandum, and continue to produce other writing forms introduced in earlier grades.

9. Use appropriate essay test-taking and time-writing strategies that:

   a. budget time for prewriting, drafting, revising, and editing.

   b. prioritize the question/prompt.

   c. identify the common directives from the prompt (identify command verbs: *explain, compare, evaluate, define, and develop*, etc.).

   d. analyze the question or prompt and determine the appropriate mode of writing.

   e. apply appropriate organizational methods to thoroughly address the prompt.

   f. evaluate work using editing checklist or rubric if available.

10. Write documented papers incorporating the techniques of Modern Language Association (MLA) or similar parenthetical styles.

Standard 3: Grammar/Usage and Mechanics. The student will demonstrate appropriate practices in writing by applying grammatical knowledge to the revising and editing stages of writing and participate independently and in groups to create oral presentations.

1. Standard English Usage - Demonstrate correct use of Standard English in speaking and writing.

a. Distinguish commonly confused words (e.g., there, their, they're; two, too, to; accept, except; affect, effect).

b. Use correct verb forms and tenses.

c. Use correct subject-verb agreement.

d. Use active and passive voice.

e. Identify and correctly use linking, transitive, and intransitive verbs.

f. Use nominative, objective, and possessive nouns and pronouns correctly.

g. Use abstract, concrete, and collective nouns correctly.

h. Correct pronoun/antecedent agreement and clear pronoun reference.

i. Correct types, forms, and cases of pronouns

j. Use correct forms of positive, comparative, and superlative adjectives.

2. **Mechanics and spelling.** Demonstrate appropriate language mechanics in writing.

a. Apply capitalization rules appropriately in writing.

b. Use correct formation of plurals.

c. Demonstrate correct use of punctuation and recognize its effect on sentence structure including:

i. commas

ii. quotation marks

iii. apostrophes, colons, and semicolons

iv. hyphens, dashes, parentheses, and brackets

d. Demonstrate correct use of punctuation in research writing including:

(i) formal outline

(ii) parenthetical documentation

(iii) works cited/bibliography

e. Use correct spelling including:

(i) commonly misspelled words and homonyms

(ii) spell consonant changes correctly Example:recede/recession; transmit/transmission.

(iii) spell correctly Greek and Latin derivatives (words that come from a base or common root word by applying correct spelling of bases and affixes (prefixes and suffixes).

3. Sentence structure. Demonstrate appropriate sentence structure in writing.

a. Identify and use parallel structure.

b. Correct dangling and misplaced modifiers.

c. Correct run-on sentences.

d. Correct fragments.

e. Correct comma splices.

f. Differentiate between dependent/independent and restrictive/nonrestrictive

(essential/nonessential) clauses.

g. Write effective simple, compound, complex, and compound-complex sentences.

Oral Language/Listening and Speaking - The student will demonstrate thinking skills in listening and speaking.

Formulate thoughtful judgment about oral communication. Deliver focused and coherent presentations that convey clear and distinct perspectives and solid reasoning. Deliver polished formal and extemporaneous presentations that combine the traditional speech strategies of narration, exposition, persuasion, and description. Use gestures, tone, and vocabulary appropriate to the audience and purpose. Use the same Standard English conventions for oral speech that are used in writing.

Standard 1: Listening - The student will listen for information and for pleasure.

1. Focus attention on the speaker's message.

2. Use knowledge of language and develop vocabulary to accurately interpret the speaker's message.

3. Listen and respond appropriately to presentations and performances of peers or published works such as original essays or narratives, interpretations of poetry, and individual or group performances.
4. Monitor speaker's message and clarity and understanding to formulate and provide effective verbal and nonverbal feedback.

5. Use feedback to evaluate own effectiveness and set goals for future presentations.

Standard 2: Speaking - The student will express ideas and opinions in group or individual

situations.

1. Use formal, informal, standard, and technical language effectively to meet the needs of purpose, audience, occasion, and task.

2. Prepare, organize, and present a variety of informative messages effectively.

3. Analyze purpose, audience, and occasion to choose effective verbal and nonverbal strategies such as pitch and tone of voice, posture, and eye contact.

Visual Literacy: The student will interpret, evaluate, and compose visual messages.

Standard 1: Interpret Meaning - The student will interpret and evaluate the various ways visual image-makers including graphic artists, illustrators, and news photographers represent meaning.

1. Document the use of stereotypes and biases in visual media (e.g., distorted representations of society; imagery and stereotyping in advertising; elements of stereotypes such as physical characteristics, manner of speech, beliefs and attitudes).

2. Indicate how symbols, images, sounds, and other conventions are used in visual media (e.g., time lapse in films; set elements that identify a particular time period or culture).

Standard 2: Evaluate Media - The student will evaluate visual and electronic media, such as film, as compared with print messages.

1. Select people with special interests and expectations who are the target audience for particular messages or products in visual media.

2. Define and design language and content that reflect the target audience for particular messages and products (e.g., in advertising and sales techniques aimed specifically towards teenagers; in products aimed toward different classes, races, ages, genders; in the appeal of popular television shows and films for a particular audience).

Standard 3: Compose Visual Messages - The student will create a visual message that effectively communicates an idea.

1. Create media products to include a billboard, cereal box, short editorials, and a three-minute documentary or print ad to engage specific audiences.

2. Create, present, test, and revise a project and analyze a response, using data-gathering techniques such as questionnaires, group discussions, and feedback forms.

LANGUAGE ARTS
Grade 10

Reading/Literature: The student will apply a wide range of strategies to comprehend, interpret, evaluate, appreciate, and respond to a wide variety of texts.

Standard 1: Vocabulary - The student will expand vocabulary through word study, literature, and class discussion.

Apply a knowledge of word origins (words from other languages, history, or literature) to determine the meaning of new words encountered in reading and use of those words accurately.

1. Apply a knowledge of Greek (e.g., tele/phone, micro/phone), Latin (e.g., flex/ible), and Anglo-Saxon (e.g., un/friend/ly) roots, prefixes, and suffixes to determine word meanings.

*2. Research word origins as an aid to understanding meaning, derivations, and spelling as well as influences on the English language.

3. Use reference material such as glossary, dictionary, thesaurus, and available technology to determine precise meaning and usage.

4. Discriminate between connotative and denotative meanings and interpret the connotative power of words.

5. Use word meanings within the appropriate context and verify these meanings by definition, restatement, example, and analogy.

Standard 2: Comprehension - The student will interact with the words and concepts on the page to understand what the writer has said.

Read and understand grade-level-appropriate material. Analyze the organizational patterns and evaluate authors' argument and position. At Grade 10, in addition to regular classroom reading, read a wide variety of classic and contemporary literature, poetry, magazines, newspapers, reference materials, and online information as well as expository (informational and technical) texts.

1. Literal Understanding

    a. Identify the structures and format of various informational documents and explain how authors use the features to achieve their purpose.

    b. Understand specific devices an author uses to accomplish purpose (persuasive techniques, style, literary forms or genre, portrayal of themes, language).

    c. Use a range of automatic monitoring and self-correcting methods (e.g., rereading, slowing down, subvocalizing, consulting resources, questioning).

    d. Recognize signal/transitional words and phrases and their contributions to the meaning of the text (e.g., however, in spite of, for example, consequently).

2. Inferences and Interpretation

a. Use elements of the text to defend responses and interpretations.

b. Draw inferences such as conclusions, generalizations, and predictions, and support them with text evidence and personal experience.

*c. Investigate influences on a reader's response to a text (e.g., personal experience and values; perspective shaped by age, gender, class, nationality).

3. Summary and Generalization

a. Determine the main idea, locate and interpret minor or subtly stated details in complex passages.

b. Use text features and elements to support inferences and generalizations about information.

c. Summarize and paraphrase complex, implicit, hierarchic structures in informational texts, including relationships among concepts and details in those structures.

4. Analysis and Evaluation

a. Discriminate between fact and opinion and fiction and nonfiction.

b. Evaluate deceptive and/or faulty arguments in persuasive texts.

c. Analyze the structure and format of informational and literary documents and explain how authors use the features to achieve their purposes.

d. Analyze techniques (e.g., language, organization, tone, context) used to convey opinions or impressions.

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Standard 3: Literature - The student will read, construct meaning, and respond to a wide variety of literary forms.

Read and respond to grade-level-appropriate historically or culturally significant works of British, American, and world literature. Conduct in-depth analysis of themes, styles, and trends of these works across historical periods. Participate productively in self-directed work teams to create observable products.

1. Literary Genres - Demonstrate a knowledge of and an appreciation for various forms of literature.

a. Analyze the characteristics of genres including short story, novel, drama, narrative and lyric poetry, and essay.

b. Analyze the characteristics of subgenres such as satire, sonnet, epic, myths and legends, mystery, and editorials.

2. Literary Elements - Demonstrate knowledge of literary elements and techniques and show how they affect the development of a literary work.

a. Describe and analyze elements of fiction including plot, conflict, character, setting, theme, mood and point of view with emphasis on how they are addressed and resolved.

b. Explain how an author's viewpoint, or choice of a narrator affects the characterization and the tone, plot, mood and credibility of a text.

c. Analyze characters' traits by what the characters say about themselves in narration, dialogue, and soliloquy (when they speak out loud to themselves).

d. Evaluate the significance of various literary devices and techniques, including imagery, irony, tone, allegory (the use of fictional figures and actions to express truths about human experiences), and symbolism (the use of symbols to represent an idea or theme), and explain their appeal.

e. Evaluate the author’s purpose and the development of time and sequence, including the use of complex literary devices, such as foreshadowing (providing clues to future events) or flashbacks (interrupting the sequence of events to include information about an event that happened in the past).

3. Figurative Language and Sound Devices - Identify and use figurative language and sound devices in writing and recognize how they affect the development of a literary work.

a. Identify and use figurative language such as analogy, hyperbole, metaphor, personification, and simile.

b. Identify and use sound devices such as rhyme, alliteration, and onomatopoeia.

*c. Analyze the melodies of literary language, including its use of evocative words, rhythms and rhymes.

4. Literary Works - The student will read and respond to historically and culturally significant works of literature.

a. Analyze and evaluate works of literature and the historical context in which they were written.

b. Analyze and evaluate literature from various cultures to broaden cultural awareness.

c. Compare works that express the recurrence of archetypal (universal modes or patterns) characters, settings, and themes in literature and provide evidence to support the ideas expressed in each work.

Standard 4: Research and Information: The student will conduct research and organize information.

1. Accessing Information - Select the best source for a given purpose.

    a. Access information from a variety of primary and secondary sources.

    *b. Skim text for an overall impression and scan text for particular information.

c. Use organizational strategies as an aid to comprehend increasingly difficult content material (e.g., compare/contrast, cause/effect, problem/solution, sequential order).

2. Interpreting Information - Analyze and evaluate information from a variety of sources.

a. Summarize, paraphrase, and/or quote relevant information.

b. Determine the author's viewpoint to evaluate source credibility and reliability.

c. Synthesize information from multiple sources to draw conclusions that go beyond those found in any of the individual studies.

d. Identify complexities and inconsistencies in the information and the different perspectives found in each medium, including almanacs, microfiche, news sources, in-depth field studies, speeches, journals, technical documents, or Internet sources.

Writing/Grammar/Usage and Mechanics. The student will express ideas effectively in written modes for a variety of purposes and audiences.

Discuss ideas for writing with other writers. Write coherent and focused essays that show a well defined point of view and tightly reasoned argument. Use the stages of the writing process. Work independently and in self-directed writing teams to edit and revise.

Standard 1: Writing Process - The student will use the writing process to write coherently.

1. Use a writing process to develop and refine composition skills. Students are expected to:

a. use a variety of prewriting strategies such as brainstorming, outlining, free writing, discussing, clustering, webbing, using graphic organizers, notes, logs, or reading to generate ideas and gather information.

b. analyze audience and purpose:

   i. consider specific purposes for writing whether to reflect, inform, explain, persuade, make a social statement, or share an experience or emotion.

   ii. analyze the characteristics of a specific audience (interests, beliefs, background knowledge) and select an appropriate audience for the writing task.

c. analyze appropriate mode/genre.

d. develop multiple drafts, individually and collaboratively, to categorize ideas, organize them into paragraphs, and blend paragraphs into larger text.

e. revise for appropriateness of organization, content, and style.

f. edit for specific purposes such as to insure standard usage, varied sentence structure, appropriate word choice, mechanics, and spelling.

g. refine selected pieces to publish for general and specific audiences.

2. Use elaboration to develop an idea:

   a. draft a text with a clear controlling idea or thesis.

   b. develop a coherent progression of ideas applying organizational strategies such as spatial, chronological, order of importance, compare/contrast, logical order, cause/effect, or classification/division.

   c. apply different methods of support, such as facts, reasons, examples, sensory details, anecdotes, paraphrases, quotes, reflections, and dialogue.

   d. apply a consistent and appropriate point of view.

   e. understand and apply formal and informal diction.

3. Demonstrate organization, unity, and coherence by using transitions and sequencing:

   a. read the draft from the intended audience's point of view to evaluate clarity of purpose.

   b. evaluate whether ideas and organizational patterns are clear and support the overall purpose of the piece.

   c. evaluate whether the topic sentences, transitions within and between paragraphs, overall sequencing, and the progression of ideas is clear, focused, smooth, and coherent.

   d. evaluate whether ideas are adequately developed. Move, add, delete, or replace text for clarity, audience, and purpose.

   e. evaluate whether word choice/figurative language is precise, compelling, effective, and appropriate.

   f. evaluate whether sentence structures are varied in type, length, and complexity.

4. Editing/Proofreading and Evaluating: Use precise word choices, including figurative language, that convey specific meaning:

   a. apply Standard English usage, spelling and mechanics to text.

   b. correct errors in grammatical conventions.

   c. employ specified editing/proofreading strategies and consult resources (e.g., spell checks, personal spelling lists, or dictionaries) to correct errors in spelling, capitalization, and punctuation, including punctuation of quotations.

   d. use a specified format for in-text citation of source materials, for bibliographies, and for lists of works cited (check against original source for accuracy).

   e. demonstrate an understanding of the ethics of writing by creating a document free from plagiarism.

5. Use a variety of sentence structures, types, and lengths to contribute to fluency and interest.

6. Evaluate own writing and others' writing (e.g., determine the best features of a piece of writing, determine how writing achieves its purpose, ask for feedback, and respond to classmates' writing).

Standard 2: Modes and Forms of Writing. The student will write for a variety of purposes and audiences using creative, narrative, descriptive, expository, persuasive, and reflective modes.

At Grade 10, combine the rhetorical strategies of narration, exposition, persuasion, reflection, and description to produce text of at least 750 to 1,000 words. Compose business letters. Demonstrate a command of Standard English and the research, organization, and drafting strategies outlined in the writing process. Writing demonstrates an awareness of the audience (intended reader) and purpose for writing that are frequently published for a general or specific audience. Final drafts are formatted appropriate for the mode/genre.

1. Compose fictional, biographical or autobiographical narratives or short stories that:

   a. establish and develop dynamic and static characters including character motivation, gestures, and feelings.

   b. establish and develop a plot that effectively communicates the overall theme and establishes significant events.

   c. establish and maintain a consistent point of view especially third person limited or omniscient point of view.

   d. establish and develop a setting within a narrative that is relevant to the overall meaning of the work.

   e. use a range of narrative devices such as dialogue, interior monologue, suspense, foreshadowing, characterization, flashback, and symbolism.

   f. present action segments to accommodate changes in time and mood.

2. Compose expository compositions, including analytical essays and research reports that:

   a. integrate evidence in support of a thesis (position on the topic) including information on all relevant perspectives.

   b. communicate, quote, summarize, and paraphrase information and ideas from primary and secondary sources accurately and coherently.

   c. integrate a variety of suitable, credible reference sources, such as print, pictorial, audio, and reliable Internet sources.

d. integrate visual aids by using technology to organize and record information on charts, data tables, maps, and graphs.

e. identify and address reader's potential misunderstandings, biases, and expectations, establishing and adjusting tone accordingly.

f. use technical terms and notations accurately.

3. Compose persuasive/argumentative compositions that:

   a. include a well-defined thesis that makes a clear and knowledgeable appeal in a sustained and effective fashion.

   b. use exposition, narration, description, and argumentation to support the main argument.

   c. use specific rhetorical devices to support assertions, such as appealing to logic through reason, appealing to emotion or ethical beliefs, or relating to a personal anecdote, case study, or analogy.

   d. clarify and defend positions with precise and relevant evidence, including facts, expert opinions, quotations, expressions of commonly accepted beliefs, and logical reasoning.

   e. effectively address reader's concerns, counterclaims, biases, and expectations.

*4. Create documents related to career development that:

a. follow conventional format for email, formal letter, or memorandum.

b. provide clear and purposeful information and address the intended audience appropriately.

c. use appropriate vocabulary, tone, and style to take into account the nature of the relationship with, and the knowledge and interests of the intended audience.

5. Compose reflective papers that may address one of the following purposes:

a. express the individual's insight into conditions or situations detailing the author's role in the outcome of the event as well as an outside viewpoint.

b. connect lessons from literature, history, current events, and movies/media to personal experiences and ideas.

c. complete a self-evaluation on a class performance.

6. Use appropriate essay test-taking and time-writing strategies that:

a. budget time for prewriting, drafting, revising, and editing.

b. prioritize the question/prompt.

c. identify the common directives from the prompt (identify command verbs: *explain, compare, evaluate, define, and develop*, etc.)

d. analyze the question/prompt and determine the appropriate mode of writing, audience, and tone.

e. apply appropriate organizational methods to thoroughly address the prompt.

7. Compose responses to literature that:

a. integrate detailed references and quotations from the text along with interpretive commentary to support important ideas and a consistent viewpoint.

b. evaluate the impact of genre, historical, and cultural context on the work.

c. evaluate the impact of literary elements/devices and complexities within the work.

d. extend writing by changing mood, plot, characterization, or voice.

8. *Compose documented papers incorporating the techniques of Modern Language Association (MLA) or similar parenthetical style~~s~~ that:

a. incorporates relevant integrated quotations, summary, and paraphrase with commentary.

b. includes internal citations.

c. contains a works cited/bibliography.

Standard 3: Grammar/Usage and Mechanics. The student will demonstrate appropriate practices in writing by applying Standard English conventions of the revising and editing stages of writing. Work independently and in self-directed writing teams to revise and edit.

1. **Standard English Usage**. The student will demonstrate correct use of Standard English in speaking and writing.

a. Distinguish commonly confused words (e.g., there, their, they're; two, too, to; accept, except; affect, effect).

b. Use nominative, objective, possessive nouns.

c. Use abstract, concrete, and collective nouns.

d. Use correct verb forms and tenses.

e. Use correct subject-verb agreement especially when the sentence contains intervening phrases or clauses.

f. Distinguish transitive, intransitive, and linking verbs.

g. Distinguish active and passive voice.

h. Use correct pronoun/antecedent agreement and clear pronoun reference.

i. Use correct forms of positive, comparative, and superlative adjectives.

j. Use correct form of conjunction (coordinating, correlating, or subordinating).

k. Use appositives and verbals in compositions.

2. Mechanics and spelling - The student will demonstrate appropriate language mechanics in writing.

   a. Apply capitalization rules appropriately in writing.

   b. Punctuate in writing including:

      i. commas

      ii. quotation marks

      iii. apostrophes, colons, and semicolons

      iv. ellipsis

      v. hyphens, dashes, parentheses, and brackets

   c. Demonstrate correct use of punctuation in research writing including:

      i. formal outline

      ii. parenthetical documentation

      iii. works cited/bibliography

   d. Use correct formation of plurals.

   e. Use correct spelling including:

      i. commonly misspelled words and homonyms

      ii. spell consonant changes correctly (example recede/recession; transmit/transmission)

      iii. spell Greek and Latin derivatives (words that come from a base or common root word) by applying correct spelling of bases and affixes (prefixes and suffixes)

3. Sentence structure. The student will demonstrate appropriate sentence structure in writing.

   a. Identify and use parallel structure.

   b. Correct dangling and misplaced modifiers.

   c. Correct run-on sentences.

   d. Correct fragments.

   e. Correct comma splices.

   f. Use independent/dependent and restrictive (essential)/nonrestrictive (nonessential) clauses to designate the importance of information.

g. Use a variety of sentence structures and lengths to create a specific effect.

Oral Language/Listening and Speaking: The student will demonstrate thinking skills in listening and speaking.

Formulate thoughtful judgments about oral communication. Deliver focused and coherent presentations that convey clear and distinct perspectives and solid reasoning. Deliver polished formal and extemporaneous presentations that combine the traditional speech strategies of narration, exposition, persuasion, and description. Use gestures, tone, and vocabulary appropriate to the audience and purpose. Use the same Standard English conventions for oral speech that are used in writing.

***Standard 1: Listening - The student will listen for information and for pleasure.**

1. Engage in critical, empathetic, appreciative, and reflective listening to interpret, respond, and evaluate speaker's messages.

2. Listen and respond appropriately to presentations and performances of peers or published works such as original essays or narratives, interpretations of poetry, and individual or group performances.

3. Evaluate informative and persuasive presentations of peers, public figures, and media presentations.

4. Use feedback to evaluate own effectiveness and set goals for future presentations.

***Standard 2: Speaking - The student will express ideas and opinions in group or individual situations.**

1. Use formal, informal, standard, and technical language effectively to meet the needs of purpose, audience, occasion, and task.

2. Prepare, organize, and present a variety of informative and persuasive messages effectively.

3. Use a variety of verbal and nonverbal techniques in presenting oral messages and demonstrate poise and control while presenting.

Visual Literacy: The student will interpret, evaluate, and compose visual messages.

***Standard 1: Interpret Meaning - The student will interpret and evaluate the various ways visual image-makers such as graphic artists, illustrators, and news photographers represent meaning.**

1. Identify the use of stereotypes and biases in visual media (e.g., distorted representations of society; imagery and stereotyping in advertising; elements of stereotypes such as physical characteristics, manner of speech, beliefs, attitudes).

2. Investigate how symbols, images, sound, and other conventions are used in visual media

(e.g., time lapse in films; set elements that identify a particular time period or culture).

***Standard 2: Evaluate Media - The student will evaluate visual and electronic media, such as film, as compared with print messages.**

1. Recall that people with special interests and expectations are the target audience for particular messages or products in visual media.

2. Select and design language and content that reflect this appeal (e.g., in advertising and sales techniques aimed specifically towards teenagers; in products aimed toward different classes, races, ages, genders; in the appeal of popular television shows and films for particular audience).

***Standard 3: Compose Visual Messages - The student will create a visual message that effectively communicates an idea.**

1. Investigate and present the sources of a media presentation or production such as who made it and why it was made.

2. Analyze a media presentation to get the main idea of the message's content and compose one using a similar format.

Blueprints for each Criterion-Referenced Test reflect the degree of representation given on the test to each *PASS* standard and objective. To access the current blueprint (when available) go to the State Department of Education Web site at <http://sde.state.ok.us>, click on site index, then click "s" to go to student assessment, then click on "Student Tests & Materials" then scroll down to "alignment blueprints."

Language Arts

Grade 11

Reading/Literature: The student will apply a wide range of strategies to comprehend, interpret, evaluate, appreciate, and respond to a wide variety of texts.

Standard 1: Vocabulary - The student will expand vocabulary through word study, literature, and class discussion.

Apply a knowledge of word origins (words from other languages, history, or literature) to determine the meaning of new words encountered in reading and use of those words accurately.

1. Apply knowledge of Greek, Latin, and Anglo-Saxon roots and word parts to draw inferences about the meaning of scientific and mathematical terminology.

2. Use reference material such as glossary, dictionary, thesaurus, and available technology to determine precise meaning and usage.

3. Analyze the meaning of analogies encountered, analyzing specific comparisons as well as relationships and inferences.

4. Rely on context to determine meanings of words and phrases such as figurative language, connotations and denotations of words, analogies, idioms, and technical vocabulary.

5. Use word meanings within the appropriate context and verify these meanings by definition, restatement, example, and analogy.

Standard 2: Comprehension - The student will interact with the words and concepts on the page to understand what the writer has said.

Read and understand grade-level-appropriate material. Analyze the organizational patterns and evaluate authors' argument and positions. At Grade 11, in addition to regular classroom reading, read a wide variety of classic and contemporary literature, poetry, magazines, newspapers, reference materials, and online information as well as expository (informational and technical) texts.

1. Literal Understanding

    a. Identify the structures and format of various informational documents and explain how authors use the features to achieve their purpose.

    b. Select and explain specific devices an author uses to accomplish purpose (persuasive techniques, style, literary forms or genre, portrayal of themes, language).

    c. Use study strategies such as note taking, outlining, and using study guide questions to better understand texts.

    d. Construct images such as graphic organizers based on text descriptions and text structures.

2. Inferences and Interpretation

a. Interpret the possible inferences of the historical context on literary works.

b. Describe the development of plot and identify conflict and how they are addressed and resolved.

c. Investigate influences on a reader's response to a text (e.g., personal experience and values; perspective shaped by age, gender, class, or nationality).

d. Make reasonable assertions about author's arguments by using elements of the text to defend and clarify interpretations.

3. Summary and Generalization

a. Determine the main idea, locate and interpret minor subtly stated details in complex passages.

b. Use text features and elements to support inferences and generalizations about information.

c. Summarize and paraphrase complex, implicit hierarchic structures in informational texts, including relationships among concepts and details in those structures.

4. Analysis and Evaluation

a. Compare and contrast aspects of texts such as themes, conflicts, and allusions both within and across texts.

b. Analyze the structure and format of informational and literary documents and explain how authors use the features to achieve their purposes.

c. Examine the way in which clarity of meaning is affected by the patterns of organization, repetition of the main ideas, organization of language, and word choice in the text.

d. Analyze the way in which authors have used archetypes (universal modes or patterns) drawn from myth and tradition in literature, film, political speeches, and religious writings.

Standard 3: Literature - The student will read, construct meaning, and respond to a wide variety of literary forms.

Read and respond to grade-level-appropriate historically or culturally significant works of British, American, or world literature. Conduct in-depth analysis of themes, styles, and trends of these works across historical periods. Participate productively in self-directed work teams to create observable products.

1. Literary Genres - Demonstrate a knowledge of and an appreciation for various forms of literature.

   a. Analyze the characteristics of genres including short story, novel, drama, poetry, and essay.

   b. Analyze the characteristics of subgenres including allegory and ballad.

2. Literary Elements - Demonstrate knowledge of literary elements and techniques and show how they affect the development of a literary work.

   a. Analyze the way in which the theme or meaning of a selection represents a view or comment on life, using textual evidence to support the claim.

   b. Analyze the way in which irony, tone, mood, the author's style, and the "sound" of language achieve specific rhetorical (communication) or aesthetic (artistic) purposes or both.

   c. Analyze characters' traits by what the characters say about themselves in narration, dialogue, and soliloquy (when they speak out loud to themselves).

   d. Evaluate the significance of various literary devices and techniques, including imagery, irony, tone, allegory (the use of fictional figures and actions to express truths about human experiences), and symbolism (the use of symbols to represent an idea or theme), and explain their appeal.

   e. Evaluate the author's purpose and the development of time and sequence, including the use of complex literary devices, such as foreshadowing (providing clues to future events) or flashbacks (interrupting the sequence of events to include information about an event that happened in the past).

3. Figurative Language and Sound Devices - Identify figurative language and sound devices and analyze how they affect the development of a literary work.

   a. Identify and explain figurative language including analogy, hyperbole, metaphor, personification, and simile.

   b. Identify and explain sound devices including alliteration and rhyme.

   c. Analyze the melodies of literary language, including its use of evocative words, rhythms and rhymes.

4. Literary Works - Read and respond to historically and culturally significant works of literature.

   a. Analyze and evaluate works of literature and the historical context in which they were written.

   b. Analyze and evaluate literature from various cultures to broaden cultural awareness.

c. Compare works that express the recurrence of archetypal (universal) characters, settings, and themes in literature and provide evidence to support the ideas expressed in each work.

d. Analyze the clarity and consistency of political assumptions in a selection of literary works or essays on a topic.

Standard 4: Research and Information - The student will conduct research and organize information.

1. Accessing Information - Select the best source for a given purpose.
   a. Access information from a variety of primary and secondary sources.

   b. Skim text for an overall impression and scan text for particular information.

   c. Use organizational strategies as an aid to comprehend increasingly difficult content material (e.g., compare/contrast, cause/effect, problem/solution, sequential order).

2. Interpreting Information - Analyze and evaluate information from a variety of sources.

   a. Summarize, paraphrase, and/or quote relevant information.

   b. Determine the author's viewpoint to evaluate source credibility and reliability.

   c. Synthesize information from multiple sources to draw conclusions that go beyond those found in any of the individual studies.

   d. Identify complexities and inconsistencies in the information and the different perspectives found in each medium, including almanacs, microfiche, news sources, in-depth field studies, speeches, journals, technical documents, or Internet sources.

   e. Develop presentations by using clear research questions and creative and critical research strategies, such as field studies, oral histories, interviews, experiments, and Internet sources.

Writing/grammar/mechanics and usage. The student will express ideas effectively in written modes for a variety of purposes and audiences.

Write coherent and focused texts that show a well defined point of view and tightly reasoned argument. The writing demonstrates progression through the stages of the writing process. Work independently and in self-directed writing teams to edit and revise.

Standard 1: Writing Process. The student will use the writing process to write coherently.

1. Students are expected to:

a. use a variety of prewriting strategies such as brainstorming, free writing, outlining, discussing, clustering, webbing, using graphic organizers, notes logs, or reading to generate ideas, develop voice, gather information, and plan.

b. develop main idea/thesis. Evaluate results of prewriting activities and select appropriate topic.

c. evaluate audience and purpose:

   i. consider specific purposes for writing (e.g., to reflect, inform, explain, persuade, make social and/or political statements, or share an experience or emotion).

   ii. evaluate possible modes/genres and select one, remembering that the choice of the mode/genre will guide the treatment of the topic, the development of a stance toward the audience, and the organizational structure.

d. develop multiple drafts, individually and collaboratively, to categorize ideas, organize them into paragraphs, and blend paragraphs into larger text.

e. revise drafts for organization, content and style.

f. edit for specific purposes such as to ensure standard usage, varied sentence structure, appropriate word choice, mechanics, and spelling.

g. refine selected pieces to publish for general and specific audiences.

2. Use elaboration to develop an idea:

   a. draft a text with a clear, controlling idea or thesis.

   b. develop a coherent progression of ideas applying organizational strategies such as spatial, chronological, order of importance, compare/contrast, logical order, cause/effect, or classification/division.

   c. apply different methods of support, such as facts, reasons, examples, sensory details, anecdotes, paraphrases, quotes, reflections, and dialogue.

   d. apply a consistent and appropriate point of view, establish a credible voice, and create a suitable tone.

   e. understand and apply formal and informal diction for a desired effect.

3. Demonstrate organization, unity, and coherence during revision process:

   a. read the draft from the intended audience's point of view to evaluate clarity of purpose.

   b. evaluate whether ideas and organizational patterns are clear and support the overall purpose of the piece.

   c. evaluate whether topic sentences, transitions within and between paragraphs, overall sequencing, and the progression of ideas is clear, focused, smooth, and coherent.

   d. evaluate whether ideas are adequately developed.

e. apply a consistent and appropriate point of view.

f. understand and apply formal and informal diction.

4. Editing/proofreading and evaluating:

a. apply Standard English usage and correct spelling in text.

b. employs specified editing/proofreading strategies and consults resources (e.g., handbooks and style manuals, spell checks, personal spelling lists, dictionaries, thesauruses, or style sheets) to correct errors in spelling, capitalization, and punctuation, including punctuation of quotations.

c. use a specified format for in-text citation of source materials for bibliographies and for lists of works cited, and check against original source for accuracy.

d. demonstrate an understanding of the ethics of writing by creating a document free from plagiarism.

5. Use point of view, characterization, style, and related elements for specific rhetorical (communication) and aesthetic (artistic) purposes.

6. Structure ideas and arguments in a sustained and persuasive way and support them with precise and relevent examples.

7. Evaluate own writing and others' writing to highlight the individual voice, improve sentence variety and style, and enhance subtlety of meaning and tone in ways that are consistent with the purpose, audience, and form of writing.

Standard 2: Modes and Forms of writing. The student will write for a variety of purposes and audiences using creative, narrative, descriptive, expository, persuasive, and reflective modes.

At Grade 11, continue to combine the rhetorical strategies of narration, exposition, persuasion, reflection, and description to produce text of at least 1,500 words. Refine reflective compositions and become familiar with forms of job applications and resumes. Deliver multimedia presentations on varied topics. Demonstrate a command of Standard English and the research, organization, and drafting strategies outlined in the writing process. Writing demonstrates an awareness of the audience [intended reader] and purpose for writing.

1. Compose fictional, biographical or autobiographical narratives that:

a. create and develop dynamic and static characters who experience internal and external conflicts, including character motivation, gestures, and feelings.

b. create and develop a plot that effectively communicates the author's purpose.

c. create and self-select first or third person point of view appropriate for the author's purpose.

d. create and develop a setting within a narrative that is relevant to the overall meaning of the work.

e. use a range of narrative devices such as dialogue, interior monologue, suspense, foreshadowing, characterization, flashback, symbolism, and allusion.

f. present action segments to accommodate changes in time and mood.

2. Compose expository compositions, including analytical essays, historical investigations, and research reports that:

    a. integrate evidence in support of a thesis including information on all relevant perspectives.

    b. quote, summarize, and paraphrase information and ideas from primary and secondary sources, including technical terms and notations, accurately and coherently.

    c. integrate a variety of suitable, credible modern/historical reference sources such as print, pictorial, audio, archives (records), interviews, and reliable Internet sources to locate information in support of topic.

    d. use technology to integrate and create visual aids such as charts, data tables, maps, and graphs.

    e. identify and address reader's potential misunderstandings, biases, and expectations, establishing and adjusting tone accordingly through a focus on appropriate diction.

3. Compose persuasive compositions that:

    a. include a well-defined thesis that makes a clear and knowledgeable appeal in a sustained and effective fashion.

    b. use exposition, narration, description, and argumentation to support the main argument.

    c. use specific rhetorical devices to support assertions such as personal anecdote, case study, analogy, or logical, emotional, and/or ethical appeal.

    d. clarify and defend positions with precise and relevant evidence, including facts, expert opinions, quotations, expressions of commonly accepted beliefs, and logical reasoning.

    e. effectively address reader's concerns, counterclaims, and individual or group biases.

4. Compose reflective compositions that:

    a. express the individual's insight into conditions or situations, detailing the author's role in the outcome and demonstrating an understanding of external influences.

    b. connect lessons from literature, history, current events, and movies/media to personal experiences and ideas.

5. Create documents related to career development that:

    a. follow conventional format for formal letter, email, and memorandum.

    b. provide clear, purposeful information and address the intended audience appropriately.

c. indicate varied levels, patterns, and types of language to achieve intended effects and aid comprehension.

d. modify the tone to fit the purpose and audience.

e. follow the conventional style for that type of document (resume, cover letter of application) and use page format, fonts (typeface), and spacing that contribute to the readability and impact of the document.

f. use accurate information to create an effective resume.

6. Compose responses to literature that:

a. evaluate the significant ideas of literary works or passages including plot development and characterization.

b. integrate textual references, integrated quotations, and interpretive commentary to create an accurate and consistent composition.

c. evaluate the impact of genre, cultural, and historical context on the work.

d. evaluate the impact of literary elements/devices, ambiguities, and complexitities within the work.

7. Write for different purposes and to a specific audience or person, adjusting tone and style as necessary to make writing interesting. Continue to produce other writing forms introduced in earlier grades.

8. Compose documented papers that:

a. integrate relevant quotations, summary, and paraphrase with commentary.

b. includes internal citations using various formats of research writing.

c. contains a works cited/bibliography consistent with the selected research-writing format.

* 9. Use appropriate essay test-taking and time-writing strategies that:

a. budget time for prewriting, drafting, revising, and editing.

b. prioritize question/prompt.

c. identify common directives from the prompt (identify common verbs: *explain, compare, evaluate, define,* and *develop*, etc.).

d. analyze the question/prompt and determine the appropriate mode of writing, audience, and tone.

e. apply appropriate organizational methods to thoroughly address the prompt.

f. evaluate work using editing checklist or rubric if available.

Standard 3: Grammar/Usage and Mechanics. The student will demonstrate appropriate

practices in writing by applying Standard English conventions to the revising and editing stages of writing.

1. Standard English Usage-Demonstrate correct use of Standard English in speaking and writing. Work independently and in self-directed work teams to edit and revise.

    a. Distinguish commonly confused words (e.g., there, their, they're; two, too, to; accept, except; affect, effect).

    b. Identify and use correct verb forms and tenses.

    c. Identify and use correct subject-verb agreement.

    d. Identify and use active and passive voice.

    e. Identify and use concrete, abstract, and collective nouns.

    f. Identify and use nominative, objective, and possessive nouns.

    g. Identify and use correct pronoun/antecedent agreement and clear pronoun reference.

    h. Identify and use correct forms of positive, comparative, and superlative adjectives.

    i. Identify and use coordinating, correlating, and subordinating conjunctions.

    j. Identify and use appositives and verbals.

2. Mechanics and Spelling - Demonstrate appropriate language mechanics in writing.

    a. Apply capitalization rules appropriately in writing.

    b. Punctuate in writing including:

        i. commas

        ii. quotation marks

        iii. apostrophes, colons, and semicolons

        iv. ellipsis

        v. hyphens, dashes, parentheses, and brackets

    c. Demonstrate correct use of punctuation in research writing including:

        i. formal outline

        ii. parenthetical documentation

        iii. works cited/bibliography

    d. Use correct formation of plurals.

e. Use correct spelling including:

    i. commonly misspelled words and homonyms

    ii. spell consonant changes correctly (example: recede/recession; transmit/transmission

    iii. spell Greek and Latin derivatives (words that come from a base or common root word) by applying correct spelling of bases and affixes (prefixes and suffixes)

3. Sentence structure - Demonstrate appropriate sentence structure in writing.

    a. Maintain parallel structure.

    b. Correct dangling and misplaced modifiers.

    c. Correct run-on sentences.

    d. Correct fragments.

    e. Correct comma splices

    f. Use dependent/independent and restrictive (essential)/nonrestrictive (nonessential) clauses to designate the importance of information

    g. Effectively use a variety of sentence structures and lengths to create a specific effect

4. Apply appropriate manuscript conventions in writing including title page presentation, pagination, spacing and margins, and integration of sources and support material, by citing sources within the text, using direct quotations, and paraphrasing.

Oral Language/Listening and Speaking - The student will demonstrate thinking skills in listening and speaking.

Formulate thoughtful judgments about oral communication. Deliver focused and coherent presentations that convey clear and distinct perspectives and solid reasoning. Deliver polished formal and extemporaneous presentations that combine the traditional speech strategies of narration, exposition, persuasion, and description. Use gestures, tone, and vocabulary appropriate to the audience and purpose. Use the same Standard English conventions for oral speech that are used in writing. Participate independently and in groups to create oral presentations.

Standard 1: Listening - The student will listen for information and for pleasure.

1. Demonstrate proficiency in critical, empathetic, appreciative, and reflective listening to interpret, respond and evaluate speaker's messages.

2. Use effective strategies for listening that prepare for listening, identify the types of listening, and adopt appropriate strategies.

3. Listen and respond appropriately to presentations and performances of peers or published

works such as original essays or narratives, interpretations of poetry, and individual or group performances.

4. Use effective strategies to evaluate own listening such as asking questions for clarification, comparing and contrasting interpretations with others, and researching points of interest or contention.

5. Use effective listening to provide appropriate feedback in a variety of situations such as conversations and discussions and informative, persuasive, or artistic presentations.

Standard 2: Speaking - The student will express ideas and opinions in group or individual situations.

1. Use a variety of verbal and nonverbal techniques in presenting oral messages such as pitch and tone of voice, posture, and eye contact, and demonstrate poise and control while presenting.

2. Use logical, ethical, and emotional appeals that enhance a specific tone and purpose.

3. Evaluate when to use different kinds of effects (including visuals, music, sound, and graphics) to create effective presentations.

4. Ask clear questions for a variety of purposes and respond appropriately to the questions of others.

Visual Literacy: The student will interpret, evaluate, and compose visual messages.

Standard 1: Interpret Meaning - The student will interpret and evaluate the various ways visual image-makers including graphic artists, illustrators, and news photographers represent meaning.

1. Use a range of strategies to interpret visual media (e.g., draw conclusions, make generalizations, synthesize material viewed, refer to images or information in visual media to support point of view).

2. Describe how editing shapes meaning in visual media (e.g., omission of alternative perspectives; filtered or implied viewpoints; emphasis of specific ideas, images, or information in order to serve particular interests).

Standard 2: Evaluate Media - The student will evaluate visual and electronic media, such as film, as compared with print messages.

1. Use a variety of criteria (e.g., clarity, accuracy, effectiveness, bias, relevance of facts) to evaluate informational media (e.g., Web sites, documentaries, news programs.

2. Identify the rules and expectations about genre that can be manipulated for particular effects or purposes (e.g., combining or altering conventions of different genres, such as presenting news as entertainment; blurring of genres, such as drama-documentaries).

Standard 3: Compose Visual Messages - The student will create a visual message that effectively communicates an idea.

1. Design and develop genres such as nightly news, news magazines, and documentaries and identify the unique properties of each.

2. Compare, contrast, and critique various media coverage of the same events such as in newspapers, television, and on the Internet, and compose a study of the results.

LANGUAGE ARTS

Grade 12

Reading/Literature: The student will apply a wide range of strategies to comprehend, interpret, evaluate, appreciate, and respond to a wide variety of texts.

Standard 1: Vocabulary - The student will expand vocabulary through word study, literature, and class discussion.

Apply a knowledge of word origins (words from other languages, history, or literature) to determine the meaning of new words encountered in reading and use those words accurately.

1. Apply knowledge of Greek, Latin, and Anglo-Saxon roots and word parts to draw inferences about new words that have been created in the fields of science and mathematics (gene splicing, genetic engineering).

2. Research unfamiliar words based on characters, themes, or historical events.

3. Analyze the meaning of analogies encountered, analyzing specific comparisons as well as relationships and inferences.

4. Rely on context to determine meanings of words and phrases such as figurative language, connotations and denotations of words, analogies, idioms, and technical vocabulary.

Standard 2: Comprehension - The student will interact with the words and concepts on the page to understand what the writer has said.

Read and understand grade-level-appropriate material. Analyze the organizational patterns and evaluate authors' argument and positions. At Grade 12, in addition to regular classroom reading, read a wide variety of classic and contemporary literature, poetry, magazines, newspapers, reference materials, and online information, as well as expository (informational and technical) texts.

1. Literal Understanding

   a. Identify the structures and format of various informational documents and explain how authors use the features to achieve their purpose.

   b. Explain specific devices an author uses to accomplish purpose (persuasive techniques, style, literary forms or genre, portrayal of themes, language).

   c. Use study strategies such as note taking, outlining, and using study-guide questions to better understand texts.

   d. Construct images such as graphic organizers based on text descriptions and text structures.

e. Read silently with comprehension for a sustained period of time.

2. Inferences and Interpretation

a. Interpret the possible inferences of the historical context on literary works.

b. Describe the development of plot and identify conflicts and how they are addressed and resolved.

c. Identify influences on a reader's response to a text (e.g., personal experience and values; perspectives shaped by age, gender, class, or nationality).

d. Make reasonable assertions about authors' arguments by using elements of the text to defend and clarify interpretations.

3. Summary and Generalization

a. Determine the main idea and supporting details by producing summaries of text.

b. Use text features and elements to support inferences and generalizations about information.

c. Summarize and paraphrase complex, implicit, hierarchic structures in informational texts, including relationships among concepts and details in those structures.

d. Compare and contrast elements of text such as themes, conflicts, and allusions both within and across text.

4. Analysis and Evaluation

a. Investigate both the features and the rhetorical (communication) devices of different types of public documents, such as policy statements, speeches, or debates, and the ways in which authors use those features and devices.

b. Examine the structure and format of informational and literary documents and explain how authors use the features to achieve their purposes.

c. Analyze the way in which clarity of meaning is affected by the patterns of organization, repetition of the main ideas, organization of language, and word choice in the text.

d. Analyze the way in which authors have used archetypes (universal modes or patterns) drawn from myth and tradition in literature, film, political speeches, and religious writings.

e. Evaluate the credibility of information sources, including how the writer's motivation may affect that credibility.

Standard 3: Literature - The student will read, construct meaning, and respond to a wide

variety of literary forms.

Read and respond to grade-level-appropriate historically or culturally significant works of British, American, or world literature. Conduct in-depth analysis of themes, styles, and trends of these works across historical periods**.** Participate productively in self-directed work teams to create observable products.

1. Literary Genres - Demonstrate a knowledge of and an appreciation for various forms of literature.

    a. Analyze the characteristics of genres including short story, novel, drama, poetry, and essay.

    b. Analyze the characteristics of subgenres including allegory, ballad, elegy, ode, parody, pastoral, satire and tragedy.

2. Literary Elements - Demonstrate knowledge of literary elements and techniques and show how they affect the development of a literary work.

    a. Evaluate the way in which the theme or meaning of a selection represents a view or comment on life, using textual evidence to support the claim.

    b. Analyze the way in which irony, tone, mood, the author's style, and the "sound" of language achieve specific rhetorical (communication) or aesthetic (artistic) purposes or both.

    c. Analyze characters' traits by what the characters say about themselves in narration, dialogue, and soliloquy (when they speak out loud to themselves).

    d. Evaluate the significance of various literary devices and techniques, including imagery, allegory (the use of fictional figures and actions to express truths about human experiences), and symbolism (the use of symbols to represent an idea or theme), and explain their appeal.

    e. Evaluate the author's purpose and the development of time and sequence, including the use of complex literary devices, such as foreshadowing (providing clues to future events) or flashbacks (interrupting the sequence of events to include information about an event that happened in the past).

3. Figurative Language and Sound Devices - Identify figurative language and sound devices and analyze how they affect the development of a literary work.

    a. Identify and explain figurative language including analogy, hyperbole, metaphor, personification, and simile.

    b. Identify and explain sound devices including alliteration and rhyme.

    c. Analyze the melodies of literary language, including its use of evocative words, rhythms and rhymes.

4. Literary Works - Read and respond to historically and culturally significant works of literature.

   a. Analyze and evaluate works of literature and the historical context in which they were written.

   b. Analyze and evaluate literature from various cultures to broaden cultural awareness.

   c. Compare works that express the recurrence of archetypal (universal modes or patterns) characters, settings, and themes in literature and provide evidence to support the ideas expressed in each work.

   d. Analyze the clarity and consistency of political assumptions in a selection of literary works or essays on a topic.

Standard 4: Research and Information - The student will conduct research and organize information.

1. Accessing Information - Select the best source for a given purpose.

   a. Access information from a variety of primary and secondary sources.

   b. Skim text for an overall impression and scan text for particular information.

   c. Use organizational strategies as an aid to comprehend increasingly difficult content material (e.g., compare/contrast, cause/effect, problem/solution, sequential order).

2. Interpreting Information - Analyze and evaluate information from a variety of sources.

   a. Summarize, paraphrase, and or quote relevant information.

   b. Determine the author's viewpoint to evaluate source credibility and reliability.

   c. Synthesize information from multiple sources to draw conclusions that go beyond those found in any of the individual studies.

   d. Identify complexities and inconsistencies in the information and the different perspectives found in each medium, including almanacs, microfiche, news sources, in-depth field studies, speeches, journals, technical documents, or Internet sources.

   e. Develop presentations by using clear research questions and creative and critical research strategies, such as field studies, oral histories, interviews, experiments, and Internet sources.

   f. Compile written ideas and information into reports, summaries, or other formats and draw conclusions.

Writing/grammar/ mechanics and usage. The student will express ideas effectively in written modes for a variety of purposes and audiences.
Standard 1: Writing Process - The student will use the writing process to write coherently.

1.Use a writing process to develop and refine composition skills. Students are expected to:

a. use a variety of prewriting strategies such as brainstorming, outlining, free writing, discussing, clustering, webbing, using graphic organizers, notes logs, interviews, or reading to generate ideas, develop voice, gather information, and plan.

b. develop main idea/thesis.

c. evaluate results of prewriting activities and select appropriate topic.

d. evaluate audience and purpose for writing:

   i. consider specific purposes for writing (e.g., to reflect, inform, explain, persuade, make a social and/or political statement, or share an experience or emotion).

   ii. evaluate the writing task, considering the assumptions, values, and background knowledge of the intended audience.

e. evaluate possible modes/genres and select one, remembering that the choice of the mode/genre will guide the treatment of the topic, the development of a stance toward the audience, and the organizational structure.

f. develop multiple drafts, individually and collaboratively, to categorize ideas organize them into paragraphs, and blend paragraphs into larger text.

g. revise drafts for organization, content, and style.

h. edit/proofread for specific purposes such as to ensure standard usage, varied sentence structure, appropriate word choice, mechanics, and spelling.

i. refine selected pieces to publish for general and specific audiences.

2. Use elaboration to develop an idea:

a. draft a text with a clear, controlling idea or thesis

b. develop a coherent progression of ideas applying organizational strategies such as spatial, chronological, order of importance, compare/contrast, logical order, cause/effect, or classification/division.

c. apply different methods of support, such as facts, reasons, examples, sensory details, anecdotes, paraphrases, quotes, reflections, and dialogue.

d. apply a consistent and appropriate point of view, establish a credible voice, and create a suitable tone.

e. understand and apply formal and informal diction for a desired effect.

3. Demonstrate organization, unity and coherence during revision process:

a. read the draft from the intended audience's point of view to evaluate clarity of purpose.

b. evaluate whether ideas and organizational patterns are clear and support the overall purpose of the piece.

c. evaluate whether topic sentences, transitions within and between paragraphs, overall sequencing, and the progression of ideas is clear, focused, smooth, and coherent.

d. evaluate whether ideas are adequately developed.

e. apply a consistent and appropriate point of view.

f. understand and apply formal and informal diction.

4. Editing/proofreading and evaluating:

a. apply Standard English usage and correct spelling in text.

b. employs specified editing/proofreading strategies and consults resources (e.g., handbooks and style manuals, spell checks, personal spelling lists, dictionaries, thesauruses, or style sheets) to correct errors in spelling, capitalization, and punctuation, including punctuation of quotations.

c. use a specified format for in-text citation of source materials for bibliographies and for lists of works cited, and check against original source for accuracy.

d. demonstrate an understanding of the ethics of writing by creating a document free from plagiarism.

5. Use point of view, characterization, style, and related elements for specific rhetorical (communication) and aesthetic (artistic) purposes.

6. Structure ideas and arguments in a sustained and persuasive way and support them with precise and relevant examples.

7. Evaluate own and others' writing to highlight the individual voice, improve sentence variety and style, and enhance subtlety of meaning and tone in ways that are consistent with the purpose, audience, and form of writing.

8. Further develop unique writing style and voice, improve sentence variety, and enhance subtlety of meaning and tone in ways that are consistent with the purpose, audience, and form of writing.

Standard 2: Modes and Forms of Writing. The student will write for a variety of purposes and audiences using creative, narrative, descriptive, expository, persuasive, and reflective modes.

At Grade 12, continue to combine the rhetorical strategies of narration, exposition, persuasion, and description: to produce text, reflective compositions, historical investigation reports, and deliver multimedia presentations. The writing demonstrates a command of Standard English and the research, organization, and drafting strategies outlined in the writing process. Writing demonstrates an awareness of the audience (intended reader) and purpose for writing.

1. Write fictional, biographical or autobiographical narratives that:

a. create and develop a character who experience internal and external conflicts, including character motivation, gestures, and feelings.

b. create and develop a plot that effectively communicates a pattern.

c. create and manipulate point of view to reveal author's purpose.

d. create and develop a setting to reinforce the mood.

e. use a range of narrative devices such as dialogue, interior monologue, suspense, foreshadowing, characterization, flashback, symbolism, allusion and frame story.

f. narrate a sequence of events.

2. Compose expository compositions, including analytical essays, historical investigations, and research reports that:

    a. integrate evidence in support of a thesis including information on all relevant perspectives.

    b. quote, summarize, and paraphrase information and ideas from primary and secondary sources, including technical terms and notations, accurately and coherently.

    c. integrate a variety of suitable, credible modern/historical reference sources such as print, pictorial, audio, archives (records), interviews, and reliable Internet sources to locate information that contains different perspectives.

    d. use technology to integrate and create visual aids such as charts, data tables, maps, and graphs.

    e. identify and address reader's potential misunderstandings, biases, and expectations, establishing and adjusting tone accordingly through a focus on appropriate professional, academic, or technical diction.

    f. use technical terms and notations accurately.

3. Compose persuasive compositions that:

    a. include a well-defined thesis that makes a clear and knowledgeable appeal in a sustained and effective fashion.

    b. use exposition, narration, description, and argumentation to support the main argument.

    c. use specific rhetorical devices to support assertions such as personal anecdote, case study, analogy, or logical, emotional, and/or ethical appeal.

    d. clarify and defend positions with precise and relevant evidence, including facts, expert opinions, quotations, expressions of commonly accepted beliefs, and logical reasoning.

    e. effectively address reader's concerns, counterclaims, and individual or group biases.

4. Write reflective compositions that:

   a. express the individual's insight into conditions or situations, detailing the author's role in the outcome and demonstrating an understanding of external influences to justify or clarify his/her perspective.

   b. connect lessons from literature, history, current events, and movies/media to personal experiences and ideas.

5. Create documents related to career development that:

   a. appropriately present purposeful and precise information to meet the need of the intended audience.

   b. write an email, formal letter, or memorandum, using conventional format.

   c. follow the conventional style for a specific document (resume, cover letter of application), and use page format, fonts (typeface), and spacing that contribute to the readability and impact of the document.

   d. use accurate information to create various resume formats.

   e. modify the tone to fit the purpose and audience.

   f. use accurate information to create an effective resume.

6. Compose responses to literature that:

   a. evaluate the significant ideas of literary works or passages including plot development and characterization.

   b. evaluate the impact of genre, cultural, and historical context on the work.

   c. evaluate the impact of literary elements/devices, ambiguities, and complexities within the work.

   d. support important ideas and viewpoints with accurate and detailed reference to the text or to other works.

7. Write for different purposes and to a specific audience or person, adjusting tone and style as necessary to make writing interesting. Continue to produce other forms of writing introduced in earlier grades.

8. Write documented papers that:

   a. incorporate relevant integrated quotations, summary, and paraphrase with commentary.

   b. include internal citations using various formats of research writing.

   c. contain a works cited/bibliography consistent with the selected research-writing format.

9. Use appropriate essay test-taking and time writing strategies that:

   a. budget time for prewriting, drafting, revising, and editing.

b. prioritize the question/prompt.

c. identify common directives from the question/prompt (identify common verbs: *explain, compare, evaluate, define, and develop*, etc.).

d. analyze the question/prompt and determine the appropriate mode of writing, audience, and tone.

e. apply appropriate organizational methods to thoroughly address the question/prompt.

f. evaluate work using editing checklist or rubric, if available.

Standard 3: Grammar/Usage and Mechanics. **The student will demonstrate appropriate practices in writing by applying Standard English conventions to the revising and editing stages of writing.**

1. Standard English Usage - Demonstrate correct use of Standard English in speaking and writing.

a. Distinguish commonly confused words (e.g., there, their, they're; two, too, to; accept, except; affect, effect).

b. Identify and use correct verb forms and tenses.

c. Identify and use correct subject-verb agreement.

d. Distinguish active and passive voice.

e. Identify and use pronouns effectively, correct pronoun/antecedent agreement, and clear pronoun reference.

f. Identify and use correct forms of positive, comparative, and superlative adjectives.

g. Continue to identify and use all grammar structure from prior grades.

2. Mechanics and Spelling - Demonstrate appropriate language mechanics in writing.

a. Demonstrate correct use of capitals.

b. Use correct formation of plurals.

c. Demonstrate correct use of punctuation and recognize its effect on sentence structure.

d. Use correct spelling of commonly misspelled words and homonyms.

3. Sentence structure - The student will demonstrate appropriate sentence structure in writing.

a. Use parallel structure.

b. Correct dangling and misplaced modifiers.

c. Correct run-on sentences.

d. Correct fragments.

e. Correct comma splices.

f. use dependent/independent and restrictive (essential)/nonrestrictive (nonessential) clauses to designate the importance of information.

g. effectively use a variety of sentence structures and lengths to create a specific effect.

4. Apply appropriate manuscript conventions in writing including title page presentation, pagination, spacing and margins, and integration of sources and support material, by citing sources within the text, using direct quotations, and paraphrasing.

Oral Language/Listening and Speaking: The student will demonstrate thinking skills in listening and speaking.

Formulate thoughtful judgments about oral communication. Deliver focused and coherent presentations that convey clear and distinct perspectives and solid reasoning. Deliver polished formal and extemporaneous presentations that combine the traditional speech strategies of narration, exposition, persuasion, and description. Use gestures, tone, and vocabulary appropriate to the audience and purpose. Use the same Standard English conventions for oral speech that are used in writing. Participate independently and in groups to create oral presentations.

Standard 1: Listening - The student will listen for information and for pleasure.

1. Demonstrate proficiency in critical, empathetic, appreciative, and reflective listening to interpret, respond and evaluate speaker's messages.

2. Use effective strategies for listening that prepare for listening, identify the types of listening, and adopt appropriate strategies.

3. Listen and respond appropriately to presentations and performances of peers or published works such as original essays or narratives, interpretations of poetry, and individual or group performances.

4. Use effective strategies to evaluate own listening such as asking questions for clarification, comparing and contrasting interpretations with others, and researching points of interest or contention.

5. Use effective listening to provide appropriate feedback in a variety of situations such as conversations and discussions and informative, persuasive, or artistic presentations.

Standard 2: Speaking - The student will express ideas and opinions in group or individual situations.

1. Use a variety of verbal and nonverbal techniques in presenting oral messages such as pitch and tone of voice, posture, and eye contact; and demonstrate poise and control while presenting.

2. Use language and rhetorical strategies skillfully in informative and persuasive messages.

3. Use logical, ethical, and emotional appeals that enhance a specific tone and purpose.

4. Use effective and interesting language, including informal expressions for effect, Standard English for clarity, and technical language for specificity.

5. Evaluate when to use different kinds of effects (including visuals, music, sound, and graphics) to create a presentation.

6. Ask clear questions for a variety of purposes and respond appropriately to the questions of others.

Visual Literacy: The student will interpret, evaluate, and compose visual messages.
Standard 1: Interpret Meaning - The student will interpret and evaluate the various ways visual image-makers including graphic artists, illustrators, and news photographers represent meaning.

1. Use a range of strategies to interpret visual media (e.g., draw conclusions, make generalizations, synthesize material viewed, refer to images or information in visual media to support point of view).

2. Demonstrate how editing shapes meaning in visual media (e.g., omission of alternative perspectives; filtered or implied viewpoints; emphasis of specific ideas, images, or information in order to serve particular interests).

Standard 2: Evaluate Media - The student will evaluate visual and electronic media, such as film, as compared with print messages.

1. Use a variety of criteria (e.g., clarity, accuracy, effectiveness, bias, relevance of facts) to evaluate informational media (e.g., Web sites, documentaries, news programs).

2. Identify the rules and expectations about genre that can be manipulated for particular effects or purposes (e.g., combining or altering conventions of different genres, such as presenting news as entertainment; blurring of genres, such as drama-documentaries).

Standard 3: Compose Visual Messages - The student will create a visual message that effectively communicates an idea.

1. Use the effects of media on constructing his/her own perception of reality.

2. Use a variety of forms and technologies such as videos, photographs, and Web pages to communicate specific messages.

GLOSSARY

affix - an element added to the base, stem, or root of a word to form a fresh word or stem. Principal kinds of affix are prefixes and suffixes. The prefix un- is an affix which added to balanced, makes unbalanced. The suffix -ed is an affix which, added to wish makes wished.
alliteration - a device commonly used in poetry and occasionally in prose: the repetition of an initial sound in two or more words of a phrase, line of poetry, or sentence (e.g., "Our souls have sight of that immortal sea.").
analogies - comparisons of the similar aspects of two different things.
antonym - words which have opposite meanings (e.g., hot and cold).
archetype - a descriptive detail, plot pattern, character type, or theme that recurs in many different cultures. One such archetype that appears in Shakespeare's Macbeth is the battle between the forces of good and the forces of evil.
autobiography - the biography of a person written by oneself.
balanced reading program - dual emphasis, stress on both skill and application of skills. A balanced reading program includes instruction in word identification skills as well as instruction in reading comprehension strategies. A balanced reading program includes reading to whole groups of students, guided reading activities with groups of students, shared reading, and independent reading by individual students.
base word - a word to which a prefix or suffix may be added to form a new word (e.g., go + ing = going).
biography - story about the achievements of others; helps students see history as the lives and events of real people and to appreciate the contribution of all cultures; subjects include explorers; political heroes and heroines; and achievers in literature, science, sports, the arts, and other disciplines; effectiveness depends on accuracy, authenticity, and an appealing narrative style.
CVC - consonant/vowel/consonant
choral reading - group reading aloud (e.g., choral reading may be used with a group to develop oral fluency or to make a presentation to an audience).
cinquain - poetic form; structure may follow a 2-4-6-8-2 syllable pattern or may follow a simpler form using words per line in a 1-2-3-4-1 pattern.
compound word - a word made by putting two or more words together (e.g., cowboy).
consonant blend - the joining of the sounds represented by two or more letters with minimal change in those sounds; consists of two or more consonants sounded together in such a way that each is heard (e.g., bl, gr, sp)
consonant digraph - consists of two consonants that together represent one sound (e.g., sh, ch, th, wh).
consonants - the letters of the alphabet (excluding a, e, i, o, u, usually including w and y); represented by a single sound made by a partial or complete obstruction of air.
context clue - the information from the immediate textual setting that helps identify a word or word group.
contraction - a short way to write two words as one by writing the two words together, leaving out one or more letters and replacing the missing letters with an apostrophe (e.g., cannot = can't).
convention - accepted practice in written language.
cooperative learning - activities in which students work together in groups to achieve a common goal.
critical thinking - logical, reflective thinking that is focused on deciding what to believe or do.

It may include analyzing arguments, seeing other points of view, and/or reaching conclusions.
cubing - a method for discovering ideas about a topic by using six strategies (in any order) to investigate it: describe it, compare it, associate it, analyze it, apply it, and argue for or against it.
cues/cueing system - Sources of information used by readers to construct meaning. The language cueing system includes the graphophonic system — the relationship between oral and written language (phonics); the syntactic system — the relationship among linguistic units such as prefixes, suffixes, words, phrases, and clauses (grammar); and the semantic system — the meaning system of language.
decode - to analyze spoken or graphic symbols of a familiar language to ascertain their intended meaning.
descriptive writing - One of four chief composition modes. Writing which paints a picture of a person, place, thing, or idea using vivid details.
dialect - a social or regional variety of a particular language with phonological, grammatical, and lexical patterns that distinguish it from other varieties.
diamante - poetic form; structure follows a diamond shape of seven lines as follows: one noun, two adjectives, three participles, four related nouns, or a phrase of four words, three participles, two adjectives, and one noun.
diphthong - a vowel sound produced when the tongue moves from one vowel sound toward another vowel in the same syllable; two vowel sounds that come together so fast they are considered one syllable (e.g., ou, ow, oi/oy).
directionality - the ability to perceive spatial orientation accurately (left to right).
epic literature - long narratives detail the adventures of a single heroic figure; the center of action revolves around the relationship between the heroic figure and the gods; the main character symbolizes the ideal characteristics of greatness; many were originally written as poetry or songs; language is lyrical, stately, and rich with images.
essays - documentary records on diverse topics such as slavery, life in the 12th century England, or songs of the American Revolution; content is based upon or adapted from an original document in diary, letter, or essay form.
etymology - the study of the origins of words; an account of the history of a particular word.
evaluative - questioning that requires the reader to use experiential background knowledge in conjunction with information explicitly stated in the text (e.g., reading beyond the line).
expository - a reading or writing selection which explains, defines, and interprets. It covers all compositions which do not primarily describe an object, tell a story, or maintain a position (e.g., content-area textbooks, magazine articles, editorials, essays).
fables - tales concern human conduct with moralistic overcomes; animals exhibit human qualities and behaviors.
fairytale - a folktale about real-life problems usually with imaginary characters and magical events.
fantasy - characters or settings depart from what is realistic; the author makes the impossible believable; characters include humanized animals, good and evil stereotypes, heroes and heroines with magical powers.
fiction - plots are simple, fast-paced and predictable; characters and their actions appeal to young children; illustrations contribute to story line; rhyme and repetition encourage reading aloud; story and language appeal to sense of humor through word play, nonsense, surprise, and exaggeration; illustrations encourage participation through naming, pointing, and seeking.
figurative language - writing or speech not meant to be taken literally. Writers use figurative language to express ideas in vivid or imaginative ways (e.g., “the apple of my eye,” “forever chasing rainbows”).

flashback - the technique of disrupting the chronology of a narrative by shifting to an earlier time in order to introduce information.
fluency - freedom from word-identification problems that might hinder comprehension in silent reading or the expression of ideas in oral reading; automaticity, the ability to produce words or larger language units in a limited time interval.
folktales - time and place are generic (e.g., "Once upon a time in a faraway castle . . ."); stories are not intended to be accepted as true; plots use predictable motifs (e.g., ogres, magic, supernatural helpers, quests); story line is frequently a series of recurring actions; characters are one-dimensional.
foreshadowing - the technique of giving clues to coming events in a narrative.
genre - a category used to classify literary and other works, usually by form, technique, or content. The novel, the short story, and the lyric poems are all genres.
grapheme - a written or printed representation of a phoneme (e.g., b for /b/ and oy for /oi/ in boy)
graphophonic cues - the relationship between graphemes and the phonemes they represent. These symbol-sound-association skills can be used as an aid in recognizing a word that is not firmly fixed in sight vocabulary, especially if used in conjunction with other cues (e.g., determining the sound of the initial letter or two and the use of context may be all that is needed to recognize a word).
high frequency words - a word that appears many more times than most other words in spoken or written language (e.g., the, of, said, for).
historical fiction - stories are grounded in history but not restricted by it; the historical setting is an authentic and integral part of the story; characters' actions, dialogue, beliefs, and values are true to the historical period.
homographs - words which are spelled alike but have different sounds and meanings (e.g., bow and arrow vs. bow of a ship).
homonyms - words which sound the same but have different spellings and meanings (e.g., bear, bare).
hyperbole - obvious and deliberate exaggeration; an extravagant statement; a figure of speech not intended to be taken literally. Hyperboles are often used for dramatic or comic effect. Example: "He died a thousand deaths." "The discussion lasted an eternity."
idiom - an expression that does not mean what it literally says (e.g., to have the upper hand has nothing to do with the hands).
imagery - the use of language to create vivid pictures in the reader's mind.
independent reading level - the readability or grade level of material that is easy for a student to read with few word-identification problems and high comprehension.
inferential - a reasoned assumption about meaning that is not explicitly stated (e.g., reading between the lines).
instructional reading level - the reading ability or grade level of material that is challenging, but not frustrating for the student to read successfully with normal classroom instruction and support. irony - a figure of speech of which the literal meaning of the word is the opposite of its intended meaning (e.g., I could care less); a literary technique for implying, through plot or character, that the actual situation is quite different from that presented.
journal - a less private form of diary. It is more readily shared, allows more flexibility, and is more adaptable as a teaching tool. It is especially useful when used to elicit responses to reading, issues, and events under study.
legends - plots record deeds of past heroes; stories are presented as true; stories are usually secular and associated with wars and victories.
literal - information directly from the text (e.g., on the line).

literature – text created for a specific purpose (poem, story, novel, etc.).
main idea - the gist of a passage; central thought.
medial - coming in the middle of a word.
metaphor - a figure of speech in which a comparison is implied by analogy but is not stated.
mode of writing - any of the major types of writing (e.g., argumentation, description, exposition, narration).
mood - the emotional state of mind expressed by an author or artist in his or her work; the emotional atmosphere produced by an artistic work.
mystery - tightly woven plots have elements of suspense, danger, or intrigue; plots are fast-paced and frequently involve foreshadowing or flashback.
myths - stories are seen as true in the represented society; plots are usually associated with theology or ritual; accounts frequently explain natural phenomena.
narrative - a reading or writing selection which tells a story (e.g., fables, fairy tales, legends, tall tales, short stories, novels).
neologism - a new word or phrase, or a new meaning of, for an established word. Neologism also applies to new doctrines, such as a fresh new interpretation of the Bible or of some other work of literature.
n**onfiction** - information is factual and may be presented by detailed descriptions or examples; organization follows a logical pattern and may include textual aids.
onomatopoeia - the formation and use of words that suggest by their sounds the object or idea being named (e.g., bow wow, bang, buzz, crackle, clatter, hiss, murmur, sizzle, twitter, zoom).
onset - all of the sounds in a word that come before the first vowel.
pacing - setting one's own reading rate by using a pattern appropriate for the reading task.
personification - metaphorical figure of speech in which animals, ideas, and things are represented as having human qualities.
phoneme - a minimal sound unit of speech that distinguishes one word from another (e.g., lace, lake).
phonemic awareness - ability to manipulate, detect, and change sounds in spoken language (precedes phonics instruction).
phonics - a way of teaching reading and spelling that stresses symbol sound relationships; the ability to associate letters and letter combinations with sound and blending them into syllables and words.
point-of-view - the way in which an author reveals a perspective/viewpoint, as in characters, events, and ideas in telling a story.
predictable text - books with dramatic cumulative repetitions and dependable schemes of rhyme and language that help children anticipate and thereby decode the printed page (e.g., Brown Bear, Brown Bear).
prediction strategy - a person's use of knowledge about language and the context in which it occurs to anticipate what is coming in writing or speech.
prefix - a syllable or group of syllables attached to the beginning of a word, or root, to change its meaning (e.g., reprint, unpack, dislike).
prior knowledge - knowing that stems from previous experience. Note: prior knowledge is a key component of schema theories of reading and comprehension.
propaganda - an extreme form of written or spoken persuasion intended to influence the reader, though sometimes subtly, and usually by one-sided rather than objective argument (e.g., advertising propaganda to sell a product).
Readers Theatre - a performance of literature, as a story, play, poetry read aloud expressively by one or more persons, rather than acted.
r-controlled vowels - the modified sound of a vowel immediately preceding /r/ in the same

syllable, e.g., care, never, sir, or.
recursive process - moving back and forth through a text in either reading or writing, as new ideas are developed or problems encountered. In reading a text, recursive processes might include rereading earlier portions in light of later ones, looking ahead to see what topics are addressed or how a narrative ends, and skimming through text to search for particular ideas or events before continuing a linear reading. In creating a written composition, recursive processes include moving back and forth among the planning, drafting, and revising phases of writing.
representing - the presentation aspect of viewing. It is nonverbal depiction of communication.
rime - the part of a syllable that contains the vowel and all that follows it (e.g., the rime of bag is -ag; of swim, -im).
root word - a word with no prefix or suffix added; may also be referred to as a base word.
Rule of Thumb - a method students can use to make their reading selections. Students select a book, open it to any page, and read. One finger is raised for each unknown word. If they encounter more than five words that they cannot pronounce, probably it is a good idea to select another book.
schwa - A mark showing an absence of a vowel sound. The neutral vowel sound of most unstressed syllables in English, e.g., sound of a in ago or e in agent. This is the symbol, (, for this sound.
science fiction - relies on hypothesized scientific advancements and raises questions about the future of humanity; can be a useful vehicle for examining issues related to human survival in an uncertain future.
semantic cues - semantic cues involving word-meaning knowledge and a general sense of the test's meaning.
sight word - any word recognized by memory only.
silent e - an e that makes no sound that is usually found in the final position of an English root word.
simile - a combination of two things that are unlike, usually using the words like or as (e.g., soft as a kitten).
soft c and g rule - when c or g is followed by e, i, or y, it is usually soft.
structural analysis - the process of using knowledge of root words, endings, and affixes to decode words.
subvocalize - reading to oneself.
suffix - a syllable or group of syllables attached to the end of a word, or root, to change its meaning (e.g., s, ed, ing).
Sustained Silent Reading/Drop Everything and Read - child reads self-selected literature 10-30 minutes daily. A brief pair discussion, approximately 2 minutes, follows SSR/DEAR.
syllabication - the division of words into syllables.
syllable - a minimal unit of sequential speech sounds made up of a vowel sound or a vowel consonant combination and always contains a vowel sound.
symbolism - use of one thing to suggest something else, specifically the use of symbols to represent ideas in concrete ways; the implied meaning of a literary work.
synonyms - words which have the same meaning.
syntactic cues - syntactic cues involve implicit knowledge of word order and the functions of words. Only certain word sequences are allowable in English, and only certain kinds of words fit into particular slots in our sentence patterns (e.g., the baseball player the ball. The missing word must be a verb).
tall tales - a story about an impossible or exaggerated happening related in a realistic,

matter-of-fact, and often humorous way (e.g., Paul Bunyan).
text – any printed material.
theme - a topic of discussion in writing. A major idea broad enough to cover the entire scope of a literary work of art. A theme can be a noun or phrase (e.g., friendship, justice).
transitional spelling - the result of an attempt to spell a word whose spelling is not already known, based on a writer's knowledge of the spelling system and how it works.
VC - vowel/consonant
vowel digraph - two vowels pronounced in such a way that the letters together stand for one sound (e.g. /a/ in sleigh).
vowels - a, e, i, o, u and sometimes y and w; made without any air obstruction.
webbing - instructional activities, particularly graphic ones, that are designed to show the relationship among ideas or topics in text or to plan for writing: cognitive mapping.
writer's workshop - instructional time that includes mini-lessons, peer/teacher conferences, process writing, sharing time, author's chair, sustained silent reading, and small teaching groups.
writing folders - a folder or notebook that contains writing generated during the various stages of the writing process.
y as a vowel rule - if y is the only vowel sound at the end of a one-syllable word, y has the sound of long i; if y is the only vowel at the end of a word of more than one syllable, y has a sound almost like long e.

OVERVIEW

MATHEMATICS

Grades 1 - 5

Developmentally appropriate mathematics curriculum for Grades 1 - 5 must encourage the exploration of a wide variety of mathematical ideas and promote in-depth levels of understanding by focusing on the key concepts and processes. Programs should fit the needs of the learner. Student success depends largely on the quality of the foundation that is established during the first years of school. The mathematics curriculum for Grades 1 - 5 must:

Help children develop conceptual understanding of number, space, and situational problems by designing explorations and investigations that make use of everyday objects and specially designed materials (e.g., base-10 blocks).

Actively involve children in doing mathematics with extensive and thoughtful use of manipulatives (concrete materials) in an environment that encourages children to develop, discuss, test, and apply ideas.

Develop newly introduced mathematics concepts by beginning instruction with concrete experiences, progressing to pictorial representations and culminating with abstract symbols.

Require appropriate reasoning and problem-solving experiences from the outset, instilling in students a sense of confidence in their ability to think and communicate mathematically, to detect patterns, and to analyze data.

Emphasize the power of mathematics in helping children understand and interpret their world and solve problems that occur in it.

Include a broad range of content by incorporating an informal approach to measurement, geometry, data analysis, and patterns (algebra). This helps students see the usefulness of mathematics and establishes a foundation for further study.

Provide appropriate and ongoing use of technology by enabling children to explore number ideas and patterns, to focus on problem-solving processes, and to investigate realistic applications. Calculators do not replace the need for students to be fluent with basic facts, have efficient computation strategies, be able to compute mentally, and do paper-and-pencil computation.

NOTE:

Asterisks (*) have been used to identify standards and objectives that must be assessed by the local school district. All other skills may be assessed by the Oklahoma School Testing Program (OSTP).

MATHEMATICS PROCESS STANDARDS

Grades 1-5

The National Council of Teachers of Mathematics (NCTM) has identified five process standards: Problem Solving, Communication, Reasoning and Proof, Connections, and Representation. Using these processes students are actively involved in deepening mathematical understandings which lead to increasingly sophisticated abilities required to meet mathematical challenges. Following is an outline of the five process standards and associated objectives.

NOTE: When examples are given there is a progression in levels of difficulty from basic to more complex skills.

Process Standard 1: Problem Solving

1. Use problem-solving approaches (e.g., act out situations, represent problems with drawings and lists, use concrete, pictorial, graphical, oral, written, and/or algebraic models, understand a problem, devise a plan, carry out the plan, look back).

2. Formulate problems from everyday and mathematical situations (e.g., how many forks are needed?, how many students are absent?, how can we share/divide these cookies?, how many different ways can we find to compare these fractions?).

3. Develop, test, and apply strategies to solve a variety of routine and non-routine problems (e.g., look for patterns, make a table, make a problem simpler, process of elimination, trial and error).

4. Verify and interpret results with respect to the original problem (e.g., students explain verbally why an answer makes sense, explain in a written format why an answer makes sense, verify the validity of each step taken to obtain a final result).

5. Distinguish between necessary and irrelevant information in solving problems (e.g., play games and discuss “best” clues, write riddles with sufficient information, identify unnecessary information in written story problems).

Process Standard 2: Communication

1. Express mathematical ideas coherently and clearly to peers, teachers, and others (e.g., with verbal ideas, models or manipulatives, pictures, or symbols).

2. Extend mathematical knowledge by considering the thinking and strategies of others (e.g., agree or disagree, rephrase another student’s explanation, analyze another student’s explanation).

3. Relate manipulatives, pictures, diagrams, and symbols to mathematical ideas.

4. Represent, discuss, write, and read mathematical ideas and concepts. Start by relating everyday language to mathematical language and symbols and progress toward the use of appropriate terminology (e.g., “add more” becomes “plus”, “repeated addition” becomes “multiplication”, “fair share” becomes “divide”, “balance the equation” becomes “solve the equation”).

Process Standard 3: Reasoning

1. Explain mathematical situations using patterns and relationships (e.g., identify patterns in situations, represent patterns in a variety of ways, extend patterns to connect with more general cases).

2. Demonstrate thinking processes using a variety of age-appropriate materials and reasoning processes (e.g., manipulatives, models, known facts, properties and relationships, inductive [specific to general], deductive [general to specific], spatial, proportional, logical reasoning ["and" "or" "not"] and recursive reasoning).

3. Make predictions and draw conclusions about mathematical ideas and concepts. Predictions become conjectures and conclusions become more logical as students mature mathematically.

Process Standard 4: Connections

1. Relate various concrete and pictorial models of concepts and procedures to one another (e.g., use two colors of cubes to represent addition facts for the number 5, relate patterns on a hundreds chart to multiples, use base-10 blocks to represent decimals).

2. Link concepts to procedures and eventually to symbolic notation (e.g., represent actions like snap, clap, clap with symbols A B B, demonstrate 3 • 4 with a geometric array, divide a candy bar into 3 equal pieces that represent one piece as $\frac{1}{3}$).

3. Recognize relationships among different topics within mathematics (e.g., the length of an object can be represented by a number, multiplication facts can be modeled with geometric arrays, $\frac{1}{2}$ can be written as .5 and 50%).

4. Use mathematical strategies to solve problems that relate to other curriculum areas and the real world (e.g., use a timeline to sequence events, use symmetry in art work, explore fractions in quilt designs and to describe pizza slices).

Process Standard 5: Representation

1. Create and use a variety of representations appropriately and with flexibility to organize, record, and communicate mathematical ideas (e.g., dramatizations, manipulatives, drawings, diagrams, tables, graphs, symbolic representations).

2. Use representations to model and interpret physical, social, and mathematical situations (e.g., counters, pictures, tally marks, number sentences, geometric models; translate between diagrams, tables, charts, graphs).

MATHEMATICS CONTENT STANDARDS

Grade 1

The following concepts and skills should be mastered by all students upon completion of first grade. The **Major Concepts** should be taught in depth using a variety of methods, applications, and connections to other concepts when possible so that all students have accessibility to and an understanding of these concepts.

MAJOR CONCEPTS

- **Develop an understanding of whole number relationships, including grouping tens and ones.**
- **Develop an understanding of addition and subtraction. Acquire strategies for basic addition and subtraction facts.**
- **Recognize and describe basic two- and three-dimensional shapes.**

First Grade Suggested Materials Kit:
snap cubes, keys, fabric, macaroni, buttons, pattern blocks, children's books, counters, beans, base-10 blocks, dominoes, calculators, geoboards, tangrams, attribute blocks, straws, containers, balance scales, rulers, coins, clocks, graph mats, painted beans or two-color counters, fraction circles, fraction squares

Standard 1: Algebraic Reasoning: Patterns and Relationships - The student will use a variety of problem-solving approaches to model, describe and extend patterns.

1. Describe, extend and create patterns using concrete objects (e.g., sort a bag of objects by attributes and orally communicate the pattern for each grouping).
2. Describe, extend and create patterns with numbers in a variety of situations (e.g., addition charts, skip counting, calendars).
3. Demonstrate number patterns by counting as many as 100 objects by 1's, 2's, 5's and 10's.
4. Recognize and apply the commutative and identity properties of addition using models and manipulatives to develop computational skills (e.g., $2 + 4 = 4 + 2$, $3 + 0 = 3$).

Standard 2: Number Sense and Operation - The student will read, write and model numbers and number relationships. The student will use models to construct basic addition and subtraction facts with whole numbers.

1. Number Sense
   a. Use concrete models of tens and ones to develop the concept of place value.
   b. Compare objects by size and quantity (e.g., more than, less than, equal to).
   c. Read and write numerals to 100.

d. Manipulate physical models and recognize graphical representation of fractional parts (e.g., halves, thirds, fourths).

2. Number Operations

   a. Develop and apply the concepts of addition and subtraction.

      i. Use models to construct addition and subtraction facts with sums up to twenty (e.g., counters, cubes).

      ii. Perform addition by joining sets of objects and subtraction by separating and by comparing sets of objects.

      iii. Demonstrate fluency (i.e., memorize and apply) with basic addition facts to make a maximum sum of 10 and the associated subtraction facts (e.g., 7+3=10 and 10-3=7).

   b. Write addition and subtraction number sentences for problem-solving situations.

   c. Acquire strategies for making computations using tens and ones to solve two-digit addition and subtraction problems without regrouping (e.g., use estimation, number sense to judge reasonableness, counting on, use base-ten blocks).

Standard 3: Geometry - The student will use geometric properties and relationships to recognize and describe shapes.

1. Sort and identify congruent shapes.

2. Identify, name, and describe two-dimensional geometric shapes (including rhombi) and objects in everyday situations (e.g., the face of a round clock is a circle, a desktop is a rectangle).

3. Identify, name and describe three-dimensional geometric shapes (including cones) and objects in everyday situations (e.g., a can is a cylinder, a basketball is a sphere).

4. Use language to describe relationships of objects in space (e.g., above, below, behind, between).

Standard 4: Measurement - The student will develop and use measurement skills in a variety of situations.

1. Linear Measurement: Measure objects with one-inch tiles and with a standard ruler to the nearest inch.

2. Time

   a. Tell time on digital and analog clocks on the hour and half-hour.

   b. Develop the concepts of days, weeks, and months using a calendar.

3. Money: Identify and name the value of pennies, dimes, nickels, and quarters.

Standard 5: Data Analysis - The student will demonstrate an understanding of data collection and display.

1. Data Analysis

   a. Organize, describe, and display data using concrete objects, pictures, or numbers.

   b. Formulate and solve problems that involve collecting and analyzing data common to children's lives (e.g., color of shoes, numbers of pets, favorite foods).

MATHEMATICS CONTENT STANDARDS

Grade 2

The following concepts and skills should be mastered by all students upon completion of second grade. The **Major Concepts** should be taught in depth using a variety of methods, applications, and connections to other concepts when possible so that all students have accessibility to and an understanding of these concepts.

<u>**MAJOR CONCEPTS**</u>

- **Develop an understanding of the base-ten system and place value within that system, up to the hundreds place.**
- **Develop quick recall of addition facts and related subtraction facts (fact families) as well as fluency with multi-digit addition and subtraction.**
- **Develop an understanding of linear measurement facility in measuring lengths.**

Second Grade Suggested Materials Kit:
snap cubes, keys, fabric, macaroni, buttons, cans, objects from nature, pattern blocks, children's books, links, rods, counters, beans, base-10 blocks, dominoes, calculators, geoboards, tangrams, attribute blocks, straws, containers, balance scales, rulers, tape measures, cups, spoons, coins, clocks, graph mats, painted beans or two-color counters

Standard 1: Algebraic Reasoning: Patterns and Relationships - The student will use a variety of problem-solving approaches to model, describe and extend patterns.

1. Describe, extend, and create patterns using symbols, shapes, or designs (e.g., repeating and growing patterns made up of sets of shapes or designs, create patterns by combining different shapes and taking them apart).

2. Formulate and record generalizations about number patterns in a variety of situations (e.g., addition and subtraction patterns, even and odd numbers, build a table showing the cost of one pencil at 10 cents, 2 pencils at 20 cents).

3. Find unknown values in open number sentences with a missing addend and use to solve everyday problems.

4. Recognize and apply the associative property of addition (e.g., 3 + (2 +1) = (3 + 2) + 1).

Standard 2: Number Sense and Operation - The student will use numbers and number relationships to acquire basic facts and will compute with whole numbers less than 100.

1. Number Sense

   a. Use concrete models of hundreds, tens, and ones to develop the concepts of place value and link the concepts to the reading and writing of numbers (e.g., base-10 blocks).

b. Represent a number in a variety of ways (e.g., write 15 as 8 + 7, write 25 as 2 tens + 5 ones or as 1 ten + 15 ones).

c. Write a number sentence to compare numbers less than 1,000 (e.g., 425 > 276, 73 < 107, page 351 comes after 350, 753 is between 700 and 800).

d. Demonstrate (using concrete objects, pictures, and numerical symbols) fractional parts including halves, thirds, fourths and common percents (25%, 50%, 75%, and 100%).

2. Number Operations

   a. Demonstrate fluency (i.e., memorize and apply) with basic addition facts to make a maximum sum of 18 and the associated subtraction facts (e.g., 15+3=18 and 18-3=15).

   b. Use strategies to estimation and solve sums and differences (e.g., compose, decompose and regroup numbers, use knowledge of 10 to estimate quantities and sums [two numbers less than 10 cannot add up to more than 20].)

   c. Solve two-digit addition and subtraction problems with and without regrouping using a variety of techniques.

   d. Use concrete models to develop understanding of multiplication as repeated addition and division as successive subtraction.

Standard 3: Geometry - The student will use geometric properties and relationships to recognize and describe shapes.

1. Identify symmetric and congruent shapes and figures.

2. Investigate and predict the results of putting together and taking apart two-dimensional shapes.

Standard 4: Measurement - The student will use appropriate units of measure in a variety of situations.

1. Linear Measurement

   a. Measure objects using standard units (e.g., measure length to the nearest foot, inch, and half inch).

   b. Select and use appropriate units of measurement in problem solving and everyday situations.

2. Time

   a. Tell time on digital and analog clocks on the quarter-hour.

   b. Solve problems involving number of days in a week, month, or year and problems involving weeks in a month and year.

3. Money

a. Identify and count money up to a twenty dollar bill.

b. Recognize and write different amounts of money using dollar and cent notation.

Standard 5: Data Analysis - The student will demonstrate an understanding of data collection, display, and interpretation.

1. Data Analysis

   a. Collect, sort, organize, and display data in charts, bar graphs, and tables (e.g., collect data on teeth lost and display results in a chart).

   b. Summarize and interpret data in charts, bar graphs, and tables.

MATHEMATICS CONTENT STANDARDS

Grade 3

The following concepts and skills should be mastered by all students upon completion of third grade. The **Major Concepts** should be taught in depth using a variety of methods, applications, and connections to other concepts when possible so that all students have accessibility to and an understanding of these concepts.

MAJOR CONCEPTS

- **Develop an understanding of multiplication and division and acquire strategies for basic multiplication facts and related division facts (fact families).**
- **Develop an understanding of fractional parts and fraction equivalence.**
- **Describe and analyze various properties of two-dimensional shapes.**

Third Grade Suggested Materials Kit:
snap cubes, pattern blocks, 1-inch color tiles, centimeter grid paper, hundreds charts, children's books, links, rods, counters, beans, base-10 blocks, dominoes, calculators, geoboards, tangrams, attribute blocks, mirrors, flexible straws, egg cartons, containers, balance scales, rulers, tape measures, cups, spoons, coins, clocks, place value mats, graph mats

Standard 1: Algebraic Reasoning: Patterns and Relationships - The student will use a variety of problem-solving approaches to extend and create patterns.

1. Describe (orally or in written form), create, extend and predict patterns in a variety of situations (e.g., 3, 6, 9, 12 . . . , use a function machine to generate input and output values for a table, show multiplication patterns on a hundreds chart, determine a rule and generate additional pairs with the same relationship).
2. Find unknowns in simple arithmetic problems by solving open sentences (equations) and other problems involving addition, subtraction, and multiplication.
3. Recognize and apply the commutative and identity properties of multiplication using models and manipulative to develop computational skills (e.g., $3 \cdot 5 = 5 \cdot 3$, $7 \cdot 1 = 7$).

Standard 2: Number Sense and Operation – The student will use numbers and number relationships to acquire basic facts. The student will estimate and compute with whole numbers.

1. Number Sense
   a. Place Value

Note: Asterisks (*) have been used to identify standards and objectives that must be assessed by the local school district. All other skills may be assessed by the Oklahoma School Testing Program (OSTP).

i. Model the concept of place value through 4 digits (e.g., base-10 blocks, bundles of 10s, place value mats).

ii. Read and write whole numbers up to 4 digits (e.g., expanded form, standard form).

b. Whole Numbers and Fractions

i. Compare and order whole numbers up to 4 digits.

ii. Create and compare physical and pictorial models of equivalent and nonequivalent fractions including halves, thirds, fourths, eighths, tenths, twelfths, and common percents (25%, 50%, 75%, 100%) (e.g., fraction circles, pictures, egg cartons, fraction strips, number lines).

2. Number Operations

a. Estimate and find the sum or difference (with and without regrouping) of 3- and 4-digit numbers using a variety of strategies to solve application problems.

b. Multiplication Concepts and Fact Families

i. Use physical models and a variety of multiplication algorithms to find the product of multiplication problems with one-digit multipliers.

ii. Demonstrate fluency (memorize and apply) with basic multiplication facts up to 10 x 10 and the associated division facts (e.g., 5 x 6 = 30 and 30 ÷ 6 = 5).

iii. Estimate the product of 2-digit by 2-digit numbers by rounding to the nearest multiple of 10 to solve application problems.

Standard 3: Geometry - The student will use geometric properties and relationships to recognize and describe shapes.

1. Identify and compare attributes of two- and three- dimensional shapes and develop vocabulary to describe the attributes (e.g., count the edges and faces of a cube, the radius is half of a circle, lines of symmetry).

2. Analyze the effects of combining and subdividing two- and three-dimensional figures (e.g., folding paper, tiling, nets, and rearranging pieces of solids).

3. Make and use coordinate systems to specify locations and shapes on a grid with ordered pairs and to describe paths from one point to another point on a grid.

Standard 4: Measurement - The student will use appropriate units of measure to solve problems.

1. Measurement

a. Choose an appropriate measurement instrument and measure the length of objects to the nearest inch or half-inch and the weight of objects to the nearest pound or ounce.

*b. Choose an appropriate measurement instrument and measure the length of objects to the nearest meter or centimeter and the weight of objects to the nearest gram or kilogram.

c. Develop and use the concept of perimeter of different shapes to solve problems.

*d. Develop and use strategies to choose an appropriate unit and measurement instrument to estimate measurements (e.g., use parts of the body as benchmarks for measuring length).

2. Time and Temperature

   a. Solve simple addition problems with time (e.g., 15 minutes added to 1:10 p.m.).

   b. Tell time on a digital and analog clock to the nearest 5 minute.

   c. Read a thermometer and solve for temperature change.

3. Money: Determine the correct amount of change when a purchase is made with a five dollar bill.

Standard 5: Data Analysis - The student will demonstrate an understanding of collection, display, and interpretation of data and probability.

1. Data Analysis

   *a. Pose questions, collect, record, and interpret data to help answer questions (e.g., which was the most popular booth at our carnival?).

   b. Read graphs and charts, identify the main idea, draw conclusions, and make predictions based on the data (e.g., predict how many children will bring their lunch based on a menu).

   c. Construct bar graphs, frequency tables, line graphs (plots), and pictographs with labels and a title from a set of data.

2. Probability: Describe the probability (more, less, or equally likely) of chance events.

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MATHEMATICS CONTENT STANDARDS

Grade 4

The following concepts and skills should be mastered by all students upon completion of fourth grade. The **Major Concepts** should be taught in depth using a variety of methods, applications, and connections to other concepts when possible so that all students have accessibility to and an understanding of these concepts.

MAJOR CONCEPTS

- **Develop quick recall of multiplication facts and related division facts (fact families) and fluency with whole number multiplication.**
- **Develop an understanding of decimals and their connection to fractions.**
- **Develop an understanding of area and acquire strategies for finding area of two-dimensional shapes.**

Fourth Grade Suggested Materials Kit:
snap cubes, number cubes, pattern blocks, 1-inch color tiles, grid paper, hundreds charts, cereal and shoe boxes, children's books, journals, rods, counters, beans, base-10 blocks, calculators, geoboards, dot paper, clay, toothpicks, mirrors, flexible straws, pipe cleaners, egg cartons, containers, balance scales, rulers, tape measures, thermometers, cups, spoons, coins, clocks, graph mats, spinners, painted beans or two-color counters

Standard 1: Algebraic Reasoning: Patterns and Relationships - The student will use a variety of problem-solving approaches to create, extend, and analyze patterns.

1. Discover, describe, extend, and create a wide variety of patterns using tables, graphs, rules, and verbal models (e.g., determine the rule from a table or "function machine", extend visual and number patterns).
2. Find variables in simple arithmetic problems by solving open sentences (equations) and other problems involving addition, subtraction, multiplication, and division with whole numbers.
3. Recognize and apply the associative property of multiplication (e.g., $6 \cdot (2 \cdot 3) = (6 \cdot 2) \cdot 3$).

Standard 2: Number Sense and Operation – The student will use numbers and number relationships to acquire basic facts. The student will estimate and compute with whole numbers and fractions.

1. Number Sense
   a. Place Value

Note: Asterisks (*) have been used to identify standards and objectives that must be assessed by the local school district. All other skills may be assessed by the Oklahoma School Testing Program (OSTP).

i. Apply the concept of place value through 6 digits (e.g., write numbers in expanded form).

ii. Model, read, write and rename decimal numbers to the hundredths (e.g., money, numerals to words).

b. Whole Number, Fraction, and Decimal

i. Compare and order whole numbers and decimals to the hundredths place (e.g., pictures of shaded regions of two-dimensional figures, use >, <, = symbols).

ii. Use 0, 1/2, and 1 or 0, 0.5, and 1 as benchmarks and place additional fractions, decimals, and percents on a number line (e.g., 1/3, 3/4, 0.7, 0.4, 62%, 12%).

iii. Compare, add, or subtract fractional parts (fractions with like denominators and decimals) using physical or pictorial models. (e.g., egg cartons, fraction strips, circles, and squares).

*iv. Explore and connect negative numbers using real world situations (e.g. owing money, temperature, measuring elevations above and below sea level).

2. Number Operation

a. Estimate and find the product of up to three-digit by three-digit using a variety of strategies to solve application problems.

b. Division Concepts and Fact Families

i. Demonstrate fluency (memorize and apply) with basic division facts up to 144 ÷ 12 and the associated multiplication facts (e.g., 144 ÷ 12 = 12 and 12 x 12 = 144).

ii. Estimate the quotient with one- and two-digit divisors and a two- or three-digit dividend to solve application problems.

iii. Find the quotient (with and without remainders) with 1-digit divisors and a 2- or 3-digit dividend to solve application problems.

Standard 3: Geometry - The student will use geometric properties and relationships to analyze shapes.

1. Identify, draw, and construct models of intersecting, parallel, and perpendicular lines.
2. Identify and compare angles equal to, less than, or greater than 90 degrees (e.g., use right angles to determine the approximate size of other angles).
3. Identify, draw, and construct models of regular and irregular polygons including triangles, quadrilaterals, pentagons, hexagons, heptagons, and octagons to solve problems.
4. Describe the effects on two-dimensional objects when they slide (translate), flip (reflect), and turn (rotate) (e.g., tessellations).

Standard 4: Measurement - The student will solve problems using appropriate units of measure in a variety of situations.

1. Measurement

   a. Estimate the measures of a variety of objects using customary units.

   b. Establish benchmarks for metric units and estimate the measures of a variety of objects (e.g., mass: the mass of a raisin is about 1 gram, length: the width of a finger is about 1 centimeter).

   c. Select appropriate customary and metric units of measure and measurement instruments to solve application problems involving length, weight, mass, area, and volume.

   d. Develop and use the concept of area of different shapes using grids to solve problems.

2. Time and Temperature

   a. Solve elapsed time problems.

   b. Read thermometers using different intervals (intervals of 1, 2, or 5) and solve for temperature change.

3. Money: Determine the correct amount of change when a purchase is made with a twenty dollar bill.

Standard 5: Data Analysis - The student will demonstrate an understanding of collection, display, and interpretation of data and probability.

1. Data Analysis

   a. Read and interpret data displays such as tallies, tables, charts, and graphs and use the observations to pose and answer questions (e.g., choose a table in social studies of population data and write problems).

   b. Collect, organize and record data in tables and graphs (e.g., line graphs (plots), bar graphs, pictographs).

2. Probability: Predict the probability of outcomes of simple experiments using words such as certain, equally likely, impossible (e.g., coins, number cubes, spinners).

3. Central Tendency: Determine the median (middle), and the mode (most often) of a set of data.

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Assessment" to go to the assessment page and then click on "Oklahoma Core Curriculum Tests (OCCT)" on the menu on the left side of the screen.

MATHEMATICS CONTENT STANDARDS

Grade 5

The following concepts and skills should be mastered by all students upon completion of fifth grade. The **Major Concepts** should be taught in depth using a variety of methods, applications, and connections to other concepts when possible so that all students have accessibility to and an understanding of these concepts.

MAJOR CONCEPTS

- **Develop an understanding of and fluency with division of whole numbers.**
- **Develop an understanding of and fluency with addition and subtraction of fractions and decimals.**
- **Recognize patterns and their associated rules and develop basic algebraic strategies for solving problems with variables.**

Fifth Grade Suggested Materials Kit:
snap cubes, rods, 1-inch color tiles, calculators, boxes, pawns, number cubes, balance scale, fraction strips, tangrams, protractors, double-sided measuring tapes, spinners, geometric solids, squares, circles, base-10 blocks, 10 x 10 grid paper, pattern blocks, fraction and decimal towers, geoboards, computer tessellation software

Standard 1: Algebraic Reasoning: Patterns and Relationships – The student will use algebraic methods to describe patterns and solve problems in a variety of contexts.

1. Describe rules that produce patterns found in tables, graphs, and models, and use variables (e.g., boxes, letters, pawns, number cubes, or other symbols) to solve problems or to describe general rules in algebraic expression or equation form.

2. Use algebraic problem-solving techniques (e.g., use a balance to model an equation and show how subtracting a number from one side requires subtracting the same amount from the other side) to solve problems.

3. Recognize and apply the commutative, associative, and distributive properties to solve problems (e.g., 3 x (2 + 4) = (3 x 2) + (3 x 4).

Standard 2: Number Sense and Operation – The student will use numbers and number relationships to acquire basic facts. The student will estimate and compute with whole numbers, fractions, and decimals.

1. Number Sense

   a. Apply the concept of place value of whole numbers through hundred millions (9 digits) and model, read, and write decimal numbers through the thousandths.

Note: Asterisks (*) have been used to identify standards and objectives that must be assessed by the local school district. All other skills may be assessed by the Oklahoma School Testing Program (OSTP).

b. Represent with models the connection between fractions and decimals, compare and order fractions and decimals, and be able to convert from one representation to the other to solve problems. (e.g., use 10x10 grids, base 10 blocks).

c. Identify and compare integers using real world situations. (e.g., owing money, temperature, or measuring elevations above and below sea level).

*d. Identify and apply factors, multiples, prime, and composite numbers in a variety of problem-solving situations (e.g., build rectangular arrays for numbers 1-100 and classify as prime or composite, use common factors to add fractions).

2. Number Operations

a. Estimate, add, or subtract decimal numbers with same and different place values to solve problems (e.g., 3.72 + 1.4, $4.56 - $2.12).

b. Estimate add, or subtract fractions (including mixed numbers) to solve problems using a variety of methods (e.g., use fraction strips, use area models, find a common denominator).

c. Estimate and find the quotient (with and without remainders) with two-digit divisors and a two- or three-digit dividend to solve application problems.

Standard 3: Geometry - The student will apply geometric properties and relationships.

1. Compare and contrast the basic characteristics of circle and polygons (triangles, quadrilaterals, pentagons, hexagons, heptagons, octagons).

2. Classify angles (e.g., acute, right, obtuse, straight).

Standard 4: Measurement - The student use appropriate units of measure to solve problems in a variety of contexts.

1. Measurement

a. Compare, estimate, and determine the measurement of angles.

b. Develop and use the formula for perimeter and area of a square and rectangle to solve application problems.

c. Convert basic measurements of volume, mass and distance within the same system for metric and customary units (e.g., inches to feet, hours to minutes, centimeters to meters).

2. Money: Solve a variety of problems involving money.

Standard 5: Data Analysis - The student will use data analysis, statistics and probability to interpret data in a variety of contexts.

1. Data Analysis

a. Compare and translate displays of data and justify the selection of the type of table of graph (e.g., charts, tables, bar graphs, pictographs, line graphs, circle graphs, Venn diagrams).

*b. Formulate questions, design investigations, consider samples, and collect, organize, and analyze data using observation, measurement, surveys, or experiments (e.g., how far can 5th graders throw a softball based on where it first hits the ground?).

2. Probability

a. Determine the probability of events occurring in familiar contexts or experiments and express probabilities as fractions from zero to one (e.g., find the fractional probability of an event given a biased spinner).

b. Use the fundamental counting principle on sets with up to four items to determine the number of possible combinations (e.g. create a tree diagrams to see possible combinations).

3. Central Tendency: Determine the range (spread), mode (most often), and median (middle) of a set of data.

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OVERVIEW

Grades 6 - 8

Students in the middle grades will expand and deepen their knowledge of numbers, computation, estimation, measurement, geometry, statistics, probability, patterns and functions, and the fundamental concepts of algebra by focusing on meaningful mathematics in each of these areas.

Instruction in the middle grades should include activities in which the students actively work to pose and solve problems both individually and together. Learning tools such as concrete models, fraction manipulatives, algebra tiles, geoboards, calculators and computers are beneficial and should be available to all students.

MATHEMATICS PROCESS STANDARDS

Grades 6 - 8

The National Council of Teachers of Mathematics (NCTM) has identified five process standards: Problem Solving, Reasoning and Proof, Communication, Connections, and Representation. Active involvement by students using these processes is likely to broaden mathematical understandings and lead to increasingly sophisticated abilities required to meet mathematical challenges in meaningful ways.

Process Standard 1: Problem Solving

1. Develop and test strategies to solve practical, everyday problems which may have single or multiple answers.

2. Use technology to generate and analyze data to solve problems.

3. Formulate problems from situations within and outside of mathematics and generalize solutions and strategies to new problem situations.

4. Evaluate results to determine their reasonableness.

5. Apply a variety of strategies (e.g., restate the problem, look for a pattern, diagrams, solve a simpler problem, work backwards, trial and error) to solve problems, with emphasis on multistep and non-routine problems.

6. Use oral, written, concrete, pictorial, graphical, and/or algebraic methods to model mathematical situations.

Process Standard 2: Communication

1. Discuss, interpret, translate (from one to another) and evaluate mathematical ideas (e.g., oral, written, pictorial, concrete, graphical, algebraic).

2. Reflect on and justify reasoning in mathematical problem solving (e.g., convince, demonstrate, formulate).

3. Select and use appropriate terminology when discussing mathematical concepts and ideas.

Process Standard 3: Reasoning

1. Identify and extend patterns and use experiences and observations to make suppositions.

2. Use counter examples to disprove suppositions (e.g., all squares are rectangles, but are all rectangles squares?).

3. Develop and evaluate mathematical arguments (e.g., agree or disagree with the reasoning of other classmates and explain why).

4. Select and use various types of reasoning (e.g., recursive [loops], inductive [specific to general], deductive [general to specific], spatial, and proportional).

Process Standard 4: Connections

1. Apply mathematical strategies to solve problems that arise from other disciplines and the real world.

2. Connect one area or idea of mathematics to another (e.g., relates equivalent number representations to each other, relate experiences with geometric shapes to understanding ratio and proportion).

Process Standard 5: Representation

1. Use a variety of representations to organize and record data (e.g., use concrete, pictorial, and symbolic representations).

2. Use representations to promote the communication of mathematical ideas (e.g., number lines, rectangular coordinate systems, scales to illustrate the balance of equations).

3. Develop a variety of mathematical representations that can be used flexibly and appropriately (e.g., base-10 blocks to represent fractions and decimals, appropriate graphs to represent data).

4. Use a variety of representations to model and solve physical, social, and mathematical problems (e.g., geometric objects, pictures, charts, tables, graphs).

MATHEMATICS CONTENT STANDARDS

Grade 6

The following concepts and skills should be mastered by all students upon completion of sixth grade. The **Major Concepts** should be taught in depth using a variety of methods, applications, and connections to other concepts when possible so that all students have accessibility to and an understanding of these concepts.

MAJOR CONCEPTS

- **Develop an understanding of and fluency with multiplication and division of fractions and decimals.**
- **Write, interpret, use, simplify, and solve mathematical expressions and equations.**
- **Develop a basic understanding of integer operations.**

Standard 1: Algebraic Reasoning: Patterns and Relationships – The student will use algebraic methods to describe patterns, simplify and write algebraic expressions and equations, and solve simple equations in a variety of contexts.

1. Generalize and extend patterns and functions using tables, graphs, and number properties (e.g., number sequences, prime and composite numbers, recursive patters like the Fibonacci numbers).
2. Write algebraic expressions and simple equations that correspond to a given situation.
3. Use substitution to simplify and evaluate algebraic expressions (e.g., if $x = 5$ evaluate $3 - 5x$).
4. Write and solve one-step equations with one variable using number sense, the properties of operations, and the properties of equality (e.g., $1/3x = 9$).

Standard 2: Number Sense and Operation – The student will use numbers and number relationships to solve a variety of problems. The student will estimate and compute with integers, fractions, and decimals.

1. Number Sense: Convert compare, and order decimals, fractions, and percents using a variety of methods.
2. Number Operations
   a. Multiply and divide fractions and mixed numbers to solve problems using a variety of methods.

Note: Asterisks (*) have been used to identify standards and objectives that must be assessed by the local school district. All other skills may be assessed by the Oklahoma School Testing Program (OSTP).

b. Multiply and divide decimals with one- or two-digit multipliers or divisors to solve problems.

c. Estimate and find solutions to single and multi-step problems using whole numbers, decimals, fractions, and percents (e.g., 7/8 + 8/9 is about 2, 3.9 + 5.3 is about 9).

d. Use the basic operations on integers to solve problems.

e. Build and recognize models of multiples to develop the concept of exponents and simplify numerical expressions with exponents and parentheses using order of operations.

Standard 3: Geometry - The student will use geometric properties and relationships to recognize, describe, and analyze shapes and representations in a variety of contexts.

1. Compare and contrast the basic characteristics of three-dimensional figures (pyramids, prisms, cones, and cylinders).

2. Compare and contrast congruent and similar figures.

3. Identify the characteristics of the rectangular coordinate system and use them to locate points and describe shapes drawn in all four quadrants.

Standard 4: Measurement - The student will use measurements within the metric and customary systems to solve problems in a variety of contexts.

1. Use formulas to find the circumference and area of circles in terms of pi.
2. Convert, add, or subtract measurements within the same system to solve problems (e.g., 9' 8" + 3' 6, 150 minutes = __ hours and __ minutes, 6 square inches = __ square feet).

Standard 5: Data Analysis - The student will use data analysis, probability, and statistics to interpret data in a variety of contexts.

1. Data Analysis: Organize, construct displays, and interpret data to solve problems (e.g., data from student experiments, tables, diagrams, charts, graphs).

2. Probability: Use the fundamental counting principle on sets with up to five items to determine the number of possible combinations.

3. Central Tendency: Find the measures of central tendency (mean, median, mode, and range) of a set of data (with and without outliers) and understand why a specific measure provides the most useful information in a given context.

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MATHEMATICS CONTENT STANDARDS

Grade 7

The following concepts and skills should be mastered by all students upon completion of seventh grade. The **Major Concepts** should be taught in depth using a variety of methods, applications, and connections to other concepts when possible so that all students have accessibility to and an understanding of these concepts.

MAJOR CONCEPTS

- **Develop an understanding of proportionality and apply that understanding to solve problems.**
- **Develop an understanding of and fluency with operations on all rational numbers.**
- **Develop and apply strategies for solving linear equations.**

Standard 1: Algebraic Reasoning: Patterns and Relationships – The student will use number properties and algebraic reasoning to identify, simplify, and solve simple linear equations and inequalities.

1. Identify, describe, and analyze functional relationships (linear and nonlinear) between two variables (e.g., as the value of x increases on a table, do the values of y increase or decrease, identify a positive rate of change on a graph and compare it to a negative rate of change).
2. Write and solve two-step equations with one variable using number sense, the properties of operations, and the properties of equality (e.g., $-2x + 4 = -2$).
3. Inequalities: Model, write, solve, and graph one-step linear inequalities with one variable.

Standard 2: Number Sense and Operation – The student will use numbers and number relationships to solve a variety of problems.

1. Number Sense
   - a. Compare and order positive and negative rational numbers.
   - b. Build and recognize models of perfect squares to find their square roots and estimate the square root of other numbers (e.g., the square root of 12 is between 3 and 4).
   - *c. Demonstrate the concept of ratio and proportion with models (e.g., similar geometric shapes, scale models).
2. Number Operations

Note: Asterisks (*) have been used to identify standards and objectives that must be assessed by the local school district. All other skills may be assessed by the Oklahoma School Testing Program (OSTP).

a. Solve problems using ratios and proportions.

b. Solve percent application problems (e.g., discounts, tax, finding the missing value of percent/part/whole).

c. Simplify numerical expressions with integers, exponents, and parentheses using order of operations.

Standard 3: Geometry - The student will apply the properties and relationships of plane geometry in a variety of contexts.

1. Classify regular and irregular geometric figures including triangles and quadrilaterals according to their sides and angles.

2. Identify and analyze the angle relationships formed by parallel lines cut by a transversal (e.g., alternate interior angles, alternate exterior angles, adjacent, and vertical angles).

3. Construct geometric figures and identify geometric transformations on the rectangular coordinate plane (e.g., rotations, translations, reflections, magnifications).

Standard 4: Measurement - The student will use measurement to solve problems in a variety of contexts.

1. Develop and apply the formulas for perimeter and area of triangles and quadrilaterals to solve problems.

2. Apply the formula for the circumference and area of a circle to solve problems.

3. Find the area and perimeter of composite figures to solve application problems.

Standard 5: Data Analysis - The student will use data analysis, probability, and statistics to interpret data in a variety of contexts.

1. Data Analysis: Compare, translate, and interpret between displays of data (e.g., multiple sets of data on the same graph, data from subsets of the same population, combinations of diagrams, tables, charts, and graphs).

2. Probability: Determine the probability of an event involving “or”, “and”, or “not” (e.g., on a spinner with one blue, two red and two yellow sections, what is the probability of getting a red or a yellow?).

3. Central Tendency: Compute the mean, median, mode, and range for data sets and understand how additional data or outliers in a set may affect the measures of central tendency.

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MATHEMATICS CONTENT STANDARDS

Grade 8

The following concepts and skills should be mastered by all students upon completion of eighth grade. The **Major Concepts** should be taught in depth using a variety of methods, applications, and connections to other concepts when possible so that all students have accessibility to and an understanding of these concepts.

MAJOR CONCEPTS

- **Analyze and represent linear functions as equations, tables, graphs, and verbal expressions.**
- **Develop an understanding of surface area and volume of three-dimensional shapes and use formulas to find the surface area and volume.**
- **Analyze and summarize data sets in various formats.**

Standard 1: Algebraic Reasoning: Patterns and Relationships – The student will graph and solve linear equations and inequalities in problem solving situations.

1. Equations
   a. Model, write, and solve multi-step linear equations with one variable using a variety of methods to solve application problems.
   b. Graph and interpret the solution to one- and two-step linear equations on a number line with one variable and on a coordinate plane with two variables.
   c. Predict the effect on the graph of a linear equation when the slope or y-intercept changes (e.g., make predictions from graphs, identify the slope or y-intercept in the equation y = mx + b and relate to a graph).
   d. Apply appropriate formulas to solve problems (e.g., d=rt, I=prt).
2. Inequalities: Model, write, solve, and graph one- and two-step linear inequalities with one variable.

Standard 2: Number Sense and Operation – The student will use numbers and number relationships to solve a variety of problems.

1. Number Sense: Represent and interpret large numbers and numbers less than one in exponential and scientific notation.
2. Number Operations
   a. Use the rules of exponents, including integer exponents, to solve problems (e.g., $7^2 \cdot 7^3 = 7^5$, $3^{-10} \cdot 3^8 = 3^{-2}$).
   b. Solve problems using scientific notation.

Note: Asterisks (*) have been used to identify standards and objectives that must be assessed by the local school district. All other skills may be assessed by the Oklahoma School Testing Program (OSTP).

c. Simplify numerical expressions with rational numbers, exponents, and parentheses using order of operations.

Standard 3: Geometry - The student will use geometric properties to solve problems in a variety of contexts.

1. Construct models, sketch (from different perspectives), and classify solid figures such as rectangular solids, prisms, cones, cylinders, pyramids, and combined forms.

2. Develop the Pythagorean Theorem and apply the formula to find the length of line segments, the shortest distance between two points on a graph, and the length of an unknown side of a right triangle.

Standard 4: Measurement - The student will use measurement to solve problems in a variety of contexts.

1. Develop and apply formulas to find the surface area and volume of rectangular prisms, triangular prisms, and cylinders (in terms of pi).

2. Apply knowledge of ratio and proportion to solve relationships between similar geometric figures.

3. Find the area of a "region of a region" for simple composite figures and the area of cross sections of regular geometric solids (e.g., area of a rectangular picture frame).

Standard 5: Data Analysis - The student will use data analysis, probability, and statistics to interpret data in a variety of contexts.

1. Data Analysis: Select, analyze and apply data displays in appropriate formats to draw conclusions and solve problems.

*2. Probability: Determine how samples are chosen (random, limited, biased) to draw and support conclusions about generalizing a sample to a population (e.g., is the average height of a men's college basketball team a good representative sample for height predictions?).

3. Central Tendency: Find the measures of central tendency (mean, median, mode, and range) of a set of data and understand why a specific measure provides the most useful information in a given context.

Blueprints for each Criterion-Referenced Test reflect the degree of representation given on the test to each *PASS* standard and objective. The item specifications give more specific information about content limits for each objective as well as sample items. To access the most current blueprints and item specifications available, go to the State Department of Education Web site at <http://sde.state.ok.us> then click on teacher icon/picture to get to the teacher resources page. From the teacher resources page, click on "Accountability and Assessment" to go to the assessment page and then click on "Oklahoma Core Curriculum Tests (OCCT)" on the menu on the left side of the screen.

OVERVIEW

High School

The *Priority Academic Student Skills (PASS)* in mathematics for high school establishes a framework for a curriculum that reflects the needs of all students. Such a curriculum recognizes that they will spend their adult lives in a society increasingly dominated by technology and quantitative methods.

A broadened view of mathematics will include the traditional topics of algebra and geometry but must also include the mathematical processes of problem-solving, communication, reasoning, connections, and representation. Although they are stated separately for emphasis, these process standards should be integrated throughout the high school core curriculum.

A school's curriculum in mathematics should be organized to permit all students to progress as far into the mathematics proposed here as their achievement with the objectives allows. Schools should use this material to create a curriculum most beneficial to their students. Those students planning to continue their mathematics education should study additional advanced mathematics topics such as trigonometry and calculus.

The curriculum is intended to provide a common body of mathematical ideas accessible to all students. It is recognized that students entering high school differ in many ways, including mathematical achievement, but it is believed these differences are best addressed by extensions of the proposed content rather than by deletions.

The increasing role of technology in instruction will alter the teaching and learning of mathematics. Calculators and computers should be integrated throughout the curriculum so that students will concentrate on the problem-solving process as well as the calculations associated with problems.

PROCESS STANDARDS

High School

The National Council of Teachers of Mathematics (NCTM) has identified five process standards: Problem Solving, Reasoning and Proof, Communication, Connections, and Representation. Active involvement by students using these processes is likely to broaden mathematical understandings and lead to increasingly sophisticated abilities required to meet mathematical challenges in meaningful ways.

Process Standard 1: Problem Solving

1. Apply a wide variety of problem-solving strategies (identify a pattern, use equivalent representations) to solve problems from within and outside mathematics.

2. Identify the problem from a described situation, determine the necessary data and apply appropriate problem-solving strategies.

Process Standard 2: Communication

1. Use mathematical language and symbols to read and write mathematics and to converse with others.

2. Demonstrate mathematical ideas orally and in writing.

3. Analyze mathematical definitions and discover generalizations through investigations.

Process Standard 3: Reasoning

1. Use various types of logical reasoning in mathematical contexts and real-world situations.

2. Prepare and evaluate suppositions and arguments.

3. Verify conclusions, identify counterexamples, test conjectures, and justify solutions to mathematical problems.

4. Justify mathematical statements through proofs.

Process Standard 4: Connections

1. Link mathematical ideas to the real world (e.g., statistics helps qualify the confidence we can have when drawing conclusions based on a sample).

2. Apply mathematical problem-solving skills to other disciplines.

3. Use mathematics to solve problems encountered in daily life.

4. Relate one area of mathematics to another and to the integrated whole (e.g., connect equivalent representations to corresponding problem situations or mathematical concepts).

Process Standard 5: Representation

1. Use algebraic, graphic, and numeric representations to model and interpret mathematical and real world situations.

2. Use a variety of mathematical representations as tools for organizing, recording, and communicating mathematical ideas (e.g., mathematical models, tables, graphs, spreadsheets).

3. Develop a variety of mathematical representations that can be used flexibly and appropriately.

MATHEMATICS CONTENT STANDARDS

Algebra I
(Updated August 2006)

The following skills are required of all students completing Algebra I. **Major Concepts** should be taught in depth using a variety of methods and applications (concrete to the abstract). **Maintenance Concepts** have been taught previously and are a necessary foundation for this course. The major concepts are considered minimal exit skills and districts are strongly encouraged to exceed these skills when building an Algebra I curriculum. Visual and physical models, calculators, and other technologies are recommended when appropriate and can enhance both instruction and assessment.

MAJOR CONCEPTS	**MAINTENANCE CONCEPTS**
Number Sense and Algebraic Operations - Polynomials, Exponents, Expressions	Number Sense & Algebraic Reasoning- Equations, Inequalities, Exponents, Rational Numbers
Relations and Functions - Linear Functions & Slope	Geometry Volume, Surface Area, Ratio,
Formulas	Proportion, Formulas
Data Analysis, Statistics and Probability- Tables, Graphs, Charts, Scatter Plots	Data Analysis and Statistics - Graphical Representations, Measures of Central Tendency

Standard 1: Number Sense and Algebraic Operations - The student will use expressions and equations to model number relationships.

1. Equations and Formulas

   a. Translate word phrases and sentences into expressions and equations and vice versa.

   b. Solve literal equations involving several variables for one variable in terms of the others.

   c. Use the formulas from measurable attributes of geometric models (perimeter, circumference, area and volume), science, and statistics to solve problems within an algebraic context.

   d. Solve two-step and three-step problems using concepts such as rules of exponents, rate, distance, ratio and proportion, and percent.

2. Expressions

   a. Simplify and evaluate linear, absolute value, rational and radical expressions.

   b. Simplify polynomials by adding, subtracting or multiplying.

   c. Factor polynomial expressions.

Note: Asterisks (*) have been used to identify standards and objectives that must be assessed by the local school district. All other skills may be assessed by the Oklahoma School Testing Program (OSTP).

Standard 2: Relations and Functions - The student will use relations and functions to model number relationships.

1. Relations and Functions

   a. Distinguish between linear and nonlinear data.

   b. Distinguish between relations and functions.

   c. Identify dependent and independent variables, domain and range.

   d. Evaluate a function using tables, equations or graphs.

2. Linear Equations and Graphs

   a. Solve linear equations by graphing or using properties of equality.

   b. Recognize the parent graph of the functions $y = k$, $y = x$, $y = |x|$, and predict the effects of transformations on the parent graph.

   c. Slope

      I. Calculate the slope of a line using a graph, an equation, two points or a set of data points.

      II. Use the slope to differentiate between lines that are parallel, perpendicular, horizontal, or vertical.

      III. Interpret the slope and intercepts within the context of everyday life (e.g., telephone charges based on base rate [y-intercept] plus rate per minute [slope]).

   d. Develop the equation of a line and graph linear relationships given the following: slope and y-intercept, slope and one point on the line, two points on the line, x-intercept and y-intercept, a set of data points.

   e. Match equations to a graph, table, or situation and vice versa.

3. Linear Inequalities and Graphs

   a. Solve linear inequalities by graphing or using properties of inequalities.

   b. Match inequalities (with 1 or 2 variables) to a graph, table, or situation and vice versa.

4. Solve a system of linear equations by graphing, substitution or elimination.

* 5. Nonlinear Functions

   a. Match exponential and quadratic functions to a table, graph or situation and vice versa.

   b. Solve quadratic equations by graphing, factoring, or using the quadratic formula.

Standard 3: Data Analysis, Probability and Statistics - The student will use data analysis, probability and statistics to formulate and justify predictions from a set of data.

1. Data Analysis

   a. Translate from one representation of data to another and understand that the data can be represented using a variety of tables, graphs, or symbols and that different modes of representation often convey different messages.

   b. Make valid inferences, predictions, and/or arguments based on data from graphs, tables, and charts.

   c. Solve two-step and three-step problems using concepts such as probability and measures of central tendency.

2. Collect data involving two variables and display on a scatter plot; interpret results using a linear model/equation and identify whether the model/equation is a line best fit for the data.

MATHEMATICS CONTENT STANDARDS

Geometry
(Updated February 2007)

The following skills are required of all students completing Geometry. **Major Concepts** should be taught in depth using a variety of methods and applications (concrete to the abstract). **Maintenance Concepts** have been taught previously and are a necessary foundation for this course. The major concepts are considered minimal exit skills and districts are strongly encouraged to exceed these skills when building a Geometry curriculum. Visual and physical models, calculators, and other technologies are recommended when appropriate and can enhance both instruction and assessment.

MAJOR CONCEPTS	MAINTENANCE CONCEPTS
Logical Reasoning	Ratios, Proportions
Properties	Perimeter, Area, Surface Area, Volume
Coordinate Geometry	Equations
Triangles	Formulas

Standard 1: Logical Reasoning - The student will use deductive and inductive reasoning to solve problems.

1. Identify and use logical reasoning skills (inductive and deductive) to make and test conjectures, formulate counter examples, and follow logical arguments.

2. State, use, and examine the validity of the converse, inverse, and contrapositive of "if-then" statements.

* 3. Compare the properties of Euclidean geometry to non-Euclidean geometries (for example, elliptical geometry, as shown on the surface of a globe, does not uphold the parallel postulate).

Standard 2: Properties of 2-Dimensional Figures - The student will use the properties and formulas of geometric figures to solve problems.

* 1. Use geometric tools (for example, protractor, compass, straight edge) to construct a variety of figures.

2. Line and Angle Relationships

   a. Use the angle relationships formed by parallel lines cut by a transversal to solve problems.

   b. Use the angle relationships formed by two lines cut by a transversal to determine if the two lines are parallel and verify, using algebraic and deductive proofs.

   c. Use relationships between pairs of angles (for example, adjacent, complementary, vertical) to solve problems.

Note: Asterisks (*) have been used to identify standards and objectives that must be assessed by the local school district. All other skills may be assessed by the Oklahoma School Testing Program (OSTP).

3. Polygons and Other Plane Figures

   a. Identify, describe, and analyze polygons (for example, convex, concave, regular, pentagonal, hexagonal, n-gonal).

   b. Apply the interior and exterior angle sum of convex polygons to solve problems, and verify using algebraic and deductive proofs.

   c. Develop and apply the properties of quadrilaterals to solve problems (for example, rectangles, parallelograms, rhombi, trapezoids, kites).

   d. Use properties of 2-dimensional figures and side length, perimeter or circumference, and area to determine unknown values and correctly identify the appropriate unit of measure of each.

4. Similarity

   a. Determine and verify the relationships of similarity of triangles, using algebraic and deductive proofs.

   b. Use ratios of similar 2-dimensional figures to determine unknown values, such as angles, side lengths, perimeter or circumference, and area.

5. Congruence

   a. Determine and verify the relationships of congruency of triangles, using algebraic and deductive proofs.

   b. Use the relationships of congruency of 2-dimensional figures to determine unknown values, such as angles, side lengths, perimeter or circumference, and area.

6. Circles

   a. Find angle measures and arc measures related to circles.

   b. Find angle measures and segment lengths using the relationships among radii, chords, secants, and tangents of a circle.

Standard 3: Triangles and Trigonometric Ratios - The student will use the properties of right triangles and trigonometric ratios to solve problems.

1. Use the Pythagorean Theorem and its converse to find missing side lengths and to determine acute, right, and obtuse triangles, and verify using algebraic and deductive proofs.

2. Apply the 45-45-90 and 30-60-90 right triangle relationships to solve problems, and verify using algebraic and deductive proofs.

3. Express the trigonometric functions as ratios and use sine, cosine, and tangent ratios to solve real-world problems.

* 4. Use the trigonometric ratios to find the area of a triangle.

Standard 4: Properties of 3-Dimensional Figures - The student will use the properties and formulas of geometric figures to solve problems.

1. Polyhedra and Other Solids

   a. Identify, describe, and analyze polyhedra (for example, regular, decahedral).

   b. Use properties of 3-dimensional figures; side lengths, perimeter or circumference, and area of a face; and volume, lateral area, and surface area to determine unknown values and correctly identify the appropriate unit of measure of each.

2. Similarity: Use ratios of similar 3-dimensional figures to determine unknown values, such as angles, side lengths, perimeter or circumference of a face, area of a face, and volume.

3. Create a model of a 3-dimensional figure from a 2-dimensional drawing and make a 2-dimensional representation of a 3-dimensional object (for example, nets, blueprints, perspective drawings).

Standard 5: Coordinate Geometry - The student will solve problems with geometric figures in the coordinate plane.

1. Find the distance between two points; the midpoint of a segment; and calculate the slopes of parallel, perpendicular, horizontal, and vertical lines.

2. Properties of Figures

   a. Given a set of points determine the type of figure formed based on its properties.

   b. Use transformations (reflection, rotation, translation) on geometric figures to solve problems within coordinate geometry.

MATHEMATICS CONTENT STANDARDS

Algebra II
(Updated February 2007)

The following skills are required of all students completing Algebra II. **Major Concepts** should be taught in depth using a variety of methods and applications (concrete to the abstract). **Maintenance Concepts** have been taught previously and are a necessary foundation for this course. The major concepts are considered minimal exit skills and districts are strongly encouraged to exceed these skills when building an Algebra II curriculum. Visual and physical models, calculators, and other technologies are recommended when appropriate and can enhance both instruction and assessment.

<u>**MAJOR CONCEPTS**</u>	<u>**MAINTENANCE CONCEPTS**</u>
Number Systems and Algebraic Operations – Real and Complex Numbers	Polynomials
Functions and Relations - Quadratic, Polynomial, Exponential, Logarithmic, Rational	Exponents
Data Analysis, Statistics, and Probability Relationships, Measures of Central Tendency and Variability, Sequences and Series	Expressions
	Slope
	Data Displays

Standard 1: Number Systems and Algebraic Operations - The student will perform operations with rational, radical, and polynomial expressions, as well as expressions involving complex numbers.

1. Rational Exponents

   a. Convert expressions from radical notations to rational exponents and vice versa.

   b. Add, subtract, multiply, divide, and simplify radical expressions and expressions containing rational exponents.

2. Polynomial and Rational Expressions

   a. Divide polynomial expressions by lower degree polynomials.

   b. Add, subtract, multiply, divide, and simplify rational expressions, including complex fractions.

3. Complex Numbers

   * a. Recognize that to solve certain problems and equations, number systems need to be extended from real numbers to complex numbers.

Note: Asterisks (*) have been used to identify standards and objectives that must be assessed by the local school district. All other skills may be assessed by the Oklahoma School Testing Program (OSTP).

b. Add, subtract, multiply, divide, and simplify expressions involving complex numbers.

Standard 2: Relations and Functions - The student will use the relationships among the solution of an equation, zero of a function, x-intercepts of a graph, and factors of a polynomial expression to solve problems involving relations and functions.

1. Functions and Function Notation

   a. Recognize the parent graphs of polynomial, exponential, radical, quadratic, and logarithmic functions and predict the effects of transformations on the parent graphs, using various methods and tools which may include graphing calculators.

   b. Add, subtract, multiply, and divide functions using function notation.

   c. Combine functions by composition.

   d. Use algebraic, interval, and set notations to specify the domain and range of functions of various types.

   e. Find and graph the inverse of a function, if it exists.

2. Systems of Equations

   a. Model a situation that can be described by a system of equations or inequalities and use the model to answer questions about the situation.

   b. Solve systems of linear equations and inequalities using various methods and tools which may include substitution, elimination, matrices, graphing, and graphing calculators.

   *c. Use either one quadratic equation and one linear equation or two quadratic equations to solve problems.

3. Quadratic Equations and Functions

   a. Solve quadratic equations by graphing, factoring, completing the square and quadratic formula.

   b. Graph a quadratic function and identify the x- and y-intercepts and maximum or minimum value, using various methods and tools which may include a graphing calculator.

   c. Model a situation that can be described by a quadratic function and use the model to answer questions about the situation.

4. Identify, graph, and write the equations of the conic sections (circle, ellipse, parabola, and hyperbola).

5. Exponential and Logarithmic Functions

   a. Graph exponential and logarithmic functions.

   b. Apply the inverse relationship between exponential and logarithmic functions to convert from one form to another.

   c. Model a situation that can be described by an exponential or logarithmic function and use the model to answer questions about the situation.

6. Polynomial Equations and Functions

   a. Solve polynomial equations using various methods and tools which may include factoring and synthetic division.

   b. Sketch the graph of a polynomial function.

   c. Given the graph of a polynomial function, identify the x- and y-intercepts, relative maximums and relative minimums, using various methods and tools which may include a graphing calculator.

   d. Model a situation that can be described by a polynomial function and use the model to answer questions about the situation.

7. Rational Equations and Functions

   a. Solve rational equations.

   b. Sketch the graph of a rational function.

   c. Given the graph of a rational function, identify the x- and y-intercepts, vertical asymptotes, using various methods and tools which may include a graphing calculator.

   d. Model a situation that can be described by a rational function and use the model to answer questions about the situation.

Standard 3: Data Analysis and Statistics - The student will use data analysis and statistics to formulate and justify predictions from a set of data.

1. Analysis of Collected Data Involving Two Variables

   a. Interpret data on a scatter plot using a linear, exponential, or quadratic model/equation.

b. Identify whether the model/equation is a curve of best fit for the data, using various methods and tools which may include a graphing calculator.

* 2. Measures of Central Tendency and Variability

a. Analyze and synthesize data from a sample using appropriate measures of central tendency (mean, median, mode, weighted average).

b. Analyze and synthesize data from a sample using appropriate measures of variability (range, variance, standard deviation).

c. Use the characteristics of the Gaussian normal distribution (bell-shaped curve) to solve problems.

d. Identify how given outliers affect representations of data.

3. Identify and use arithmetic and geometric sequences and series to solve problems.

GLOSSARY

addend - in the addition problem 3 + 2 + 6 = 11, the addends are 3, 2, and 6.

algorithm - step-by-step procedure for solving a problem.

analog time - time displayed on a timepiece having hour and minute hands.

array - (rectangular) an orderly arrangement of objects into a rectangular configuration (e.g., take six tiles and arrange two long and three wide to form a rectangle).

attribute - characteristics (e.g., size, shape, color, weight).

combinations - a selection of objects without regard to order.

complementary angles - two angles whose measure have a sum of 90 degrees.

complex numbers - numbers of the form a + bi, where a and b are real numbers and i equals the square root of -1.

composite numbers - any positive integer exactly divisible by one or more positive integers other than itself and 1.

congruent - geometric figures having exactly the same size and shape.

conic sections - circles, parabolas, ellipses, and hyperbolas which can all be represented by passing a plane through a hollow double cone.

conjecture - a statement believed to be true but not proved.

cosine - in a right triangle, the cosine of an acute angle is the ratio of the length of the leg adjacent to the angle to the length of the hypotenuse.

dependent events - events that influence each other. If one of the events occurs, it changes the probability of the other event.

domain of a relation - the set of all the first elements or x-coordinates of a relation.

exponential function - an exponential function with base b is defined by $y = b^x$, where $b > 0$ and b is not equal to 1.

expression - a mathematical phrase that can include operations, numerals and variables. In algebraic terms: 2m + 3x; in numeric terms: 2.4 - 1.37.

Fibonacci sequence - the sequence of numbers, 1, 1, 2, 3, 5, 8, 13, 21, . . . where each number, except the first two, is the sum of the two preceding numbers.

function - a relation in which each element of the domain is paired with exactly one element of the range.

function machine - an input/output box (often made with milk cartons, boxes, or drawn on the board) to show one number entering and a different number exiting. Students guess the rule that produced the second number (e.g., enter 3, exit 5, rule: add 2).

histogram - a bar graph of a frequency distribution.

imaginary number - any complex number, a + bi, for which a = 0 and b does not = 0.

independent events - events that do not influence one another. Each event occurs without changing the probability of the other event.

integers - . . . -2, -1, 0, 1, 2, . . .

intercepts (x & y) - the x (y)-coordinate of the point where a graph intercepts the x (y)- axis.

inverse operations - operations that undo each other (e.g., addition and subtraction are inverse operations; multiplication and division are inverse operations).

irrational numbers - nonterminating, nonrepeating decimals (e.g., square root of 2, pi).

logarithmic functions - logarithmic function with base b is the inverse of the exponential function, and is defined by $x = \log_b y$ ($y > 0$, $b > 0$, b not equal to 1).

manipulatives - concrete materials (e.g., buttons, beans, egg and milk cartons, counters, attribute and pattern blocks, interlocking cubes, base-10 blocks, geometric models, geoboards, fractions pieces, rulers, balances, spinners, dot paper) to use in mathematical calculations.

mean - in a set of n numbers, the sum of the numbers divided by n.

median - the middle number in the set, or the mean of the two middle numbers, when the numbers are arranged in order from least to greatest.

mode - a number in a set of data that occurs most often.

multiple - a number that is the product of a given integer and another integer (e.g., 6 and 9 are multiples of 3).

natural numbers - (counting numbers) 1, 2, 3, 4, . . .

nonstandard measurement - a measurement determined by the use of nonstandard units like hands, paper clips, beans, cotton balls, etc.

number sense - involves the understanding of number size (relative magnitude), number representations, number operations, referents for quantities and measurements used in everyday situations, etc.

operation - addition, subtraction, multiplication, division, etc.

order of operations - rules for evaluating an expression: work first within parentheses; then calculate all powers, from left to right; then do multiplications or divisions, from left to right; then do additions and subtractions, from left to right.

ordinal - a number that is used to tell order (e.g., first, fifth).

prime number - an integer greater than one whose only positive factors are 1 and itself (e.g., 2, 3, 5, 7, 11, 13 . . .).

probability - the study and measure of the likelihood of an event happening.

properties of arithmetic - for all real numbers a, b and c:

commutative property: $a + b = b + a$ and $a \bullet b = b \bullet a$
associative property: $(a + b) + c = a + (b + c)$ and $(a \bullet b) \bullet c = a \bullet (b \bullet c)$
distributive property: $a(b + c) = (a \bullet b) + (a \bullet c)$
identity property: $a + 0 = a$ and $a \bullet 1 = a$
inverse property: $a + (-a) = 0$ and $a \bullet \frac{1}{a} = 1$

proportion - a statement that ratios are equal.

quadrants - the four regions formed by the axes in a coordinate plane.

quadratic equation - an equation of the form $ax^2 + bx + c = 0$, where a, b and c are real numbers and a is not equal to 0.

quadratic formula - if $ax^2 + bx + c = 0$, where a, b and c are real numbers and a is not equal to 0, then $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$.

range of a relation - the set of all the second elements or y-coordinates of a relation is called the range.

ratio - the comparison of two quantities by division.

rational numbers - quotients of integers (commonly called fractions - includes both positive and negative numbers).

real numbers - the set of all rational and irrational numbers.

recursive patterns - patterns in which each number is found from the previous number by repeating a process (e.g., Fibonacci numbers).

relation - a set of one or more pairs of numbers.

relative magnitude - the size of an object or number compared to other objects and numbers.

scatter plot - a dot or point graph of data.

sequence - a set of numbers arranged in a pattern.

sine - in a right triangle, the sine of an acute angle is the ratio of the length of the leg opposite the angle to the length of the hypotenuse.

slope of a line - the ratio of the change in y to the corresponding change in x. For any two points (x_1, y_1) and (x_2, y_2), $m = \dfrac{(y_2 - y_1)}{(x_2 - x_1)}$.

spatial sense - involves building and manipulating mental representations of 2- and 3-dimensional objects and ideas.

standard deviation - measures how much each value in the data differs from the mean of the data.

statistics - the study of data.

stem-and-leaf plot - a frequency distribution made by arranging data in the following way (e.g., student scores on a test were 96, 87, 77, 93, 85, 85, and 75 would be displayed as

9 | 6, 3
8 | 7, 5, 5
7 | 7, 5

supplementary angles - two angles whose measures have a sum of 180 degrees.

supposition - (act of supposing) making a statement or assumption without proof.

tangent - in a right triangle, the tangent is the ratio of the length of the leg opposite the angle to the length of the leg adjacent to the angle.

transformation - motion of a geometric figure (rotation [turn], translation [slide], and reflection [flip]).

whole numbers - 0, 1, 2, 3, 4, . . .

SCIENCE
OVERVIEW
ORGANIZATION

The Priority Academic Student Skills (PASS) are organized by Science Process and Inquiry Standards and Content Standards which include Physical Science, Life Science, and Earth/Space Science. They are arranged by grade level at Grades 1-8, and by course subject area at the high school level. Each standard is followed by two or more objectives to accomplish each standard. Students should be provided with science experiences at each grade level from all areas of the content standards. This integrated approach will provide students with a coordinated, coherent understanding of the necessary skills and knowledge of scientifically literate citizens.

The Oklahoma State Testing Program assesses the Science *Priority Academic Student Skills (PASS)* with a 5^{th} and 8^{th} grade criterion-referenced test and a Biology I End-of-Instruction test. All of these state level assessments are based on the standards in this document.

The objectives presented in the "Science Processes and Inquiry" standards are included at all grade levels because the understandings and abilities associated with these concepts need to be developed throughout a student's educational experience.

The content standard areas (physical, life, earth/space) are designed to facilitate conceptual development by building on the content knowledge introduced at the Pre-Kindergarten level. Because each of the content standards subsumes the knowledge and skills of the other standards, they are designed to be used as a whole. Although material can be added to the content standards, using only a portion of the standards will leave gaps in the scientific understanding expected of students.

SCIENCE STANDARDS
Grades 1-12

The science framework presented in this outline is what students should know, understand, and be able to do in the natural sciences. Students combine process and knowledge as they use scientific reasoning and critical thinking to develop their understanding of science. Inquiry builds conceptual bridges between process and scientific knowledge. Relevant use of developmentally appropriate technology facilitates the inquiry process.

The attainment of scientific literacy is the result of a sequential curriculum that is dependent on quality science teaching at each grade level beginning in prekindergarten. Quality science teaching requires direct, inquiry-oriented learning experiences that emphasize the processes of science and major science concepts. Consistent with national standards, fewer concepts in physical, life and earth/space sciences are explored while more emphasis is placed on in-depth understanding. The following standards provide a framework to achieve the above goals.

The science standards are not a scope and sequence or a district curriculum guide. They provide a framework for schools to develop an aligned science curriculum and for teachers to develop their own classroom lessons. The science standards in this document were developed

based on the *National Science Education Standards* by the National Research Council (NRC), the *Benchmarks for Scientific Literacy by the American Association* for the Advancement of Science (AAAS), and the *Science Frameworks* by the National Association for Educational Progress (NAEP). The United States has established a goal for all students to achieve scientific literacy. These national publications, developed by science and education experts, will enable the nation and the state of Oklahoma to meet this goal.

NOTE:

Asterisks (*) have been used to identify standards and objectives that must be assessed by the local school district. All other skills may be assessed by the Oklahoma School Testing Program (OSTP).

Book Icons (🕮) identify Information Literacy skills. Students are best served when these are taught in collaboration and cooperation between the classroom teacher and the library media specialist.

Use of term i.e. means “in exactness”; use of the term e.g. means “example given”.

OAC 210:15-3-70—210:15-3-82

Approved by the Oklahoma State Board of Education, March 24, 2011.

SCIENCE

Grade 1

Standards for Inquiry, Physical, Life, and Earth/Space Science

The *Priority Academic Students Skills (PASS)* should be taught by investigating broad concepts, and principles of major themes in Physical, Life, and Earth/Space Sciences.

SCIENCE PROCESSES AND INQUIRY

Grade 1

Process Standard 1: Observe and Measure – Observing is the first action taken by the learner to acquire new information about an object, organism, or event. Opportunities for observation are developed through the use of a variety of scientific tools. Measurement allows observations to be quantified. The student will accomplish these objectives to meet this process standard.

*1. Observe and measure objects, organisms and/or events using developmentally appropriate nonstandard units of measurement (e.g., hand, paper clip, book); and International System of Units (SI) (i.e., meters, centimeters, and degrees Celsius).

2. Compare and contrast similar and/or different characteristics in a given set of simple objects, familiar organisms and/or observable events.

Process Standard 2: Classify – classifying establishes order. Objects, organisms, and events are classified based on similarities, differences, and interrelationships. The student will accomplish these objectives to meet this process standard.

1. Classify a set of simple objects, familiar organisms, and/or observable events by observable properties.

2. Arrange simple objects, familiar organisms, and/or observable events in a serial order (e.g., least to greatest, tallest to shortest).

Process Standard 3: Experiment and Inquiry - Experimenting is a method of discovering information. It requires making observations and measurements to test ideas. Inquiry can be defined as the skills necessary to carry out the process of scientific or systemic thinking. In order for inquiry to occur, students must have the opportunity to ask a question, formulate a procedure, and observe phenomena. The student will accomplish these objectives to meet this process standard.

*1. Ask a question about objects, organisms, or events in the environment.

*2. Plan and conduct a simple investigation.

*3. Employ simple equipment and tools such as magnifiers, thermometers, and rulers to gather data.

4. Recognize potential hazards and practice safety procedures in all science activities.

Process Standard 4: Interpret and Communicate – Interpreting is a process of recognizing patterns in collected data by making inferences, predictions, or conclusions. Communicating is the process of describing, recording, and reporting experimental procedures and results to others. Communication may be oral, written, or mathematical and includes organizing ideas, using appropriate vocabulary, graphs, and other visual representations. The student will accomplish these objectives to meet this process standard.

1. Interpret pictures, simple bar graphs, and/or tables.

2. Recognize and describe patterns, then make predictions based on patterns. 🕮

*3. Communicate the results of a simple investigation using drawings, tables, graphs, and/or written and oral language. 🕮

PHYSICAL SCIENCE

Grade 1

Standard 1: Properties of Objects and Materials – Characteristics of objects can be described using physical properties such as size, shape, color, or texture. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Objects have properties that can be observed, described, and measured.

2. Using the five senses, objects can be grouped or ordered by physical properties.

3. Water can be a liquid or a solid, and can be made to go back and forth from one form to the other.

LIFE SCIENCE

Grade 1

Standard 2: Characteristics and Basic Needs of Organisms – All living things have structures that enable them to function in unique and specific ways to obtain food, reproduce, and survive. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Plants and animals need to take in air, water, and food. In addition, plants need light.

2. Scientists use the five senses and tools (e.g., magnifiers and rulers) to gather information, such as size and shape about living things.

EARTH/SPACE SCIENCE

Grade 1

Standard 3: Changes of Earth and Sky – Observe natural changes of all kinds such as the movement of the sun and variable changes like the weather. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. The sun warms the land, air, and water.

2. Weather changes from day to day and over the seasons. Weather can be observed by measuring temperature and describing cloud formations.

Grade 2

Standards for Inquiry, Physical, Life, and Earth/Space Science

The *Priority Academic student Skills (PASS)* should be taught by investigating broad concepts, and principles of major themes in Physical, Life, and Earth/Space Sciences.

SCIENCE PROCESSES AND INQUIRY

Grade 2

Process Standard 1: Observe and Measure – Observing is the first action taken by the learner to acquire new information about an object, organism, or event. Opportunities for observation are developed through the use of a variety of scientific tools. Measurement allows observations to be quantified. The student will accomplish these objectives to meet this process standard.

1. Observe and measure objects, organisms, and/or events using developmentally appropriate standard units of measurement (e.g., inches, feet, yard, degrees Fahrenheit) and the International System of Units (SI) (i.e., meters, centimeters, grams, and degrees Celsius).

2. Compare and contrast similar and/or different characteristics in a given set of simple objects, familiar organisms and/or observable events.

Process Standard 2: Classify – Classifying establishes order. Objects, organisms, and events are classified based on similarities, differences, and interrelationships. The student will accomplish these objectives to meet this process standard.

1. Classify a set of simple objects, familiar organisms, and/or observable events by observable properties (e.g., graphic organizers, t-charts, tables, and Venn diagrams).

2. Arrange simple objects, familiar organisms, and/or observable events in a serial order (e.g., least to greatest, tallest to shortest).

Process Standard 3: Experiment and Inquiry – Experimenting is a method of discovering information. It requires making observations and measurements to test ideas. Inquiry can be defined as the skills necessary to carry out the process of scientific or systemic thinking. In order for inquiry to occur, students must have the opportunity to ask a question, formulate a procedure, and observe phenomena. The student will accomplish these objectives to meet this process standard.

*1. Ask a question about objects, organisms, or events in the environment. 🕮

*2. Plan and conduct a simple investigation.

*3. Employ simple equipment and tools such as magnifiers, thermometers, and rulers to gather data.

4. Recognize potential hazards and practice safety procedures in all science activities.

Process Standard 4: Interpret and Communicate – Interpreting is the process of recognizing patterns in collected data by making inferences, predictions, or conclusions. Communicating is the process of describing, recording, and reporting experimental procedures and results to others. Communication may be oral, written, or mathematical and includes organizing ideas, using appropriate vocabulary, graphs, and other visual representations. The student will accomplish these objectives to meet this process standard.

1. Interpret pictures, simple bar graphs, and/or tables. 🕮

2. Recognize and describe patterns, then make predictions based on patterns. 🕮

*3. Communicate the results of a simple investigation using drawings, tables, graphs, and/or written and oral language. 🕮

PHYSICAL SCIENCE

Grade 2

Standard 1: Properties and Interactions of Objects and Materials – characteristics of objects can be described using physical properties such as size, shape, color, texture, or magnetism. Interactions change the position and motion of objects. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Objects can be described in terms of materials of which they are made. Physical properties of materials can be changed by tearing, sifting, sanding, or pounding.

2. Motion and interaction of objects can be observed in toys and playground activities.

3. Magnets attract and repel each other and certain other materials. Magnetic force passes through materials such as paper, glass, and water.

LIFE SCIENCE

Grade 2

Standard 2: Life Cycles and Organisms – Life cycles represent the stages an organism passes through from its own birth to the birth of the next generation. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Plants and animals have life cycles that include developing into adults, reproducing, and eventually dying. The details of this life cycle are different for different organisms.

2. Plants and animals often have characteristics similar to their parents.

EARTH/SPACE SCIENCE

Grade 2

Standard 3: Properties and Changes of Earth and Sky – Earth materials consist of rocks, soils, water, and air. The sun appears to move across sky in the same way every day. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Earth materials have different properties and serve as natural resources that sustain plant and animal life.

2. The size and shape of shadows change at different times of the day.

Grade 3

Standards for Inquiry, Physical, Life and Earth/Space Science

The *Priority Academic Student Skills (PASS)* should be taught by investigating broad concepts, and principles of major themes in Physical, Life, and Earth/Space Sciences.

SCIENCE PROCESSES AND INQUIRY

Grade 3

Process Standard 1: Observe and Measure – Observing is the first action taken by the learner to acquire new information about an object, organism, or event. Opportunities for observation are developed through the use of a variety of scientific tools. Measurement allows observations to be quantified. The student will accomplish these objectives to meet this process standard.

1. Observe and measure objects, organisms, and/or events using developmentally appropriate International System of Units (SI) (i.e., meters, centimeters, grams, and degrees Celsius).

2. Compare and contrast similar and/or different characteristics in a given set of simple objects, familiar organisms, and/or observable events.

Process Standard 2: Classify – Classifying establishes order. Objects, organisms, and events are classified based on similarities, differences, and interrelationships. The student will accomplish these objectives to meet this process standard.

1. Classify a set of simple objects, familiar organisms, and/or observable events by observable properties (e.g., graphic organizers, t-charts, tables, and Venn diagrams).

2. Arrange simple objects, familiar organisms, and/or observable events in a serial order (e.g., least to greatest, order of steps, and smallest to largest).

Process Standard 3: Experiment and Inquiry – Experimenting is a method of discovering information. It requires making observations and measurements to test ideas. Inquiry can be defined as the skills necessary to carry out the process of scientific or systemic thinking. In order for inquiry to occur, students must have the opportunity to ask a question, formulate a procedure, and observe phenomena. The student will accomplish these objectives to meet this process standard.

*1. Ask a question about objects, organisms, or events in the environment. 🕮

*2. Plan and conduct a simple investigation.

*3. Employ simple equipment and tools such as magnifiers, thermometers, and rulers to gather data.

4. Recognize potential hazards and practice safety procedures in all science activities.

Process Standard 4: Interpret and Communicate – Interpreting is the process of recognizing patterns in collected data by making inferences, predictions, or conclusions. Communicating is the process of describing, recording, and reporting experimental procedures and results to others. Communication may be oral, written, or mathematical and includes organizing ideas, using appropriate vocabulary, graphs, other visual representations, and mathematical equations. The student will accomplish these objectives to meet this process standard.

1. Interpret tables, pictorial, and/or simple bar graphs. 🕮

2. Recognize and describe patterns, then make predictions based on patterns. 🕮

*3. Communicate the results of a simple investigation using drawings, tables, graphs, and/or written and oral language. 🕮

PHYSICAL SCIENCE

Grade 3

Standard 1: Properties of Objects and Materials – Describe characteristics of objects based on physical properties such as size, shape, color, or texture. Vibration of materials causes sound. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Objects can be described in terms of the materials of which they are made. Mixtures and solutions can be separated (i.e., sand and marbles, salt and water).

2. Sound is produced by vibrations (i.e., pitch and loudness).

3. Sound travels through air, water, and/or solids.

LIFE SCIENCE

Grade 3

Standard 2: Characteristics and Basic Needs of Organisms and Environments – All living things have structures that enable them to function in unique and specific ways to obtain food, reproduce, and survive. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Plants and animals have features (i.e., breathing structures, limbs, skin covering, seed dispersal, roots, stems, and leaves) that help them live in different environments such as air, water, or land.

2. Each plant or animal has different structures that serve different functions in growth and survival (i.e., the way it moves, type of food it needs, and where it lives).

3. All animals depend on plants. Some animals eat plants for food. Other animals consume animals that eat the plants.

    a. The primary source of energy in a food chain is the sun.

    b. Animals can be classified by the type of food they eat.

EARTH/SPACE SCIENCE

Grade 3

Standard 3: Properties of Earth Materials – Earth materials consist of rock, soils, water, and air. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Rocks and minerals have similarities and differences (i.e., size of particles, color pattern, and layering).

2. Soils have properties of color and texture, capacity to retain water, and ability to support the growth of many kinds of plants and animals, including those in our food supply.

3. Earth exerts a force called gravity which attracts objects, pulling them toward Earth’s center.

Grade 4

Standards for Inquiry, Physical, Life, and Earth/Space science

The *Priority Academic Student Skills (PASS)* should be taught by investigating content, concepts, and principles of major themes in Physical, Life, and Earth/Space Sciences.

SCIENCE PROCESSES AND INQUIRY

Grade 4

Process Standard 1: Observe and Measure – Observing is the first action taken b the learner to acquire new information about an object, organism, or event. Opportunities for observation are developed through the use of a variety of scientific tools. Measurement allows observations to be quantified. The student will accomplish these objectives to meet this process standard.

1. Observe and measure objects, organisms, and/or events (e.g., mass, length, time, volume, temperature) using International System of Units (SI) (i.e., grams, milligrams, meters, millimeters, centimeters, kilometers, liters, milliliters, and degrees Celsius).

2. Compare and/or contrast similar and/or different characteristics (e.g., color, shape, size, texture, sound, position, change) in a given set of objects organisms or events.

Process Standard 2: Classify – Classifying establishes order. Objects, organisms, and events are classified based on similarities, differences, and interrelationships. The student will accomplish these objectives to meet this process standard.

1. Classify a set of objects, organisms, and/or events using two or more observable properties (e.g., simple dichotomous keys).

2. Arrange objects, organisms, and/or events in serial order (e.g., least to greatest, fastest to slowest).

Process Standard 3: Experiment – Experimenting is a method of discovering information. It requires making observations and measurements to test ideas. The student will accomplish these objectives to meet this process standard.

*1. Ask questions about the world and formulate an orderly plan to investigate a question. 🕮

2. Evaluate the design of a scientific investigation.

*3. Design and conduct a scientific investigation.

4. Recognize potential hazards and practice safety procedures in all science investigations.

Process Standard 4: Interpret and Communicate – Interpreting is the process of recognizing patterns in collected data by making inferences, predictions, or conclusions. Communicating is the process of describing, recording, and reporting experimental procedures and results to others. Communication may be oral, written, or mathematical and includes organizing ideas, using appropriate vocabulary, graphs, other visual representations, and mathematical equations. The student will accomplish these objectives to meet this process standard.

*1. Report data using tables, line, bar, trend, and/or simple circle graphs. 📖

2. Interpret data tables, line, bar, trend and/or simple circle graphs. 📖

3. Make predictions based on patterns in experimental data.

4. Communicate the results of investigations and/or give explanations based on data. 📖

Process Standard 5: Inquiry – Inquiry can be defined as the skills necessary to carry out the process of scientific or systemic thinking. In order for inquiry to occur, students must have the opportunity to ask a question, formulate a procedure, and observe phenomena. The student will accomplish these objectives to meet this process standard.

*1. Use different ways to investigate questions and evaluate the fairness of the test.

*2. Use a variety of measurement tools and technology.

*3. Formulate a general statement to represent the data.

*4. Share results of an investigation in sufficient detail so that data may be combined with data from other students and analyzed further.

PHYSICAL SCIENCE

Grade 4

Standard 1: Position and Motion of Objects – The position of a moving object can be described relative to a stationary object or the background. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. The position and motion of objects can be changed by pushing or pulling. The size of the change is related to the strength of the push or pull.

2. The motion of an object can be described by tracing and measuring its position over time.

Standard 2: Energy – Energy is the ability to do work or to cause a change in matter. Forms of energy include electricity, heat (thermal), light and sound. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Electricity is the flow of electrical power or charge.

    a. The flow of electricity is controlled by open and closed circuits.

    b. Some materials are conductors of electricity while others are insulators.

2. Heat results when substances burn, when certain kinds of materials rub against each other, and when electricity flows through wires.

    a. Metals are good conductors of heat and electricity.

    b. Increasing the temperature of any substance requires the addition of heat energy.

3. Light is a form of energy made of electromagnetic waves.

    a. Light waves travel in a straight line.

    b. Substances may cause light waves to change direction of travel (e.g., reflection, refraction).

    c. Sound is a form of energy caused by waves of vibrations that spread from its source.

LIFE SCIENCE

Grade 4

Standard 3: Characteristics of Organisms – Each type of organism has structures that enable it to function in unique and specific ways to obtain food, reproduce and survive. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Organisms can survive only in environments in which their needs can be met (e.g., food, shelter, air, reproduction, and water).

2. Living organisms may be grouped by various characteristics or the environment in which they live (e.g., habitats, anatomy, behaviors).

3. Many observable characteristics of an organism, are inherited from the parents of the organisms (e.g., color of flowers, number of limbs on an animal).

4. Energy from the Sun is passed to organisms through food chains.

ELEMENTARY EARTH/SPACE SCIENCE

Grade 4

Standard 4: Properties of Earth and Moon - The Earth and its Moon have specific properties. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Earth materials consist of rock, soils, water, and air.

2. The processes of erosion, weathering, and sedimentation affect Earth materials (e.g., earthquakes, floods, landslides, volcanic eruptions).

3. Fossils provide evidence about the plants and animals that lives long ago and the nature of the environment at that time (e.g., the formation of fossils).

4. The observable shape of the moon changes from day to day in a cycle that lasts about a month.

SCIENCE
Grade 5

Standards for Inquiry, Physical, Life, and
Earth/Space Science

The *Priority Academic Student Skills (PASS)* should be taught by investigating content, concepts, and principles of major themes in Physical, Life, and Earth/Space Sciences.

SCIENCE PROCESSES AND INQUIRY

Grade 5

Process Standard 1: Observe and Measure – Observing is the first action taken by the learner to acquire new information about an objects, organism, or event. Opportunities for observation are developed through the use of a variety of scientific tools. Measurement allows observations to be quantified. The student will accomplish these objectives to meet this process standard.

1. Observe and measure objects, organisms, and/or events (e.g., mass, length, time, volume, temperature) using the International System of Units (SI) (i.e., grams, milligrams, meters, millimeters, centimeters, kilometers, liters, milliliters, and degrees Celsius). Measure using tools (e.g., simple microscopes or magnifier, graduated cylinders, gram spring scales, metric rulers, metric balances and Celsius thermometers).

2. Compare and/or contrast similar and/or different characteristics (e.g., color, shape, size, texture, sound, position, change) in a given set of objects, organisms, or events.

Process Standard 2: Classify – Classifying establishes order. Objects, organisms, and events are classified based on similarities, differences, and interrelationships. The student will accomplish these objectives to meet this process standard.

1. Classify a set of objects, organisms, and/or events using no more than three observable properties (e.g., dichotomous keys).

2. Arrange objects, organisms and/or events in serial order (e.g., least to greatest, fastest to slowest).

Process Standard 3: Experiment – Experimenting is a method of discovering information. It requires making observations and measurements to test ideas. The student will accomplish these objectives to meet this process standard.

*1. Ask questions about the world and formulate an orderly plan to investigate a question. 🕮

2. Evaluate the design of a scientific investigation (e.g., order of investigation procedures, number of tested variables). 🕮

*3. Design and conduct a scientific investigation.

4. Recognize potential hazards and practice safety procedures in all science investigations.

Process Standard 4: Interpret and Communicate – Interpreting is the process of recognizing patterns in collected data by making inferences, predictions, or conclusions. Communicating is the process of describing, recording, and reporting experimental procedures and results to others. Communication may be oral, written, or mathematical and includes organizing ideas, using appropriate vocabulary, graphs, other visual representations, and mathematical equations. The student will accomplish these objectives to meet this process standard.

*1. Report data using tables, line, bar, trend, and/or simple circle graphs. 🕮

2. Interpret data tables, line bar, trend, and/or simple circle graphs. 🕮

3. Make predictions based on patterns in experimental data. 🕮

4. Communicate the results of investigations and/or give explanations based on data. 🕮

Process Standard 5: Inquiry – Inquiry can be defined as the skills necessary to carry out the process of scientific or systemic thinking. In order for inquiry to occur, students must have the opportunity to ask a question, formulate a procedure, and observe phenomena. The student will accomplish these objectives to meet this process standard.

*1. Use different ways to investigate questions and evaluate the fairness of the test.

*2. Use a variety of measurement tools and technology.

*3. Formulate a general statement to represent the data.

*4. Share results of an investigation in sufficient detail so that data may be combined with data from other students and analyzed further. 🕮

PHYSICAL SCIENCE

Grade 5

Standard 1: Properties of Matter and Energy – Describe characteristics of objects based on physical qualities such as size, shape, color, mass, temperature, and texture. Energy can produce changes in properties of objects such as changes in temperature. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Matter has physical properties that can be used for identification (e.g., color, texture, shape).

2. Physical properties of objects can be observed, described, and measured using tools such as simple microscopes, gram spring scales, metric rulers, metric balances, and Celsius thermometers.

3. Energy can be transferred in many ways (e.g., energy from the Sun to air, water, and metal).

4. Energy can be classified as either potential or kinetic.

LIFE SCIENCE

Grade 5

Standard 2: Organisms and Environments – Organisms within an ecosystem are dependent on one another and the environment. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Organisms in an ecosystem depend on each other for food, shelter, and reproduction.

   a. Ecosystems include food chains and food webs.

   b. Relationships exist between consumers, producers, and decomposers within an ecosystem.

   c. Predators and prey relationships affect populations in an ecosystem.

2. Changes in environmental conditions due to human interactions or natural phenomena can affect the survival of individual organisms and/or entire species.

a. Earth's resources can be natural (non-renewable) or man-made (renewable).

b. The practices of recycling, reusing, and reducing help to conserve Earth's limited resources.

EARTH/SPACE SCIENCE

Grade 5

Standard 3: Structure of Earth and the Solar System – Interaction between air, water, rock/soil, and all living things. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Soil consists of weathered rocks and decomposed organic material from dead plants, animals, and bacteria. Soils are often found in layers.

2. Weather exhibits daily and seasonal patterns (i.e., air temperature, basic cloud types – cumulus, cirrus, stratus, and nimbus, wind direction, wind speed, humidity, precipitation).

   a. Weather measurement tools include thermometer, barometer, anemometer, and rain gauge.

   b. Weather maps are used to display current weather and weather predictions.

3. Earth is the third planet from the Sun in a system that includes the moon, the Sun, and seven other planets.

   a. Most objects in the solar system are in regular and predictable motion (e.g., phases of the moon).

   b. Objects in the Solar System have individual characteristics (e.g., distance from Sun, number of moons, temperature of object).

   c. The Earth rotates on its axis while making revolutions around the Sun.

SCIENCE
OVERVIEW
ORGANIZATION

The *Priority Academic Student Skills (PASS)* are organized by Science Process and Inquiry standards and content Standards which include Physical Science, Life Science, and Earth/Space Science. They are arranged by grade level at Grades 1-8, and by course subject area at the high school level. Each standard is followed by two or more objectives to accomplish each standard. Students should be provided with science experiences at each grade level from all areas of the content standards. This integrated approach will provide students with a coordinated, coherent understanding of the necessary skills and knowledge of scientifically literate citizens.

The Oklahoma State Testing Program assesses the Science Priority Academic Student Skills (PASS) with a 5th and 8th grade criterion-referenced test and a Biology I End-of-Instruction test. All of these state level assessments are based on the standards in this document.

The objectives presented in the "Science Processes and Inquiry" standards are included at all grade levels, because the understandings and abilities associated with these concepts need to be developed throughout a student's educational experience.

The content standard areas (physical, life, earth/space) are designed to facilitate conceptual development by building on the content knowledge introduced at the PreKindergarten level. Because each of the content standards subsumes the knowledge and skills of the other standards, they are designed to be used as a whole. Although material can be added to the content standards, using only a portion of the standards will leave gaps in the scientific understanding expected of students.

SCIENCE STANDARDS
Grades 1-12

The science framework presented in this outline is what students should know, understand, and be able to do in the natural sciences. Students combine process and knowledge as they use scientific reasoning and critical thinking to develop their understanding of science. Inquiry builds conceptual bridges between process and scientific knowledge. Relevant use of developmentally appropriate technology facilitates the inquiry process.

The attainment of scientific literacy is the result of a sequential curriculum that is dependent on quality science teaching at each grade level beginning in prekindergarten. Quality science teaching requires direct, inquiry-oriented learning experiences that emphasize the processes of science and major science concepts. Consistent with national standards, fewer concepts in physical, life and earth/space sciences are explored while more emphasis is placed on in-depth understanding. The following standards provide a framework to achieve the above goals.

The science standards are not a scope and sequence or a district curriculum guide. They provide a framework for schools to develop an aligned science curriculum and for teachers to develop their own classroom lessons. The science standards in this document were developed

based on the *National Science Education Standards* by the National Research Council, the *Benchmarks for Scientific Literacy* by the American Association for the Advancement of Science, and the *Science Frameworks* by the National Association for Educational Progress (NAEP). The United States has established a goal for all students to achieve scientific literacy. These national publications, developed by science and education experts, will enable the nation and the state of Oklahoma to meet this goal.

NOTE:
Asterisks (*) have been used to identify standards and objectives that must be assessed by the local school district. All other skills may be assessed by the Oklahoma School Testing Program (OSTP).

Book icons (📖) identify Information Literacy skills. Students are best served when these are taught in collaboration and cooperation between the classroom teacher and the library media specialist.

Use of term i.e. means “in exactness”; use of the term e.g. means “example given”.

OAC 210:15-3-70—210:15-3-82

Approved by the Oklahoma State Board of Education, March 24, 2011. Final approval pending by Oklahoma Governor and Legislature.

SCIENCE
Grade 6

Standards for Inquiry, Physical, Life, and Earth/Space Science

The *Priority Academic Student Skills (PASS)* should be taught by investigating content, concepts, and principles of major themes in Physical, Life, and Earth/Space Sciences.

SCIENCE PROCESSES AND INQUIRY

Grade 6

Process Standard 1: Observe and Measure – Observing is the first action taken by the learner to acquire new information about an object, organism, or event. Opportunities for observation are developed through the use of a variety of scientific tools. Measurement allows observations to be quantified. The student will accomplish these objectives to meet this process standard.

1. Identify qualitative and/or quantitative changes given conditions (e.g., temperature, mass, volume, time, position, length) before, during, and after an event.

2. Use appropriate tools (e.g., metric ruler, graduated cylinder, thermometer, balances, spring scales, stopwatches, computers and handheld data collection devices) to measure objects, organisms, and/or events.

3. Use appropriate International System of Units (SI) (i.e., grams, meters, liters, degrees Celsius, and seconds) and SI prefixes (i.e. milli-, centi-, and kilo-) when measuring objects, organisms and/or events.

Process Standard 2: Classify – Classifying establishes order. Objects, organisms, and events are classified based on similarities, differences, and interrelationships. The student will accomplish these objectives to meet this process standard.

1. Using observable properties, place an object, organism, and/or event into a classification system (e.g., dichotomous keys, periodic table, biological hierarchy).

2. Identify properties by which a set of objects, organisms, or events could be ordered.

Process Standard 3: Experimental design – Understanding experimental designs requires that students recognize the components of a valid experiment. The student will accomplish these objectives to meet this process standard.

*1. Ask questions about the world and design investigations that lead to scientific inquiry. Identify testable questions based on prior knowledge, background research, or observations.

2. Evaluate the design of a scientific investigation.

3. Identify variables and/or controls in an experimental setup: independent variable and dependent variable.

*4. Identify a testable hypothesis for an experiment.

*5. Follow a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

6. Recognize potential hazards and practice safety procedures in all science activities.

Process Standard 4: Interpret and Communicate – Interpreting is the process of recognizing patterns in collected data by making inferences, predictions, or conclusions. Communicating is the process of describing, recording, and reporting experimental procedures and results to others. Communication may be oral, written, or mathematical and includes organizing ideas, using appropriate vocabulary, graphs, other visual representations, and mathematical equations. The student will accomplish these objectives to meet this process standard.

*1. Report and record both quantitative/qualitative data in an appropriate method when given an experimental procedure or data.

2. Interpret data tables, line, bar, trend, and/or circle graphs.

3. Evaluate data to develop reasonable explanations and/or predictions.

4. Determine if results of investigations support or do not support hypotheses.

*5. Communicate scientific processes, procedures, and conclusions (e.g., model, poster, diagram, journal entry, lab report, scientific paper, oral presentation, and digital presentation).

Process Standard 5: Inquiry – Inquiry can be defined as the skills necessary to carry out the process of scientific thinking. In order for inquiry to occur students must have the opportunity to make observations, pose questions, formulate testable hypotheses, carry out experiments, and make conclusions based on evidence. The student will accomplish these objectives to meet this process standard.

*1. Ask questions that can be answered through scientific investigation.

*2. Design and conduct experiments utilizing scientific processes.

*3. Use the engineering design process to address a problem or need (e.g., identify a need, conduct background research, prepare preliminary designs, build and test a prototype, test and revise design, communicate results). 🕮

*4. Understand the value of technology and use technology to gather data and analyze results of investigations (e.g., probes, hand-held digital devices, digital cameras, software.

*5. Develop a logical relationship between evidence and explanation to form and communicate a valid conclusion, and suggest alternative explanations.

PHYSICAL SCIENCE

Grade 6

Standard 1: Physical Properties in Matter - Physical characteristics of objects can be described using shape, size, and mass whereas the materials from which objects are made can be described using color and texture. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Matter has physical properties that can be measured (i.e., mass, volume, temperature, color, and texture). Changes in physical properties of objects can be observed, described, and measured using tools such as simple microscopes, gram spring scales, metric rulers, metric balances, and Celsius thermometers.

2. The mass of an object is not altered due to changes in shape.

Standard 2: Transfer of Energy - Change from one form of energy to another. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Energy exists in many forms such as heat, light, electricity, mechanical motion, and sound. Energy can be transferred in various ways (e.g., potential to kinetic, electrical to light, chemical to electrical, mechanical to electrical).

2. Electrical circuits provide a means of transferring electrical energy when heat, light, and sound are produced (e.g., open and closed circuits, parallel and series circuits).

3. Electric currents and magnets can exert a force on each other (e.g., direct and alternating currents).

LIFE SCIENCE

Grade 6

Standard 3: Structure and Function in Living Systems - Living systems at all levels of organization demonstrate the complementary nature of structure and function. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Cells are the building blocks of all organisms (both plants and animals).

    a. Plant and animal cells have similarities and differences (i.e., nucleus, mitochondria, cell wall, plasma membrane, chloroplast, and vacuole).

2. Living systems are organized by levels of complexity (i.e., cells, organisms, and ecosystems).

Standard 4: Populations and Ecosystems - Populations consist of individuals of a species that occur together at a given place and time. All populations living together and the physical factors with which they interact compose an ecosystem. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Organisms within an ecosystem are dependent on one another and on nonliving components of the environment. Some source of energy is needed for all organisms to stay alive and grow. Energy transfer can be followed in food chains and webs.

2. In all environments, organisms with similar needs may compete with one another for resources, including food, space, water, air, and shelter. Other relationships may be beneficial (e.g., producers/autotrophs, consumers/heterotrophs, symbiosis).

Standard 5: Structures of the Earth and the Solar System - The earth is mostly rock, three-fourths of its surface is covered by a relatively thin layer of water, and the entire planet is surrounded by a relatively thin blanket of air, and is able to support life. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Earth has four main systems that interact: the geosphere, the hydrosphere, the atmosphere, and the biosphere.

    a. The geosphere is the portion of the Earth system that includes the Earth’s interior, rocks and minerals, landforms, and the processes that shape the Earth’s surface.

    b. The hydrosphere is the liquid water component of the Earth. Water covers the majority of the Earth’s surface and circulates through the crust, oceans and atmosphere in what is known as the water cycle.

   c. The atmosphere is a mixture of nitrogen, oxygen, and trace gases that include water vapor. The atmosphere has a different physical and chemical composition at different elevations.

   d. The biosphere is made up of all that is living on the Earth. It is a life-supporting global ecosystem, where living things depend on other organisms and the environment.

2. The sun provides the light and heat necessary to maintain life on Earth and is the ultimate source of energy (i.e., producers receive their energy from the sun).

SCIENCE

Grade 7

Standards for Inquiry, Physical, Life, and Earth/Space Science

The *Priority Academic student Skills (PASS)* should be taught by investigating content, concepts, and principles of major themes in Physical, Life, and Earth/Space Sciences.

SCIENCE PROCESSES AND INQUIRY

Grade 7

Process Standard 1: Observe and Measure – Observing is the first action taken by the learner to acquire new information about an object, organism, or event. Opportunities for observation are developed through the use of a variety of scientific tools. Measurement allows observations to be quantified. The student will accomplish these objectives to meet this process standard.

1. Identify qualitative and/or quantitative changes given conditions (e.g., temperature, mass, volume, time, position, length) before, during, and after an event.

2. Use appropriate tools (e.g., metric ruler, graduated cylinder, thermometer, balances, spring scales, stopwatches, computers and handheld data collection devices) to measure objects, organisms, and/or events.

3. Use appropriate International System of Units (SI) (i.e., grams, meters, liters, degrees Celsius, and seconds) and SI prefixes (i.e., milli-, centi-, and kilo-) when measuring objects, organisms and/or events.

Process Standard 2: Classify – Classifying establishes order. Objects, organisms, and events are classified based on similarities, differences, and interrelationships. The student will accomplish these objectives to meet this process standard.

1. Using observable properties, place an object, organism, and/or event into a classification system (i.g., dichotomous keys, periodic table, biological hierarchy.

2. Identify properties by which a set of objects, organisms, or events could be ordered.

Process Standard 3: Experimental design – Understanding experimental designs requires that students recognize the components of a valid experiment. The student will accomplish these objectives to meet this process standard.

1. Evaluate the design of a scientific investigation. 🕮

2. Identify variables and/or controls in an experimental setup: independent variable and dependent variable.

*3. Identify a testable hypothesis for an experiment.

*4. Follow a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

5. Recognize potential hazards and practice safety procedures in all science activities.

Process Standard 4: Interpret and Communicate – Interpreting is the process of recognizing patterns in collected data by making inferences, predictions, or conclusions. Communicating is the process of describing, recording, and reporting experimental procedures and results to others. Communication may be oral, written, or mathematical and includes organizing ideas, using appropriate vocabulary, graphs, other visual representations, and mathematical equations. The student will accomplish these objectives to meet this process standard.

*1. Report and record both quantitative/qualitative data in an appropriate method when given an experimental procedure or data. 🕮

2. Interpret data tables, line, bar, trend, and/or circle graphs. 🕮

3. Evaluate data to develop reasonable explanation and/or predictions. 🕮

*4. Determine if results of investigations support or do not support hypotheses. 🕮

*5. Communicate scientific processes, procedures, and conclusions (e.g., model, poster, diagram, journal entry, lab report, scientific paper, oral presentation, and digital presentation). 🕮

Process Standard 5: Inquiry – Inquiry can be defined as the skills necessary to carry out the process of scientific thinking. In order for inquiry to occur students must have the opportunity to make observations, pose questions, formulate testable hypotheses, carry out experiments, and make conclusions based on evidence. The student will accomplish these objectives to meet this process standard.

*1. Ask questions that can be answered through scientific investigation.

*2. Design and conduct experiments utilizing scientific processes.

*3. Use the engineering design process to address a problem or need (e.g., identify a need, conduct background research, prepare preliminary designs, build and test a prototype, test and revise design, communicate results). 🕮

*4. Understand the value of technology and use technology to gather data and analyze results of investigations (e.g., probes, hand-held digital devices, digital cameras, software, computers, calculators, digital balances, GPS).

*5. Develop a logical relationship between evidence and explanation to form and communicate a valid conclusion, and suggest alternative explanation.

PHYSICAL SCIENCE

Grade 7

Standard 1: Properties and Physical changes in Matter – Physical characteristics of objects can be described using shape, size, and mass whereas the materials from which objects are made can be described using color and texture. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Matter has physical properties that can be measured (i.e., mass, volume, temperature, color, texture, and density). Physical changes of a substance do not alter the chemical nature of a substance (e.g., phase changes of water, sanding wood).

2. Mixtures can be classified as homogeneous or heterogeneous and can be separated by physical means.

LIFE SCIENCE

Grade 7

Standard 2: Structure and Function in Living Systems - Living systems at all levels of organization demonstrate the complementary nature of structure and function. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Living systems are organized by levels of complexity (i.e., cells, tissues, organs, systems).

2. Specialized structures perform specific functions at all levels of complexity (e.g., leaves on trees, wings on birds, organelles in cells).

Standard 3: Reproduction and Heredity – Reproduction is the process by which organisms give rise to offspring. Heredity is the passing of traits to offspring. All organisms must be able to grown and reproduce. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Characteristics of an organism result from inheritance and from interactions with the environment (e.g., genes, chromosomes, DNA, inherited traits, cell division).

2. Similarities among organisms are found in anatomical features, which can be used to infer the degree of relatedness among organisms.

Standard 4: Behavior and Regulations - All organisms must be able to maintain stable internal conditions while living in a constantly changing external environment. Behavioral response is a set of actions determined in part by heredity and in part by experience. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Living organisms strive to maintain a constant internal environment (i.e., homeostasis).

2. Living organisms have physical and/or behavioral responses to external stimuli (e.g., hibernation, migration, geotropism).

EARTH/SPACE SCIENCE

Grade 7

Standard 5: Structures of the Earth Structures of the Earth System - The Earth is mostly rock, three-fourths of its surface is covered by a relatively thin layer of water, and the entire planet is surrounded by a relatively thin blanket of air, and is able to support life. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Global patterns of atmospheric movement influence local weather such as oceans' effect on climate (e.g., sea breezes, land breezes, ocean currents). Clouds, formed by the condensation of water vapor, affect local weather and climate.

2. The solid crust of the earth consists of separate plates that move very slowly pressing against one another in some places and pulling apart in other places (i.e., volcanoes, earthquakes, mountain creation).

Standard 6: Earth and the Solar System - The earth is the third planet from the sun in a system that includes the moon, the sun, seven other planets and their moons, and smaller objects (e.g., asteroids, comets, dwarf planets. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Most objects in the solar system are in regular and predictable motion. Those motions explain such phenomena as the day, the year, phases of the moon, and eclipses.

*2. Seasons result from variations in the amount of the sun's energy hitting the surface, due to the tilt of the earth's rotation on its axis and the length of the day. The relationship of motion of the Sun, Earth, and Earth's Moon is a result of the force of gravity.

SCIENCE
Grade 8

Standards for Inquiry, Physical, Life, and
Earth/Space Science

The *Priority Academic Student Skills (PASS)* should be taught by investigating content, concepts, and principles of major themes in Physical, Life, and Earth/Space Sciences.

SCIENCE PROCESSES AND INQUIRY

Grade 8

Process Standard 1: Observe and Measure - Observing is the first action taken by the learner to acquire new information about an object, organism, or event. Opportunities for observation are developed through the use of a variety of scientific tools. Measurement allows observations to be quantified. The student will accomplish these objectives to meet this process standard.

1. Identify qualitative and/or quantitative changes given conditions (e.g., temperature, mass, volume, time, position, length) before, during, and after an event.

2. Use appropriate tools (e.g., metric ruler, graduated cylinder, thermometer, balances, spring scales, stopwatches, computers, handheld data collection devices) to measure objects, organisms, and/or events.

3. Use appropriate International System of Units (SI) (i.e., grams, meters, liters, degrees Celsius, and seconds) and SI prefixes (i.e. milli-, centi-, and kilo-) when measuring objects, organisms and/or events.

Process Standard 2: Classify - Classifying establishes order. Objects, organisms, and events are classified based on similarities, differences, and interrelationships. The student will accomplish these objectives to meet this process standard.

1. Using observable properties, place an object, organism, and/or event into a classification system (e.g., dichotomous keys, periodic table, biological hierarchy).

2. Identify properties by which a set of objects, organisms, or events could be ordered.

Process standard 3: Experimental design - Understanding experimental design requires that students recognize the components of a valid experiment. The student will accomplish these objectives to meet this process standard.

*1. Ask questions about the world and design investigations that lead to scientific inquiry. Identify testable questions based on prior knowledge, background research, or observations.

2. Evaluate the design of a scientific investigation.

3. Identify variables and/or controls in an experimental setup: independent variable and dependent variable.

*4. Identify a testable hypothesis for an experiment.

*5. Follow a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

6. Recognize potential hazards and practice safety procedures in all science activities.

Process Standard 4: Interpret and Communicate - Interpreting is the process of recognizing patterns in collected data by making inferences, predictions, or conclusions. Communicating is the process of describing, recording, and reporting experimental procedures and results to others. Communication may be oral, written, or mathematical and includes organizing ideas, using appropriate vocabulary, graphs, other visual representations, and mathematical equations. The student will accomplish these objectives to meet this process standard.

*1. Report and record both quantitative/qualitative data in an appropriate method when given an experimental procedure or data. 🕮

2. Interpret data tables, line, bar, trend, and/or circle graphs. 🕮

3. Evaluate to develop reasonable explanation and/or predictions. 🕮

*4. Determine if results of investigations support or do not support hypotheses. 🕮

*5. Communicate scientific processes, procedures, and conclusions (e.g., model, poster, diagram, journal entry, lab report, scientific paper, oral presentation, and digital presentation). 🕮

Process Standard 5: Inquiry - Inquiry can be defined as the skills necessary to carry out the process of scientific thinking. In order for inquiry to occur students must have the opportunity to make observations, pose questions, formulate testable hypotheses, carry out experiments, and make conclusions based on evidence. The student will accomplish these objectives to meet this process standard.

*1. Ask questions that can be answered through scientific investigation.

*2. Design and conduct experiments utilizing scientific processes.

*3. Use the engineering design process to address a problem or need (e.g., identify a need, conduct background research, prepare preliminary designs, build and test a prototype, test and revise design, communicate results).

*4. Understand the value of technology and use technology to gather data and analyze results of investigations (e.g., probes, hand-held digital devices, digital cameras, software, computers, calculators, digital balances, GPS).

*5. Develop a logical relationship between evidence and explanation to form and communicate a valid conclusion, and suggest alternative explanation.

PHYSICAL SCIENCE

Grade 8

Standard 1: Properties and Chemical Changes in Matter - Physical characteristics of objects can be described using shape, size, and mass. The materials from which objects are made can be described using color, texture, and hardness. These properties can be used to distinguish and separate one substance from another. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Substances react chemically with other substances to form new substances with different characteristics (e.g., oxidation, combustion, acid/base reactions).

2. Matter has physical properties that can be measured (i.e., mass, volume, temperature, color, texture, density, and hardness) and chemical properties. In chemical reactions and physical changes, matter is conserved (e.g., compare and contrast physical and chemical changes).

Standard 2: Motions and Forces - The motion of an object can be described by its position, direction of motion, and speed as prescribed by Newton's Laws of Motion. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. The motion of an object can be measured. The position of an object, its speed, and direction can be represented on a graph.

2. An object that is not being subjected to a net force will continue to move at a constant velocity (i.e., inertia, balanced and unbalanced forces).

LIFE SCIENCE

Grade 8

Standard 3: Diversity and Adaptations of Organisms - Millions of species of animals, plants, and microorganisms are alive today. Although different species might look dissimilar, the unity among organisms becomes apparent from an analysis of internal and external structures. Adaptation involves the selection of naturally occurring variations in populations. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. By classifying organisms, biologists consider details of internal and external structure to infer the degree of relatedness among organisms (i.e., kingdom, phylum, class, order, family, genus, species).

2. Organisms have a great variety of internal and external structures that enable them to survive in a specific habitat (e.g., echolocation, seed dispersal).

EARTH/SPACE SCIENCE

Grade 8

Standard 4: Structures and Forces of the Earth and Solar System - The earth is mostly rock, three-fourths of its surface is covered by a relatively thin layer of water, and the entire planet is surrounded by a relatively thin blanket of air, and is able to support life. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Landforms result from constructive forces such as crustal deformation, volcanic eruption, and deposition of sediment and destructive forces such as weathering and erosion.

2. The formation, weathering, sedimentation, and reformation of rock constitute a continuing "rock cycle" in which the total amount of material stays the same as its form changes.

3. Atmospheric and ocean circulation patterns affect weather on a global scale (e.g., El Ninõ, La Ninã, Gulf Stream).

Standard 5: Earth's History - The Earth's history involves periodic changes in the structures of the earth over time. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Earth's history has been punctuated by occasional catastrophic events (e.g., the impact of asteroids or comets, enormous volcanic eruptions, periods of continental glaciation, and the rise and fall of sea level).

2. Fossils provide important evidence of how life and environmental conditions have changed (e.g., Law of Superposition, index fossil, geologic time period, extinction).

SCIENCE
OVERVIEW
ORGANIZATION

The *Priority Academic Student Skills (PASS)* are organized by Science Process and Inquiry Standards and Content Standards which include Physical Science, Life Science, and Earth/Space Science. They are arranged by grade level at Grades 1-8, and by course subject area at the high school level. Each standard is followed by two or more objectives to accomplish each standard. Students should be provided with science experiences at each grade level from all areas of the content standards. This integrated approach will provide students with a coordinated, coherent understanding of the necessary skills and knowledge of scientifically literate citizens.

The Oklahoma State Testing Program assesses the Science *Priority Academic Student Skills (PASS)* with a 5th and 8th grade criterion-referenced test and a Biology I End-of-Instruction test. All of these state level assessments are based on the standards in this document.

The objectives presented in the “Science Processes and Inquiry” standards are included at all grade levels, because the understandings and abilities associated with these concepts need to be developed throughout a student’s educational experience.

The content standard areas (physical, life, earth/space) are designed to facilitate conceptual development by building on the content knowledge introduced at the PreKindergarten level. Because each of the content standards subsumes the knowledge and skills of the other standards, they are designed to be used as a whole. Although material can be added to the content standards, using only a portion of the standards will leave gaps in the scientific understanding expected of students.

SCIENCE STANDARDS
Grades 1-12

The science framework presented in this outline is what students should know, understand, and be able to do in the natural sciences. Students combine process and knowledge as they use scientific reasoning and critical thinking to develop their understanding of science. Inquiry builds conceptual bridges between process and scientific knowledge. Relevant use of developmentally appropriate technology facilitates the inquiry process.

The attainment of scientific literacy is the result of a sequential curriculum that is dependent on quality science teaching at each grade level beginning in prekindergarten. Quality science teaching requires direct, inquiry-oriented learning experiences that emphasize the processes of science and major science concepts. Consistent with national standards, fewer concepts in physical, life and earth/space sciences are explored while more emphasis is placed on in-depth understanding. The following standards provide a framework to achieve the above goals.

The science standards are not a scope and sequence or a district curriculum guide. They provide a framework for schools to develop an aligned science curriculum and for teachers to develop their own classroom lessons. The science standards in this document were developed

based on the *National Science Education Standards* by the National Research Council (NRC) and the *Benchmarks for Scientific Literacy* by the American Association for the Advancement of Science (AAAS), and the *Science Frameworks* by the National Association for Education Progress (NAEP). The United States has established a goal for all students to achieve scientific literacy. These national publications, developed by science and education experts, will enable the nation and the state of Oklahoma to meet this goal.

NOTE:

Asterisks (*) have been used to identify standards and objectives that must be assessed by the local school district. All other skills may be assessed by the Oklahoma School Testing Program (OSTP).

Book icons (🕮) identify Information Literacy skills. Students are best served when these are taught in collaboration and cooperation between the classroom teacher and the library media specialist.

Use of the term i.e. means “in exactness”; use of the term e.g. means “example given”.

OAC 210:15-3-70—210:15-3-82

Approved by the Oklahoma State Board of Education, March 24, 2011. Final approval pending by Oklahoma Governor and Legislature.

PHYSICAL SCIENCE

High School

Standards for Inquiry and the Physical Sciences

The *Priority Academic Student Skills (PASS)* should be taught by investigating broad, integrated content, concepts, and principles of major themes in the physical sciences.

SCIENCE PROCESSES AND INQUIRY

Process Standard 1: Observe and Measure - Observing is the first action taken by the learner to acquire new information about an object or event. Opportunities for observation are developed through the use of a variety of scientific tools. Measurement allows observations to be quantified. The student will accomplish these objectives to meet this process standard.

1. Identify qualitative and quantitative changes given conditions (e.g., temperature, mass, volume, time, position, length) before, during, and after an event.

2. Use appropriate tools with accuracy and precision (e.g., metric ruler, graduated cylinder, thermometer, balances, spring scales, stopwatches) when measuring objects and/or events.

3. Use appropriate International System of Units (SI) (i.e., grams, meters, liters, degrees Celsius, and seconds) and SI prefixes (i.e., micro-, milli-, centi-, and kilo-) when measuring objects and/or events.

Process Standard 2: Classify - Classifying establishes order. Objects and events are classified based on similarities, differences, and interrelationships. The student will accomplish these objectives to meet this process standard.

1. Using observable properties, place an object or event into a classification system.

2. Identify the properties by which a classification system is based.

Process Standard 3: Experimental Design - Understanding experimental design requires that students recognize the components of a valid experiment. The student will accomplish these objectives to meet this process standard.

1. Evaluate the design of a physical science experiment.

2. Identify the independent variables, dependent variables, controlled variables, and control set-up in an experiment.

3. Use mathematics to show relationships within a given set of observations.

4. Identify a hypothesis for a given problem in physical science investigations.

5. Recognize potential hazards and practice safety procedures in all physical science activities.

Process Standard 4: Interpret and Communicate - Interpreting is the process of recognizing patterns in collected data by making inferences, predictions, or conclusions. Communicating is the process of describing, recording, and reporting experimental procedures and results to others. Communication may be oral, written, or mathematical and includes organizing ideas, using appropriate vocabulary, graphs, other visual representations, and mathematical equations. The student will accomplish these objectives to meet this process standard.

1. Select appropriate predictions based on previously observed patterns of evidence.

*2. Report and display data using appropriate technology and other media.

3. Interpret data tables, line, bar, trend, and/or circle graphs from existing science research or student experiments.

4. Determine if results of physical science investigations support or do not support hypotheses.

5. Evaluate experimental data to draw the most logical conclusion.

*6. Routinely prepare a written report describing the sequence, results, and interpretation of a physical science investigation or event.

   a. Establish and maintain a formal style and objective tone.

   b. When appropriate or possible, utilize technology to produce, publish, or revise writing products.

   c. Gather relevant information from multiple authoritative print and digital sources and follow a standard format for citation, avoiding plagiarism.

*7. Communicate or defend scientific thinking that resulted in conclusions.

   a. Read, comprehend, and present evidence from a range of sources (e.g. texts, experiments, simulations) to support conclusions.

   b. Recognize bias in observation/research.

8. Identify and/or create an appropriate graph or chart from collected data, tables, or written description.

   a. Translate quantitative information expressed in words into visual form (e.g., table, chart).

   b. Translate information expressed visually or mathematically (e.g. a table, chart, or equation) into words.

Process Standard 5: Model - Modeling is the active process of forming a mental or physical representation from data, patterns, or relationships to facilitate understanding and enhance prediction. The student will accomplish these objectives to meet this process standard.

1. Interpret a model which explains a given set of observations.

2. Select predictions based on models, and when appropriate, apply mathematical reasoning to make accurate predictions.

*3. Compare a given model to the physical world.

Process Standard 6: Inquiry - In order for inquiry to occur, students must have the opportunity to make observations, pose questions, formulate testable hypotheses, carry out experiments, and make conclusions based on evidence. The student will accomplish these objectives to meet this process standard.

*1. Formulate a testable hypothesis and design an appropriate experiment relating to the physical world.

*2. Design and conduct physical science investigations in which variables are identified and controlled.

*3. Use a variety of technologies (e.g., probes, handheld digital devices, digital cameras, software, calculators, digital balances, microscopes, measuring instruments, computers) to collect, analyze, and display data.

*4. Inquiries should lead to the formulation of explanations or models (physical, conceptual, and mathematical). In answering questions, students should engage in discussions (based on scientific knowledge, the use of logic, and evidence from the investigation) and arguments that encourage the revision of their explanations, leading to further inquiry.

Process Standard 7: Engineering Design - Engineering design can be defined as the creative process of turning abstract ideas into a physical prototype (laboratory apparatus, trial product, or model) that addresses a need

or solves a problem. In order for engineering design to occur, students must have the opportunity to identify a need or problem, establish design criteria, prepare preliminary designs, build then test a prototype, and test and redesign as necessary. The student will accomplish these objectives to meet this process standard:

*1. Identify a need or problem or improve an existing design.

*2. Identify design criteria and constraints (e.g., materials used, product limitations, time limits).

*3. Use a variety of resources (e.g., Internet, databases, texts) to conduct research in order to develop a preliminary design.

*4. Build and test a prototype. Document the strengths and weaknesses of the prototype in writing.

*5. Analyze and redesign to determine which solution best meets the criteria and constraints.

*6. Communicate results in a variety of ways (e.g., orally, written, Internet publications, videos, posters, product demonstrations).

PHYSICAL SCIENCE

High School

Standard 1: Structure and Properties of Matter – All matter is made up of atoms. Its structure is made up of repeating patterns and has characteristic properties. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Matter is made up of minute particles called atoms, and atoms are composed of even smaller components (i.e., protons, neutrons, and electrons).

2. An element is identified by the number of protons (atomic number) in the nucleus.

   a. When elements are listed in order of increasing number of protons, repeating patterns of physical and chemical properties identify families of elements with similar properties.

   b. Elements found on the earth are also found throughout the universe.

3. Matter has characteristic properties that are unique for pure substances and can be used to separate one substance from another (e.g., boiling points, melting points, density).

4. A compound is formed when two or more kinds of atoms bind together chemically. Each compound is formed when two or more kinds of atoms bind together chemically. Each compound has unique chemical and physical properties.

Standard 2: Conservation of Matter – Matter is neither created nor destroyed in physical and chemical interactions. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Chemical changes are identified by one or more events (i.e., precipitate, color change, gas production, heat gain or loss).

2. Chemical equations are used to represent chemical changes in which reactant(s) form product(s).

3. Chemical reactions can be classified (e.g., synthesis/combination, decomposition, single displacement, double displacement).

Standard 3: Motion and Forces – The motion of an object can be described by its position, direction of motion, and speed. A change in motion occurs as a result of a net force. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Objects change their motion only due to a net force. Laws of motion are used to determine the effects of forces on the motion of objects. Gravitation is a universal force that each object exerts on any other object.

2. Moving electric charges produce magnetic forces, and moving magnets produce electric forces. Electricity and magnetism are two aspects of a single electromagnetic force (e.g., voltage, current, resistance, induction).

Standard 4: Interactions of Energy and Matter – Energy can be transferred or transformed but never destroyed. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Energy can be classified as kinetic energy (energy of motion) or potential energy (e.g., positional, elastic, chemical, nuclear).

2. Waves radiate energy and interact with matter.

    a. Propagation of mechanical waves (e.g., sound, seismic, water) requires a medium.

    b. Electromagnetic waves (radio waves to gamma rays) do not require a medium.

BIOLOGY I

HIGH SCHOOL

Standards for Inquiry and the Biological Sciences

The Priority Academic Student Skills (PASS) should be taught by investigating content, concepts, and principles of major themes in the Biological Sciences.

SCIENCE PROCESSES AND INQUIRY

High School

Process Standard 1: Observe and Measure – Observing is the first action taken by the learner to acquire new information about an organism or event. Opportunities for observation are developed through the use of a variety of scientific tools, allowing the student to distinguish between observation and inference. Measurement allows observations to be quantified. The student will accomplish these objectives to meet this process standard.

1. Identify qualitative and quantitative changes in cells, organisms, populations, and ecosystems given conditions (e.g., temperature, mass, volume, time, position, length, quantity) before, during, and after an event.

2. Use appropriate tools with accuracy and precision (e.g., microscope, pipette, metric ruler, graduated cylinder, thermometer, balance, stopwatch) when measuring cells, organisms, populations, and ecosystems.

3. Use appropriate International System of Units (SI) (i.e., grams, meters, liters, degrees Celsius, and seconds) and SI prefixes (i.e., micro-, milli-, centi-, and kilo-) when measuring objects and/or events.

Process Standard 2: Classify – Classifying establishes order. Organisms and events are classified based on similarities, differences, and interrelationships. The student will accomplish these objectives to meet this process standard.

1. Using observable properties, place cells, organisms, and/or events into a biological classification system (e.g., dichotomous keys, taxonomy charts, cladograms).

2. Identify the properties by which a biological classification system is based.

Process Standard 3: Experimental Design – Understanding experimental design requires that students recognize the components of a valid experiment. The student will accomplish these objectives to meet this process standard.

1. Evaluate the design of a biology laboratory experiment.

2. Identify the independent variables, dependent variables, controlled variables, and control set-up in an experiment.

3. Use mathematics to show relationships within a given set of observations (e.g., population studies, biomass, probability).

4. Identify a hypothesis for a given problem in biology investigations.

5. Recognize potential hazards and practice safety procedures in all biology activities.

Process Standard 4: Interpret and Communicate – Interpreting is the process of recognizing patterns in collected data by making inferences, predictions, or conclusions. Communicating is the process of describing, recording, and reporting experimental procedures and results to others. Communication may be oral, written, or mathematical and includes organizing ideas, using appropriate vocabulary, graphs, other visual representations, and mathematical equations. The student will accomplish these objectives to meet this process standard.

1. Select appropriate predictions based on previously observed patterns of evidence.

*2. Report and display data using appropriate-technology and other media.

3. Interpret data tables, line, bar, trend, and/or circle graphs from existing science research or student experiments.

4. Determine if results of biological science investigations support or do not support hypotheses.

5. Evaluate experimental data to draw the conclusion that is best supported by the evidence.

*6. Routinely prepare a written report describing the sequence, results, and interpretation of a biological investigation or event.

   a. Establish and maintain a formal style and objective tone.

   b. When appropriate or possible, utilize technology to produce, publish, or revise writing products.

   c. Gather relevant information from multiple authoritative print and digital sources and follow a standard format for citation, avoiding plagiarism.

*7. Communicate or defend scientific thinking that results in conclusions.

   a. Read, comprehend, and present evidence from a range of sources (e.g., texts, experiments, or simulations) to support conclusions.

   b. Recognize bias in observation/research.

8. Identify and/or create an appropriate graph or chart from collected data, tables, or written description (e.g., population studies, plant growth, heart rate).

   a. Translate quantitative information expressed in words into visual form (e.g., a table or chart).

   b. Translate information expressed visually or mathematically (e.g., a table, chart or equation) into words.

Process Standard 5: Model – Modeling is the active process of forming a mental or physical representation from data, patterns, or relationships to facilitate understanding and enhance prediction. The student will accomplish these objectives to meet this process standard.

1. Interpret a biological model which explains a given set of observations.

2. Select predictions based on models (e.g., pedigrees, life cycles), and when appropriate, apply mathematical reasoning to make accurate predictions.

*3. Compare a given model to the living world.

Process Standard 6: Inquiry – Inquiry can be defined as the skills necessary to carry out the process of scientific or systemic thinking. In order for inquiry to occur students must have the opportunity to make observation, pose questions, formulate testable hypotheses, carry out experiments, and make conclusions based on evidence. The student will accomplish these objectives to meet this process standard.

*1. Ask a scientific question, formulate a testable hypothesis, and design an appropriate experiment relating to the living world.

*2. Design and conduct biological investigations in which variables are identified and controlled.

*3. Use a variety of technologies (e.g., probes, handheld digital devices, electrophoresis equipment, digital cameras, software, calculators, digital balances, microscopes, measuring instruments, and computers) to collect, analyze and display data.

*4. Inquiries should lead to the formulation of explanations or models (physical, conceptual, and mathematical). In answering questions, students should engage in research and discussions (based on scientific knowledge, the use of logic, and evidence from the investigation) and arguments that encourage the revision of their explanations, leading to further inquiry.

BIOLOGY I

High School

Standard 1: The Cell – Cells are the fundamental unit of life, composed of a variety of structures that perform functions necessary to maintain life. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Cells are composed of a variety of structures such as the nucleus, cell/plasma membrane, cell wall, cytoplasm, ribosomes, mitochondria, and chloroplasts.

   a. The cell/plasma membrane functions (i.e., active transport, passive transport, diffusion, osmosis, and surface area to volume ratio) to maintain homeostasis.

   b. Differentiate among hypotonic, hypertonic, and isotonic conditions.

   c. Compare and contrast prokaryotic and eukaryotic cells.

2. In multicellular organisms, cells have levels of organization (i.e., cells, tissues, organs, organ systems, organisms).

3. Specialized cells enable organisms to monitor what is going on in the world around them (e.g., detect light, sound, specific chemicals, gravity, plant tropism, sense organs, homeostasis).

Standard 2: The Molecular Basis of Heredity – DNA determines the characteristics of organisms. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Cells function according to the information contained in the master code of DNA (i.e., cell cycle, DNA replication and transcription). Transfer RNA and protein synthesis will be taught in life science courses with rigor greater than Biology I.

2. A sorting and recombination of genes during sexual reproduction results in a great variety of possible gene combinations from the offspring of any two parents (i.e., Punnett squares and pedigrees). Students will understand concepts in a single trait cross (e.g., alleles, dominant trait, recessive trait, phenotype, genotype, homozygous, heterozygous, incomplete dominance, and sex-linked traits).

Standard 3: Biological Diversity – Diversity of species is developed through gradual processes over many generations. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Different species might look dissimilar, but the unity among organisms becomes apparent from an analysis of internal structures, the similarity of their chemical processes, and the evidence of common ancestry (e.g., homologous and analogous structures, embryology, fossil record, genetic data).

2. Characteristics of populations change through the mechanism of natural selection. These biological adaptations, including changes in structures, behaviors, and/or physiology, may enhance or limit survival and reproductive success within a particular environment.

3. Broad patterns of behavior exhibited by animals have changed over time to ensure reproductive success. Responses to external stimuli can result from interactions with the organism's own species and others, as well as environmental changes; these responses can be either innate or learned.

Standard 4: The Interdependence of Organisms – Interdependence of organisms in an environment includes the interrelationships and interactions between and among organisms. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Organisms both cooperate and compete in ecosystems (e.g., symbiotic relationships).

2. Living organisms have the capacity to produce populations of infinite size, but environments and resources limit population size (e.g., carrying capacity, limiting factors, ecological succession).

Standard 5: Matter, Energy, and Organization in Living Systems – Living systems require a continuous input of energy to maintain their chemical and physical organizations. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. The complexity and organization of organisms accommodates the need for obtaining, transforming, transporting, releasing, and eliminating the matter and energy used to sustain the organism (i.e., photosynthesis and cellular respiration).

2. As matter and energy flow through different levels of organization of living systems and between living systems and the physical environment, chemical elements are recombined in different ways by different structures. Matter and energy are conserved in each change (i.e., water cycle, carbon cycle, nitrogen cycle, food webs, and energy pyramids).

3. Matter on earth cycles among the living (biotic) and nonliving (abiotic) components of the biosphere.

CHEMISTRY

HIGH SCHOOL

The Priority Academic Student Skills (PASS) should be taught by investigating content, concepts, and principles of major themes in chemistry.

SCIENCE PROCESSES AND INQUIRY

Process Standard 1: Observe and Measure – Observing is the first action taken by the learner to acquire new information about an object or event. Opportunities for observation are developed through the use of a variety of scientific tools. Measurement allows observations to be quantified. The student will accomplish these objectives to meet this process standard.

1. Identify qualitative changes in reactions and quantitative changes in chemical reactions given conditions (e.g., temperature, mass, volume, time, position, length) before, during and after an event.

2. Use appropriate tools with accuracy and precision (e.g., metric ruler, graduated cylinder, thermometer, balance, spring scale, stopwatch, probeware, graphing calculators, digital cameras, computer simulations) when measuring objects and/or events.

3. Use appropriate International Systems of Units (SI) (i.e., meters, liters, degrees Celsius, and seconds) and SI prefixes (i.e., micro-, milli-, centi-, and kilo-) when measuring mass volume and temperature.

Process Standard 2: Classify – Classifying establishes order. Objects and events are classified based on similarities, differences, and interrelationships. The student will accomplish these objectives to meet this process standard.

1. Using observable properties, place an object or event (i.e., chemical versus physical, charge, electron level, and reaction types) into a classification system

2. Identify properties by which a classification system is based.

Process Standard 3: Experimental Design – Understanding experimental design requires that students recognize the components of a valid experiment. The student will accomplish these objectives to meet this process standard.

1. Evaluate the design of a chemistry laboratory experiment.

2. Identify the independent variables, dependent variables, controlled variables, and control in an experiment.

3. Use mathematics to show relationships within a given set of observations (i.e., conservation of mass and stoichiometry).

4. Identify a hypothesis for a given problem in chemistry investigations.

5. Recognize potential hazards and practice safety procedures in all chemistry laboratory activities.

Process Standard 4: Interpret and Communicate – Interpreting is the process of recognizing patterns in collected data by making inferences, predictions, or conclusions. Communicating is the process of describing, recording, and reporting experimental procedures and results to others. Communication may be oral, written, or mathematical and includes organizing ideas, using appropriate vocabulary, graphs, other visual representations, and mathematical equations. The student will accomplish these objectives to meet this process standard.

1. Select appropriate predictions based on previously observed patterns of evidence.

*2. Report and display data using appropriate technology and other media.

3. Interpret data tables, line, bard, trend, and/or circle graphs from existing science research or student experiments.

4. Determine if results of chemical science investigations support or do not support hypotheses.

5. Evaluate experimental data to draw the most logical conclusion.

*6. Routinely prepare a written report describing the sequence, results, and interpretation of a chemistry investigation or event.

    a. Establish and maintain a formal style and objective tone.

    b. When appropriate or possible, utilize technology to produce, publish, or revise writing products.

    c. Gather relevant information from multiple authoritative print and digital sources and follow a standard format for citation, avoiding plagiarism.

*7. Communicate or defend scientific thinking that resulted in conclusions.

a. Read, comprehend, and present evidence from a range of sources (e.g., texts, experiments, or simulations) to support conclusions.

b. Recognize bias in observation/research.

8. Identify and/or create an appropriate graph or chart from collected data, tables, or written description.

a. Translate quantitative information expressed in words into visual form (e.g., a table or chart).

b. Translate information expressed visually or mathematically (e.g., a table, chart, or equation) into words.

Process Standard 5: Model – Modeling is the active process of forming a mental or physical representation from data, patterns, or relationships to facilitate understanding and enhance prediction. The student will accomplish these objectives to meet this process standard.

1. Interpret an atomic model which explains a given set of observations.

2. Select predictions based on models (e.g., electron configuration, bonding, compound formation), and when appropriate, apply mathematical reasoning to make accurate predictions.

*3. Compare a given model to the physical world.

Process Standard 6: Inquiry – In order for inquiry to occur, students must have the opportunity to make observations, pose questions, formulate testable hypotheses, carry out experiments, and make conclusions based on evidence. The student will accomplish these objectives to meet this process standard.

*1. Ask a scientific question, formulate a testable hypothesis, and design an appropriate experiment to identify an unknown substance.

*2. Design and conduct scientific investigations in which variables are identified and controlled.

*3 .Use a variety of technologies (e.g., hand tools, balances, conductivity apparatus, thermometers, graduated cylinders, volumetric flasks, computers, probeware, graphing calculators, digital cameras, computer simulations) to collect, analyze, and display data.

*4. Inquiries should lead to the formulation of explanations or models (physical, conceptual, and mathematical). In answering questions, students should engage in discussions (based on scientific knowledge, the use of logic, and evidence from the investigation) and arguments that encourage the revision of their explanations, leading to further inquiry.

Process Standard 7: Engineering Design - Engineering design can be defined as the creative process of turning abstract ideas into a physical prototype (laboratory apparatus, trial product, model) that addresses a need or solves a problem. In order for engineering design to occur, students must have the opportunity to identify a need or problem, establish design criteria, prepare preliminary designs, build then test a prototype, and test and redesign as necessary. The student will accomplish these objectives to meet this process standard:

*1. Identify a need or problem or improve an existing design.

*2. Identify design criteria and constraints (e.g., materials used, product limitations, time limits).

*3. Use a variety of resources (e.g., Internet, databases, text) to conduct research in order to develop a preliminary design.

*4. Build and test a prototype. Document the strengths and weaknesses of the prototype in writing.

*5. Analyze and redesign to determine which solutions best meet the criteria and constraints.

*6. Communicate results in a variety of ways (e.g., orally, written, Internet publications, videos, posters, or product demonstrations).

CHEMISTRY

High School

Standard 1: Structure and Properties of Matter - All matter is made up of atoms. Its structure is made up of repeating patterns and has characteristic properties. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Matter is made of atoms which are in constant motion. Atoms are composed of subatomic particles (e.g., protons, neutrons, electrons, quarks).

2. Atoms interact with one another by transferring or sharing outer electrons that are farthest from the nucleus. These outer electrons govern the chemical properties of the element.

3. When elements are listed in order by increasing numbers of protons, repeating patterns of physical and chemical properties identify families of elements with similar properties.

4. A compound is formed when two or more kinds of atoms bind together chemically.

    a. Atoms interact with one another by transferring (ionic) or sharing (covalent) valence electrons.

    b. Valence electrons govern the chemical properties and reactivity of the element.

    c. Each compound has unique chemical and physical properties.

Standard 2: Chemical Reactions - A chemical reaction is a reaction in which one or more substances are changed into different substances. A chemical change cannot be reversed by physical means. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Chemical substances react in definite molar weight proportions and mass is conserved. Balanced chemical equations are used to determine molar ratios.

2. Chemical reactions can be classified (e.g., synthesis/combination, decomposition, single displacement, double displacement, combustion, oxidation/reduction, acid/base). Reaction classification aids in the prediction of products.

3. The rate of a chemical reaction is affected by the concentration and temperature of reactants and presence of a catalyst.

Standard 3: Interactions of Energy and Matter – Total energy is conserved in a closed system. The student will engage in investigations that integrate the process and inquiry standards and lead to the discovery of the following objectives:

1. Matter can be found in four phases (i.e., solid, liquid, gas, plasma). Phase change occurs when heat energy is absorbed or released from the system.

2. Chemical reactions in a system either release energy to the surroundings (exothermic) or absorb energy from the surroundings (endothermic), as a result of breaking or forming bonds between atoms.

3. The amount of heat gained or released during interactions (e.g., phase changes, chemical reactions, specific heat) can be quantified using calorimetric methods.

4. As energy varies in a closed system containing a gas, the parameters (i.e., volume, temperature, and pressure) are governed by specific laws (i.e., Avogadro's Law, Boyle's Law, Charles' Law, Dalton's Law, Ideal Gas Law).

Standard 4: Solution chemistry – Solutions are homogenous mixtures of solutes dissolved in solvents. Most chemical reactions occur in solutions. The student will engage in investigations that integrate the process and inquiry standards and lead to the discovery of the following objectives:

1. Dissolving rates can be influenced by conditions (e.g., temperature, surface area of solute, particle collisions, pressure concentration).

2. Solutions can be classified by the amount of solute dissolved by a solvent (i.e., unsaturated, saturated, supersaturated). Solution concentration can be quantified.

PHYSICS

High School

Standards for Inquiry and Physics

The *Priority Academic Student Skills (PASS)* should be taught by investigating content, concepts, and principles of major themes in Physics.

SCIENCE PROCESSES AND INQUIRY

Process Standard 1: Observe and Measure - Observing is the first action taken by the learner to acquire new information about an object or event. Opportunities for observation are developed through the use of a variety of scientific tools. Measurement allows observations to be quantified. The student will accomplish these objectives to meet this process standard.

1. Identify qualitative and quantitative changes given conditions (e.g., temperature, mass, volume, time, position, length) before, during, and after an event.

2. Use appropriate tools with accuracy and precision (e.g., metric ruler, graduated cylinder, thermometer, balance, spring scale, stopwatch, probeware, graphing calculators, digital cameras, computer simulations) when measuring objects and/or events.

3. Use appropriate International System of Units (SI) (i.e., grams, meters, liters, degrees Celsius, and seconds) and SI prefixes (i.e., micro-, milli-, centi-, and kilo-) when measuring objects and/or events.

Process Standard 2: Classify - Classifying establishes order. Objects and events are classified based on similarities, differences, and interrelationships. The student will accomplish these objectives to meet this process standard.

1. Using observable properties, place an object or event into a classification system.

2. Identify the properties by which a classification system is based.

3. Graphically classify physical relationships (e.g., linear, parabolic, inverse).

Process Standard 3: Experimental Design - Understanding experimental design requires that students recognize the components of a valid experiment. The student will accomplish these objectives to meet this process standard.

1. Evaluate the design of a physics experiment.

2. Identify the independent variables, dependent variables, controlled variables, and control in an experiment.

3. Use mathematics to show relationships within a given set of observations.

4. Identify a hypothesis for a given problem in physics investigations.

5. Recognize potential hazards and practice safety procedures in all physics activities.

Process Standard 4: Interpret and Communicate - Interpreting is the process of recognizing patterns in collected data by making inferences, predictions, or conclusions. Communicating is the process of describing, recording, and reporting experimental procedures and results to others. Communication may be oral, written, or mathematical and includes organizing ideas, using appropriate vocabulary, graphs, other visual representations, and mathematical equations. The student will accomplish these objectives to meet this process standard.

1. Select appropriate predictions based on previously observed patterns of evidence.

*2. Report and display data using appropriate using technology and other media.

3. Interpret data tables, line, bar, trend, and/or circle graphs from existing science research or student experiments.

4. Determine if results of physical science investigations support or do not support hypotheses.

5. Evaluate experimental data to draw the most logical conclusion.

*6. Routinely prepare a written report describing the sequence, results, and interpretation of a chemistry investigation or event.

   a. Establish and maintain a formal style and objective tone.

   b. When appropriate or possible, utilize technology to produce, publish, or revise writing products.

   c. Gather relevant information from multiple authoritative print and digital sources and follow a standard format for citation, avoiding plagiarism.

*7. Communicate or defend scientific thinking that resulted in conclusions.

a. Read, comprehend, and present evidence from a range of sources (e.g., texts, experiments, or simulations) to support conclusions.

b. Recognize bias in observation/research.

8. Identify and/or create an appropriate graph or chart from collected data, tables, or written description.

a. Translate quantitative information expressed in words into visual form (e.g., a table or chart).

b. Translate information expressed visually or mathematically (e.g., a table, chart, or equation) into words.

Process Standard 5: Model - Modeling is the active process of forming a mental or physical representation from data, patterns, or relationships to facilitate understanding and enhance prediction. The student will accomplish these objectives to meet this process standard.

1. Interpret a model which explains a given set of observations.

2. Select predictions based on models and when appropriate, apply mathematical reasoning to make accurate predictions.

*3. Compare a given model to the physical world.

Process Standard 6: Inquiry - Inquiry can be defined as the skills necessary to carry out the process of scientific or systemic thinking. In order for inquiry to occur, students must have the opportunity to ask a question, formulate a procedure, and observe phenomena. The student will accomplish these objectives to meet this process standard.

*1. Ask a scientific question, formulate a testable hypothesis, and design an appropriate experiment relating to the physical world.

*2. Design and conduct physics investigations in which variables are identified and controlled.

*3. Use a variety of technologies (e.g., hand tools, measuring instruments, computers, probeware, graphing calculators, digital cameras, digital balances, computer simulations) to collect, analyze, and display data).

*4. Inquiries should lead to the formulation of explanations or models (physical, conceptual, and mathematical). In answering questions, students should engage in discussions (based on scientific knowledge, the use of logic, and evidence from the investigation) and arguments that encourage the revision of their explanations, leading to further inquiry.

Process Standard 7: Engineering Design - Engineering design can be defined as the creative process of turning abstract ideas into a physical prototype (laboratory apparatus, trial product, model) that addresses a need or solves a problem. In order for engineering design to occur, students must have the opportunity to identify a need or problem, establish design criteria, prepare preliminary designs, build then test a prototype, and test and redesign as necessary. The student will accomplish these objectives to meet this process standard:

*1. Identify a need or problem or improve an existing design.

*2. Identify design criteria and constraints (e.g., materials used, product limitations, time limits).

*3. Use a variety of resources (e.g., Internet, databases, text) to conduct research in order to develop a preliminary design.

*4. Build and test a prototype. Document the strengths and weaknesses of the prototype in writing.

*5. Analyze and redesign to determine which solutions best meet the criteria and constraints.

*6. Communicate results in a variety of ways (e.g., orally, written, Internet publications, videos, posters, product demonstrations).

PHYSICS

High School

Standard 1: Motion – The change in position of an object is motion. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. The motion of an object can be described by its position, direction, and speed.

2. Motion can be modeled in terms of 1- or 2-dimensions relative to a system’s defined reference point (e.g., particle model, vector model, graphical model).

3. Objects undergoing acceleration can be mathematically modeled using time, displacement, velocity, and acceleration equations.

Standard 2: Force - A change in motion occurs as a result of a net force. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Objects change their motion due to a net force. Newton's Laws of Motion are used to calculate the effects of forces on the motion of objects (e.g., balanced vs. unbalanced forces, momentum, inertia, impulse, action vs. reaction, friction, torque).

2. Gravitation is a universal force that each object exerts on any other object. The strength of the gravitational attractive force between two objects is proportional to the masses and inversely proportional to the square of the distance between them (e.g., Law of Universal Gravitation, Kepler's Law).

3. The electric force is a universal force that exists between any two charged objects. The strength of the force is proportional to the charges and inversely proportional to the square of the distance between them (e.g., Coulomb's Law).

4. Electricity and magnetism are two aspects of a single electromagnetic force (e.g., series/parallel/complex circuits, electromagnets, induction, Ohm's Law, generators, motors, capacitors).

Standard 3: Energy - The total energy of the universe is constant. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Energy in a system is never created nor destroyed but may be transferred or transformed (e.g., Law of Conservation of Energy, Laws of Thermodynamics).

   a. As changes occur, energy becomes less ordered.

   b. Conservation of energy can be modeled (e.g., pendulum motion, spring system).

2. Energy can be classified as kinetic energy (energy of motion) or potential energy (e.g., positional, elastic, chemical, nuclear).

Standard 4: Interactions of Energy and Matter – Energy interacts with matter and is transferred during these interactions. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Heat is energy transferred due to temperature differences within a system. The amount of heat is also dependent on the mass and type of substances.

2. Transfer of energy and changes in wave properties (e.g., speed, amplitude, wavelength, frequency) may occur as waves and matter interact (e.g., reflection, refraction, diffraction, interference).

3. When work is done on an object, energy is transferred.

4. Machines change the force/distance ratios involved in doing work.

5. Power is the rate at which work is done.

Environmental Science

High School

Standards for Environmental Science

The *Priority Academic Student Skills (PASS)* should be taught by investigating content, concepts, and principles of major themes in Environmental Science.

SCIENCE PROCESSES AND INQUIRY

Process Standard 1: Observe and Measure - Observing is the first action taken by the learner to acquire new information about an object or event. Opportunities for observation are developed through the use of a variety of scientific tools. Measurement allows observations to be quantified. The student will accomplish these objectives to meet this process standard.

1. Identify qualitative and quantitative changes given conditions (e.g., temperature, mass, volume, time, position, length) before, during, and after an event.

2. Use appropriate tools (e.g., metric ruler, graduated cylinder, thermometer, balance, spring scale, stopwatch) when measuring objects and/or events.

3. Use appropriate International System of Units (SI) (i.e., grams, meters, liters, degrees Celsius, and seconds) and SI prefixes (i.e., micro-, milli-, centi-, and kilo-) when measuring objects and/or events.

Process Standard 2: Classify - Classifying establishes order. Objects and events are classified based on similarities, differences, and interrelationships. The student will accomplish these objectives to meet this process standard.

1. Using observable properties, place an object or event into a classification system.

2. Identify the properties by which a classification system is based.

Process Standard 3: Experimental Design – Understanding experimental design requires that students recognize the components of a valid experiment. The student will accomplish these objectives to meet this process standard.

1. Evaluate the design of an environmental experiment.

2. Identify the independent variables, dependent variables, controlled variables, and controls in an experiment.

3. Use mathematics to show relationships within a given set of observations.

4. Identify a hypothesis for a given problem in environmental investigations.

5. Recognize potential hazards and practice safety procedures in all environmental activities.

Process Standard 4: Interpret and Communicate - Interpreting is the process of recognizing patterns in collected data by making inferences, predictions, or conclusions. Communicating is the process of describing, recording, and reporting experimental procedures and results to others. Communication may be oral, written, or mathematical and includes organizing ideas, using appropriate vocabulary, graphs, other visual representations, and mathematical equations. The student will accomplish these objectives to meet this process standard.

1. Select appropriate predictions based on previously observed patterns of evidence.

*2. Report and display data using appropriate technology and other media.

3. Interpret data tables, line, bar, trend, and/or circle graphs from existing research or student experiments.

4. Determine if results of environmental science investigations support or do not support hypotheses.

5. Evaluate experimental data to draw the most logical conclusion.

*6. Routinely prepare a written report describing the sequence, results, and interpretation of an environmental investigation or event.

   a. Establish and maintain a formal style and objective tone.

   b. When appropriate or possible, utilize technology to produce, publish, or revise writing products.

   c. Gather relevant information from multiple authoritative print and digital sources and follow a standard format for citation, avoiding plagiarism.

*7. Communicate or defend scientific thinking that resulted in conclusions.

   a. Read, comprehend, and present evidence from a range of sources (e.g. texts, experiments, or simulations) to support conclusions.

   b. Recognize bias in observation/research.

8. Identify and/or create an appropriate graph or chart from collected data, tables, or written description.

    a. Translate quantitative information expressed in words into visual form (e.g. a table or chart).

    b. Translate information expressed visually or mathematically (e.g. a table, chart, or equation) into words.

Process Standard 5: Model - Modeling is the active process of forming a mental or physical representation from data, patterns, or relationships to facilitate understanding and enhance prediction. The student will accomplish these objectives to meet this process standard.

1. Interpret a model which explains a given set of observations.

2. Select predictions based on models, and when appropriate, apply mathematical reasoning to make accurate predictions.

*3. Compare a given model to the physical world.

Process Standard 6: Inquiry - Inquiry can be defined as the skills necessary to carry out the process of scientific or systemic thinking. In order for inquiry to occur, students must have the opportunity to ask a question, formulate a procedure, and observe phenomena. The student will accomplish these objectives to meet this process standard.

*1. Ask a scientific question, formulate a testable hypothesis and design an appropriate experiment relating to the physical world.

*2. Design and conduct environmental investigations in which variables are identified and controlled.

*3. Use a variety of technologies, (e.g., hand tools, measuring instruments, computers, handheld digital devices, digital cameras, software, calculators, digital balances, microscopes, measuring instruments and computers) to collect, analyze, and display data).

*4. Inquiries should lead to the formulation of explanations or models (physical, conceptual, and mathematical). In answering questions, students should engage in discussions (based on scientific knowledge, the use of logic, and evidence from the investigation) and arguments that encourage the revision of their explanations, leading to further inquiry.

Environmental Science

High School

Standard 1: The Physical Earth system – The Physical Earth system is determined by dynamic and static processes revealed through investigations of the geosphere, atmosphere, and hydrosphere. These interrelated processes are large-scale and long-term characteristics of the Earth that require knowledge of energy and matter. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Composition and structure of the Earth is affected by an interaction of processes and events.

    a. Geologic processes affect the Earth over time (e.g., plate tectonics, erosion).

    b. Atmospheric processes affect the Earth over time (e.g., changes in daily weather conditions, convection/conduction/radiation, greenhouse effect, climate trends).

    c. Hydrologic processes affect the Earth over time (e.g., water cycle, ocean currents, ground water transport).

    d. Earth's current structure has been influenced by both sporadic and gradual events.

2. Natural systems require a certain amount of energy input to maintain their organization (i.e., Laws of Thermodynamics).

Standard 2: The Living Earth System – The living environment is comprised of interrelated, dynamic systems of the biosphere. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. The biosphere can be examined at several levels (e.g., biome, ecosystem, community, population, species, organism).

2. Ecosystems are composed of biotic and abiotic factors. Matter and energy move between these factors.

3. Energy flows through ecosystems from the sun to producers to consumers (e.g., photosynthesizers, chemoautotrophs).

4. Matter flows through biogeochemical cycles (i.e., carbon, nitrogen, phosphorus, water).

5. Cycling of matter and the flow of energy are governed by the Laws of Conservation of Matter and Energy.

Standard 3: Populations – A population is a group of naturally-interbreeding individuals of one species, living in a defined area, and usually isolated to some degree from similar groups. Populations are dynamic: they increase, decrease, or stabilize depending on their interactions with other populations and with their environment. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Organisms and populations both cooperate and compete in ecosystems and/or habitats for resources (e.g., symbiotic relationships, limiting factors).

2. Mutation and environmental selective pressures may result in adaptations which may enhance or limit the survival and reproductive success in a particular environment (e.g., changes in structures, behaviors, diversity).

3. Each population has specific properties including size, density, and pattern of dispersion (e.g., carrying capacity and exponential growth).

Standard 4: Natural Resources – Natural resources are raw materials and energy obtained or derived from the environment. The student will engage in investigations that integrate the process and inquiry standards and lead to the discovery of the following objectives:

1. Natural resources are classified as renewable or nonrenewable.

    a. Only a small fraction of Earth's water supply is available for human use.

    b. Soil conservation methods are important for protecting and managing topsoil and reducing erosion.

    c. Fossil fuels (coal, oil, natural gas) are carbon containing molecules that take millions of years to form. Reserves are being depleted much faster than new ones are being made.

2. Pollution is an undesired change in air, water, or soil that adversely affects the health, survival, or activities of organism (e.g., temperature inversion, pH changes, organic and inorganic substances).

3. Alternative energy sources include wind power, active and passive solar power, geothermal power, and biomass power.

Standard 5: Environment and Society – Environmental perspective encompasses how one thinks society works in relation to environmental issues, what one believes the environmental world should be, and what is ethical environmental behavior. Sustainability is a long-term process to maintain a quality environment for future generations. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. As human populations and their consumption levels increase, it becomes more difficult to sustain environmental quality.

2. Environmental issues can be described in terms of qualitative and quantitative costs and benefits for different groups of people and specific species or ecosystems (e.g., oil spills, energy consumption, invasive species, natural disasters).

3. People are capable of reducing and reversing their impact on the environment because they can think, plan, and educate.

    a. Governments develop policies to address environmental problems and establish agencies to implement those policies.

    b. Individuals and groups have the ability and responsibility to help maintain environmental quality and resolve environmental problems and issues.

    c. A variety of methods are used to analyze the sustainability of current trends in world population growth and natural resource consumption (e.g., carrying capacity, ecological footprints).

SCIENCE

OKLAHOMA STATE DEPARTMENT OF
EDUCATION

OKLAHOMA
ACADEMIC
STANDARDS

OKLAHOMA ACADEMIC STANDARDS

OKLAHOMA STATE DEPARTMENT OF EDUCATION

JANET BARRESI

STATE SUPERINTENDENT *of* PUBLIC INSTRUCTION

OKLAHOMA STATE DEPARTMENT OF EDUCATION

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SCIENCE

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Introduction

Science uses observation and experimentation to explain natural phenomena. Science refers to an organized body of knowledge that includes core ideas from the disciplines of science and common themes that bridge the disciplines. The Oklahoma Academic Standards for Science include standards for kindergarten through grade twelve. The standards are arranged by grade levels at Grades K-8, and by course subject area at the high school level. The Oklahoma Academic Standards include the integration of scientific and engineering practices with core content from Physical Science, Life Science, and Earth/Space Science. This integrated approach will provide students with a coordinated and coherent understanding of the necessary skills and knowledge to be scientifically literate citizens.

Development and Review of the Standards

Executive Committee

An Executive Committee was comprised to assist in planning the process for the revision of the Oklahoma Academic Standards for Science and selecting representatives to comprise a Writing Committee and a Draft Committee. The Executive Committee also served on the Writing Committee.

The Oklahoma State Department of Education would like to extend a special thanks to the following members of the Executive Committee who gave their time, services and expertise to the revision process:

- Dr. Paul Risser (University of Oklahoma)
- Dr. Julie Angle (Oklahoma State University)
- Sarah Vann (Owasso Middle School)
- Missy Dominy (Gordon Cooper Technology Center)

Writing Committee

A Writing Committee was selected through an application process to revise the Oklahoma Academic Standards for Science. The committee met in person on six occasions and numerous times virtually. The committee was comprised of 37 representatives from K-12 education, higher education, career technology, scientists, engineers, parent and community members from across the state.

Janice Airhart (Broken Arrow PS)
Dr. Julie Angle (Oklahoma State University)
Christa Askins (Bixby PS)
Theresa Balan (Moore PS)
Johana Benson (Bing)
Renee Bell (Mid Del PS)
Quentin Biddy (K20 Center– University of Okla.)
Jennifer Bobo (Stillwater PS)
Lori Chafee (Mustang PS)
Hal Clary (Noble Public Schools)
Deborah Coffman (Broken Arrow PS)
Richard Day (Union PS)
Wanda Dickenson (Wellston PS)
Chris Dobbins (Comanche PS)
Missy Dominy (Gordon Cooper Tech. Center)
Tina Fugate (Okla. State Career Technology)
Cora James (Putnam City PS)
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Teri Kimble (Hydro-Eakly PS)
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Gaile Loving (Mustang PS)
Tanya Mantooth (Wayne PS)
Bob Melton (Putnam City PS)
Norma Neely (American Indian Institute – University of Oklahoma)
Jeffery Patterson (Norman PS)
Kendra Phillips (Muldrow PS)
Patrice Powdar (Moore PS)
Alisa Reimer (Cordell PS)
Dr. Paul Risser (University of Oklahoma)
Tina Rogers (Woodward Public Schools)
Georgia Smith (Bristow PS)
Amanda Smith (Moore PS)
Sara Snodgrass (Noble)
Sarah Vann (Owasso PS)
Dr. Dan Vincent (University of Central Okla.)
Cathy Walker (Stillwater PS)
Craig Walker (OSDE)
Tiffany Neill (OSDE)

Draft Committee

A Draft Committee was selected through an application process to review draft standards developed by the Writing Committee and provide feedback. The committee was comprised of 21 representatives from K-12 education, higher education, career technology, scientists, engineers, parent and community members from across the state.

Peggy Alexander (Owasso PS)
William Bass (Berryhill PS)
Tom Creider (Okla. Tourism & Recreation Dept.)
Wendy Howard (Fredrick PS)
Carol Huett (Moore PS)
Amy Johnson (Deer Creek PS)
Kristi Carrluci (Osteology Museum)
Jennifer Koeninger (Mustang PS)
Laura Lewis (Shawnee PS)
Don Loving (Murray State College)
Derrick Meador (Jennings PS)
Debi Merkey (Cordell PS)
Timothy Munson (OERB-Chairperson)
Traci Richardson (Stillwater PS)
Dr. Michael Soreghan (University of Oklahoma)
Candy Schrack (Piedmont PS)
Rebecca Spinks (Tulsa PS)
Janis Slater (K20 Center – University of Okla.)
Gaylen Urie (Glenpool PS)
Dr. Laura Wilhelm (Oklahoma City University)
Connie Ward (Piedmont PS)

Focus Groups

An additional level of review of the draft version of the Oklahoma Academics Standards for Science was conducted through Focus Groups. Over 500 educators and community members participated in meetings held in Bristow, Durant, Guymon, Hugo, Lawton, Oklahoma City, Ponca City, Tulsa, Woodward, and Vinita. Participants were able to review samples of the draft standards and provide feedback to the Writing Committee.

Oklahoma Academic Standards

The Oklahoma Academic Standards describe the specific areas of student learning that are considered the most important for proficiency in the discipline at a particular level and provide a basis for the development of local curricula and statewide assessments.

The Oklahoma Academic Standards in this document are not sequenced for instruction and do not prescribe classroom activities; materials; or instructional strategies, approaches, or practices. The Oklahoma Academic Standards are not a curriculum and they do not represent a scope, sequence, or curriculum guide. They provide a framework for schools and teachers to develop an aligned science curriculum. Such curriculum includes instructional units, lessons, and tasks; formative and summative assessments; opportunities for remediation and acceleration; and other selected activities, interventions, and strategies deemed appropriate and meaningful for the academic success of students.

The Oklahoma Academic Standards in this document were informed by *A Framework for K-12 Science Education* (National Research Council, 2012), *Benchmarks for Science Literacy* (American Association for the Advancement of Science, 1993), *The Next Generation Science Standards* (2013) and the *Oklahoma Priority Academic Student Skills for Science* (Oklahoma State Department of Education, 2011).

Because each of the standards subsumes the knowledge and skills of the other standards, they are designed to be used as a whole. Although material can be added to the standards, using only a portion of the standards will leave gaps in the scientific understanding and practice of students.

Statewide Assessment

The Oklahoma Academic Standards for Science are defined as performance expectations and will be used as the basis for the development and/or refinement of questions on the Oklahoma State Testing Program. Although efforts to begin implementation of these Oklahoma Academic Standards will begin in the 2014-2015 school year, the Oklahoma School Testing Program will continue to assess standards and objectives found in the 2011 Oklahoma Academic Standards for Science through the 2015-2016 school year. The test blue prints will continue to align to the standards and objectives of the 2011 Oklahoma Academic Standards for Science through the 2015-2016 school year. In the 2016-2017 school year, the Oklahoma State Testing Program will begin measuring the performance expectations defined in the 2014 Oklahoma Academic Standards for Science for 5th grade, 8th grade, and Biology I.

Consistent with the current structure of the Oklahoma State Tests for science, questions will measure the practices and the core content at each grade level. In addition, most performance expectations may be assessed with items that utilize any of the science and engineering practices. For example, an assessment item for a performance expectation that requires students to construct explanations may also ask students to use other practices such as asking questions, using models, or analyzing data around the core content with a science and engineering practice.

Structure of this Document

Each Performance Expectation is displayed in a Standard Document that contains one Performance Expectation along with supporting structures intended to assist educators in understanding the expectation of the standard and the skills and knowledge associated with the standard. These components are explained on page 6. Also, see reference sample document on page 7.

OKLAHOMA ACADEMIC STANDARDS

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Components of a Standard Document

❶ Performance Expectation

Performance Expectations represent the things students should know, understand, and be able to do to be proficient in science. Performance Expectations are the standards.

Each Performance Expectation is built around *A Framework for K-12 Science Education* recommendation that science education in grades K-12 be built around three major dimensions:
1. Science and Engineering Practices
2. Crosscutting Concepts
3. Disciplinary Core Ideas (NRC, 2012, p. 2)

The additional components in the standard documents serve as support for instructors in providing clarity and further guidance for each Performance Expectation.

❷ Clarification Statement

Where needed, a Clarification Statement accompanies a Performance Expectation. The aim of a Clarification Statement is to provide further explanation or examples to better support educators in understanding the aim of the Performance Expectation.

❸ Assessment Boundary

Where applicable, an Assessment Boundary accompanies a Performance Expectation in order to provide additional support for educators in understanding the intent of the Performance Expectation and its relation to other Performance Expectations in the learning progression. While all teachers can utilize the Assessment Boundary as a tool for developing curriculum and local assessments, the Assessment Boundaries for 5th grade, 8th grade, and Biology will be utilized as a guide in the development of the Oklahoma Core Curriculum Tests.

❹ Science and Engineering Practices

The Science and Engineering Practices describe the major practices that scientists employ as they investigate and build models and theories about the world and a key set of engineering practices that engineers use as they design and build systems. The term "practice" is used instead of the term "process" to emphasize that scientists and engineers use skill and knowledge simultaneously, not in isolation. The eight science and engineering practices are:
1. Ask questions and define problems
2. Develop and use models
3. Plan and conduct investigations
4. Analyze and interpret data
5. Use mathematical and computational thinking
6. Construct explanations and design solutions
7. Engage in scientific argument from evidence
8. Obtain, evaluate, and communicate information

Each Performance Expectation integrates one of the above Science and Engineering Practices with a Disciplinary Core Idea in science. The integration of Science and Engineering Practices with science content represents a shift from previous science standards in Oklahoma, giving the learning context and allowing students to utilize scientific reasoning and critical thinking to develop their understanding of science.

❺ Disciplinary Core Ideas

The Disciplinary Core Ideas represent a set of science and engineering ideas for K-12 science education that have broad importance across multiple sciences or engineering disciplines; provide a key tool for understanding or investigating more complex ideas and solving problems; relate to the interests and life experiences of students; be teachable and learnable over multiple grades at increasing levels of sophistication. (NRC, 2012, p. 31)

Disciplinary Core Ideas are grouped into three domains:
1. Physical Science (PS)
2. Life Science (LS)
3. Earth and Space Science (ESS)

Each Performance Expectation integrates at least one Disciplinary Core Idea with a Science and Engineering Practice.

❻ Crosscutting Concepts

The Crosscutting Concepts represent common threads or themes that span across science disciplines (biology, chemistry, physics, environmental science, Earth/space science) and have value to both scientists and engineers because they identify universal properties and processes found in all disciplines. These crosscutting concepts are:
1. Patterns
2. Cause and Effect: Mechanisms and explanations
3. Scale, Proportion, and Quantity
4. Systems and System Models
5. Energy and Matter: Flows, cycles, and conservation
6. Structure and Function
7. Stability and Change

Where applicable each of the Performance Expectations includes one of the above Crosscutting Concepts, thereby ensuring that the concepts are not taught in isolation but reinforced in the context of instruction within the science content.

❼ Oklahoma Academic Standards Connections

Where applicable the Performance Expectations provide optional connections to the Oklahoma Academic Standards for English Language Arts/Literacy and Mathematics. The connections represent mathematics and literacy standards that could work in tandem with a Performance Expectation for science. The connections are not mandatory. Integration of a connecting English language arts or mathematics standards is determined by the instructor and carried out in the instruction.

1-ESS1-1 Earth's Place in the Universe

Science & Engineering Practices

❶ Asking questions (for science) and defining problems (for engineering)
❷ Developing and using models
❸ Planning and carrying out investigations
❹ **Analyzing and interpreting data**
Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.
- **Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions.**

❺ Using mathematics and computational thinking
❻ Constructing explanations (for science) and designing solutions (for engineering)
❼ Engaging in argument from evidence
❽ Obtaining, evaluating, and communicating information

4

Disciplinary Core Ideas

The Universe and its Stars:
- Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted.

5

Performance Expectations

1-ESS1-1
Students who demonstrate understanding can:

Use observations of the sun, moon, and stars to describe patterns that can be predicted.

1

Clarification Statement:
Examples of patterns could include that the sun and moon appear to rise in one part of the sky, move across the sky, and set; and stars other than our sun are visible at night but not during the day.

2

Assessment Boundary:
Assessment of star patterns is limited to stars being seen at night and not during the day.

3

6

Crosscutting Concepts: Patterns
- Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.

Oklahoma Academic Standards Connections

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ELA/Literacy	Mathematics
W.1.8 With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.	**N/A**

A Message From State Superintendent **Janet Barresi**

Oklahoma can be a leader in education, but only if we are committed to new fundamentals – and focused on the goal of advancing learning for all students. I've issued a call to the State: By the year 2020, each student graduating from an Oklahoma high school must be college, career, and citizen ready. I call it the C^3 Plan, building on the success of a slate of reforms now being implemented.

The C^3 Plan sets the stage for Oklahoma to win the competition for excellence. To that end, the Oklahoma State Department of Education has developed and adopted a more rigorous framework of standards, known as the Oklahoma Academic Standards.

For science, these standards were written and reviewed by more than 500 individuals including educators and representatives of science related fields of business from all across Oklahoma. The science framework focuses on preparing all students for whatever future life path the student chooses, whether that be advanced studies at the collegiate level or in post-secondary workforce training or to enter the workforce competently equipped.

The standards are simply the measure of what a child should know and be able to do by the end of a year of learning. Successful teaching of the standards will result in children who show proficiency in the subject matter on state assessments, demonstrating they are ready for the next phase of learning. Curriculum materials and instructional practices for each classroom are left to local teachers, administrators and school boards.

By law, Oklahoma's standards of learning are updated on a cyclical basis for each subject area. Science standards were last updated in 2011, but as Oklahoma transitions to more rigorous standards, it was determined that another update was necessary. To accomplish this, the State Department of Education's Science Director convened a committee of educators and industry leaders from throughout the state to review the previous Priority Academic Student Skills (PASS) Standards for Science and to update them. The Oklahoma Academic Standards for Science presented here reflect the strengths of the previous PASS Standards, as well as some new content and literacy skills that prepare students for more rigorous requirements in the future.

The Oklahoma Academic Standards for Science focus educators and students on the priority of scientific literacy, so they both appreciate and understand the exceptional nature of science in their everyday lives. This knowledge base and set of skills are essential for our students, so they may be careful consumers of scientific and technical information and have the skills to enter careers in science, engineering, and technology if they so choose.

The ultimate goal of education is to prepare students for future careers. A recent report by the Brookings Institute stated that more than 46,000 jobs in the state in 2011 required knowledge of science. That figure will only grow in the future. Indeed, according to a report by The Alliance for Science and Technology Research in America, by the year 2018 Oklahoma will have 81,000 STEM jobs to fill. Students with advanced knowledge in science are prepared for jobs in industries such as medicine, environment, energy, engineering and other fields that are expanding in our state. The same report showed that Science, Technology, Engineering and Math (STEM) jobs paid almost double those of non-STEM professions.

Increasing the rigor of our science standards will prepare our students for the bright futures that will exist for those with the most knowledge and skills.

Janet C. Barresi
State Superintendent of Public Instruction
Oklahoma State Department of Education

OKLAHOMA STATE DEPARTMENT OF
EDUCATION

K-5 Overview

The Kindergarten through 5th Grade Oklahoma Academic Standards for Science include the following Domains:

❶ Physical Science (PS)
❷ Life Science (LS)
❸ Earth & Space Science (ESS)

Each Domain has a set of Topics in science that fit within that Domain:

❶ Physical Science (PS)
- Matter and Its Interactions (PS1)
- Motion and Stability: Forces and Interactions (PS2)
- Energy (PS3)
- Waves and Their Application in Technologies for Information Transfer (PS4)

❷ Life Science (LS)
- From Molecules to Organisms: Structure and Processes (LS1)
- Ecosystems: Interactions, Energy, and Dynamics (LS2)
- Heredity: Inheritance and Variation of Traits (LS3)
- Biological Unity and Diversity (LS4)

❸ Earth & Space Science (ESS)
- Earth's Place in the Universe (ESS1)
- Earth's Systems (ESS2)
- Earth and Human Activity (ESS3)

The abbreviations for the Domains and Topics are utilized in the naming system of each Performance Expectation found in the Oklahoma Academic Standards for Science.

For example, the Performance Expectation **4-PS3-1** represents the following:

GRADE: 4
DOMAIN: Physical Science
TOPIC: Energy
STANDARD: 1

Each grade level contains Performance Expectations from each Domain. However, to ensure students have a meaningful and focused experience with science in preparation of more advanced topics in Middle and High School, topics are not necessarily covered in each grade level. An example of the progression of topics in grade span 3-5 can be found in the table below. Physical Science Topic 2, "Motion and Stability: Forces and Interactions" (PS2) appears in grade 3 and 5 but not grade 4, is highlighted in green. In contrast, Life Science Topic 1, "From Molecule to Organisms: Structure and Function" (LS1), is highlighted in blue and occurs in each grade level.

Grade 3	Grade 4	Grade 5
3-PS2-1	4-PS3-1	5-PS1-1
3-PS2-2	4-PS3-2	5-PS1-2
3-PS2-3	4-PS3-3	5-PS1-3
3-PS2-4	4-PS3-4	5-PS1-4
3-LS1-1	4-PS4-1	5-PS2-1
3-LS2-1	4-PS4-2	5-PS3-1
3-LS3-1	4-PS4-3	5-LS1-1
3-LS3-2	4-LS1-1	5-LS2-1
3-LS4-1	4-LS1-2	5-LS2-2
3-LS4-2	4-ESS1-1	5-ESS1-1
3-LS4-3	4-ESS2-1	5-ESS1-2
3-LS4-4	4-ESS2-2	5-ESS2-1
3-ESS2-2	4-ESS3-1	5-ESS2-2
3-ESS3-1	4-ESS3-2	5-ESS3-1

K-2

3-5

6-8

9-12

K-PS2-1 Motion and Stability: Forces and Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ **Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.** • **With guidance, plan and conduct an investigation in collaboration with peers.** ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Forces and Motion:** • Pushes and pulls can have different strengths and directions. • Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it. **Types of Interactions:** • When objects touch or collide, they push on one another and can change motion. **Relationship Between Energy and Forces:** • A bigger push or pull makes things speed up or slow down more quickly.	**K-PS2-1** *Students who demonstrate understanding can:* **Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.** **Clarification Statement:** Examples of pushes or pulls could include a string attached to an object being pulled, a person pushing an object, a person stopping a rolling ball, and two objects colliding and pushing on each other (e.g. ramps such as blocks or wooden moldings with cars and balls; paper towel threaded on rope or string across the classroom). **Assessment Boundary:** Assessment is limited to different relative strengths or different directions, but not both at the same time. Assessment does not include non-contact pushes or pulls such as those produced by magnets.

Crosscutting Concepts: Cause and Effect

• Simple tests can be designed to gather evidence to support or refute student ideas about causes.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them).	**MP.2** Reason abstractly and quantitatively. **K.MD.A.1** Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object. **K.MD.A.2** Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

K-PS2-2 Motion and Stability: Forces and Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data **Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations**. • **Analyze data from tests of an object or tool to determine if it works as intended.** ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Forces and Motion:** • Pushes and pulls can have different strengths and directions. • Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it. **Defining Engineering Problems:** (secondary to K-PS2-2) • A situation that people want to change or create can be approached as a problem to be solved through engineering. • Such problems may have many acceptable solutions.	**K-PS2-2** *Students who demonstrate understanding can:* **Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.*** **Clarification Statement:** Examples of problems requiring a solution could include having a marble or other object move a certain distance, follow a particular path, and knock down other objects. Examples of solutions could include tools such as a ramp to increase the speed of the object and a structure that would cause an object such as a marble or ball to turn and using a rope or string to pull an object. **Assessment Boundary:** Assessment does not include friction as a mechanism for change in speed.

Crosscutting Concepts: Cause and Effect

• Simple tests can be designed to gather evidence to support or refute student ideas about causes.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RI.K.1 With prompting and support, ask and answer questions about key details in a text. **SL.K.3** Ask and answer questions in order to seek help, get information, or clarify something that is not understood.	**K.MD.A.1** Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object. **K.MD.A.2** Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. For example, directly compare the heights of two children and describe one child as taller/shorter. **K.CC.C.6** Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group, e.g., by using matching and counting strategies. **K.CC.C.7** Compare two numbers between 1 and 10 presented as written numerals.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

K-2

3-5

6-8

9-12

KINDERGARTEN

K-PS3-1 Energy

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models **❸ Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.** **• Make observations (firsthand or from media) to collect data that an be used to make comparisons.** ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Conservation of Energy and Energy Transfer:** • Sunlight warms Earth's surface.	**K-PS3-1** *Students who demonstrate understanding can:* **Make observations to determine the effect of sunlight on Earth's surface.** **Clarification Statement:** Examples of Earth's surface could include sand, soil, rocks, and water. Examples can extend beyond natural objects on Earth's surface to include man-made objects such as plastics, asphalt, or concrete. **Assessment Boundary:** Assessment of temperature is limited to relative measures such as warmer/cooler.

Crosscutting Concepts: Cause and Effect
• Events have causes that generate observable patterns.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them).	**K.MD.A.2** Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

K-PS3-2 Energy

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking **❻ Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.** **• Use tools and materials provided to design and build a device that solves a specific problem or a solution to a specific problem.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Conservation of Energy and Energy Transfer:** • Sunlight warms Earth's surface.	**K-PS3-2** *Students who demonstrate understanding can:* **Use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area.*** **Clarification Statement:** Examples of structures could include umbrellas, canopies, and tents that minimize the warming effect of the sun. **Assessment Boundary:** N/A

Crosscutting Concepts: Cause and Effect
- Events have causes that generate observable patterns.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them).	**K.MD.A.2** Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

K-2

3-5

6-8

9-12

KINDERGARTEN

K-LS1-1 From Molecules to Organisms: Structure and Processes

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations **❹ Analyzing and interpreting data Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.** **• Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions.** ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Organization for Matter and Energy Flow in Organisms:** • All animals need food in order to live and grow. • Animals obtain their food from plants or from other animals. • Plants need water and light to live and grow.	**K-LS1-1** *Students who demonstrate understanding can:* **Use observations to describe patterns of what plants and animals (including humans) need to survive.** **Clarification Statement:** Examples of patterns could include that plants make their own food while animals do not; the different kinds of food needed by different types of animals; the requirement of plants to have light; and, that all living things need water. **Assessment Boundary:** Students are not expected to understand the mechanisms of photosynthesis.

Crosscutting Concepts: Patterns
- Patterns in the natural and human designed world can be observed and used as evidence.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them).	**K.MD.A.2** Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

K-ESS2-1 Earth's Systems

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations **❹ Analyzing and interpreting data** **Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.** **• Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions.** ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Weather and Climate:** • Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region at a particular time. • People measure these conditions to describe and record the weather and to notice patterns over time.	**K-ESS2-1** *Students who demonstrate understanding can:* **Use and share observations of local weather conditions to describe patterns over time.** **Clarification Statement:** Examples of qualitative observations could include descriptions of the weather (such as sunny, cloudy, rainy, and warm); examples of quantitative observations could include numbers of sunny, windy, and rainy days in a month. Examples of patterns could include that it is usually cooler in the morning than in the afternoon and the number of sunny days versus cloudy days in different months. **Assessment Boundary:** Assessment of quantitative observations limited to whole numbers and relative measures such as warmer/cooler.

Crosscutting Concepts: Patterns
• Patterns in the natural and human designed world can be observed and used as evidence.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them).	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **K.CC.A** Know number names and the count sequence. **K.MD.A.1** Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object. **K.MD.B.3** Classify objects into given categories; count the number of objects in each category and sort the categories by count.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

K-ESS2-2 Earth's Systems

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) **❼ Engaging in argument from evidence in K–2 builds on prior experiences and progresses to comparing ideas and representations about the natural and designed world(s).** **• Construct an argument with evidence to support a claim.** ❽ Obtaining, evaluating, and communicating information	**Biogeology:** • Plants and animals can change their environment. **Human Impacts on Earth Systems:** • Things that people do to live comfortably can affect the world around them.	**K-ESS2-2** *Students who demonstrate understanding can:* **Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.** **Clarification Statement:** Examples of plants and animals changing their environment could include a squirrel digs in the ground to hide its food and tree roots can break concrete, or a dandelion spreading seeds to generate more dandelions. **Assessment Boundary:** Arguments should be based on qualitative not quantitative evidence.

Crosscutting Concepts: Systems and System Models
• Systems in the natural and designed world have parts that work together.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RI.K.1 With prompting and support, ask and answer questions about key details in a text. **W.K.1** Use a combination of drawing, dictating, and writing to compose opinion pieces in which they tell a reader the topic or the name of the book they are writing about and state an opinion or preference about the topic or book. **W.K.2** Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic.	**N/A**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

K-ESS3-1 Earth and Human Activity

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ **Developing and using models** **Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, storyboard) that represent concrete events or design solutions.** • **Use a model to represent relationships in the natural world.** ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Natural Resources:** • Living things need water, air, and resources from the land, and they live in places that have the things they need. • Humans use natural resources for everything they do.	**K-ESS3-1** *Students who demonstrate understanding can:* **Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.** **Clarification Statement:** Examples of relationships could include that deer eat buds and leaves, therefore, they usually live in forested areas; and, grasses need sunlight so they often grow in meadows. Plants, animals, and their surroundings make up a system. **Assessment Boundary:** N/A

Crosscutting Concepts: Systems and System Models
• Systems in the natural and designed world have parts that work together.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
SL.K.5 Add drawings or other visual displays to descriptions as desired to provide additional detail.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **K.CC** Counting and Cardinality

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

K-ESS3-2 Earth and Human Activity

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) **Asking questions and defining problems in grades K–2 builds on prior experiences and progresses to simple descriptive questions that can be tested.** • **Ask questions based on observations to find more information about the designed world.** ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Natural Hazards:** • Some kinds of severe weather are more likely than others in a given region. • Weather scientists forecast severe weather so that the communities can prepare for and respond to these events. **Defining and Delimiting an Engineering Problem:** • Asking questions, making observations, and gathering information are helpful in thinking about problems. ** Connections to Engineering, Technology, and Application of Science* **Interdependence of Science, Engineering, and Technology:** • People encounter questions about the natural world every day. **Influence of Engineering, Technology, and Science on Society and the Natural World:** • People depend on various technologies in their lives; human life would be very different without technology.	**K-ESS3-2** *Students who demonstrate understanding can:* **Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.*** **Clarification Statement:** Emphasis is on local forms of severe weather and safety precautions associated with that severe weather. **Assessment Boundary:** N/A

Crosscutting Concepts: Cause and Effect

• Events have causes that generate observable patterns.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RI.K.1 With prompting and support, ask and answer questions about key details in a text. **SL.K.3** Ask and answer questions in order to seek help, get information, or clarify something that is not understood.	**MP.4** Model with mathematics. **K.CC** Counting and Cardinality

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

1-PS4-1 Waves and Their Applications in Technologies for Information Transfer

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ **Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.** • **Plan and conduct investigations collaboratively to produce data to serve as the basis for evidence to answer a question.** ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Wave Properties:** • Sound can make matter vibrate, and vibrating matter can make sound.	**1-PS4-1** *Students who demonstrate understanding can:* **Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.** **Clarification Statement:** Examples of vibrating materials that make sound could include tuning forks and plucking a stretched string. Examples of how sound can make matter vibrate could include holding a piece of paper near a speaker making sound and holding an object near a vibrating tuning fork. **Assessment Boundary:** N/A

Crosscutting Concepts: Cause and Effect

• Simple tests can be designed to gather evidence to support or refute student ideas about causes.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
W.1.7 Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions). **W.1.8** With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question. **SL.1.1** Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups.	**N/A**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

1ST GRADE

1-PS4-2 Waves and Their Applications in Technologies for Information Transfer

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking **❻ Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.** **• Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Electromagnetic Radiation:** • Objects can be seen if light is available to illuminate them or if they give off their own light.	**1-PS4-2** *Students who demonstrate understanding can:* **Make observations to construct an evidence-based account that objects can be seen only when illuminated.** **Clarification Statement:** Examples of observations could include those made in a completely dark room, a pinhole box, and a video of a cave explorer with a flashlight. Illumination could be from an external light source or by an object giving off its own light. This can be explored with light tables, 3-way mirrors, overhead projectors and flashlights. **Assessment Boundary:** N/A

Crosscutting Concepts: Cause and Effect
• Simple tests can be designed to gather evidence to support or refute student ideas about causes.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
W.1.2 Write informative/explanatory texts in which they name a topic, supply some facts about the topic, and provide some sense of closure. **W.1.7** Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions). **W.1.8** With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question. **SL.1.1** Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups.	**N/A**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

1-PS4-3 Waves and Their Applications in Technologies for Information Transfer

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models **❸ Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.** **• Plan and conduct investigations collaboratively to produce data to serve as the basis for evidence to answer a question.** ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Electromagnetic Radiation:** • Some materials allow light to pass through them, others allow only some light through and others block all the light and create a dark shadow on any surface beyond them, where the light cannot reach. • Mirrors can be used to redirect a light beam. (Boundary: The idea that light travels from place to place is developed through experiences with light sources, mirrors, and shadows, but no attempt is made to discuss the speed of light.)	**1-PS4-3** *Students who demonstrate understanding can:* **Plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light.** **Clarification Statement:** Examples of materials could include those that are transparent (such as clear plastic), translucent (such as wax paper), opaque (such as cardboard), and reflective (such as a mirror). **Assessment Boundary:** Assessment does not include the speed of light or assessment of descriptive words like transparent, translucent, opaque or reflective.

Crosscutting Concepts: Cause and Effect
• Simple tests can be designed to gather evidence to support or refute student ideas about causes.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
W.1.7 Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions). **W.1.8** With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question. **SL.1.1** Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups.	**N/A**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

1ST GRADE

1-PS4-4 Waves and Their Applications in Technologies for Information Transfer

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ **Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.** • **Use tools and materials provided to design a device that solves a specific problem.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Information Technologies and Instrumentation:** • People also use a variety of devices to communicate (send and receive information) over long distances. ** Connections to Engineering, Technology, and Application of Science* **Influence of Engineering, Technology, and Science, on Society and the Natural World:** • People depend on various technologies in their lives; human life would be very different without technology.	**1-PS4-4** *Students who demonstrate understanding can:* **Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.*** **Clarification Statement:** Examples of devices could include a light source to send signals, paper cup and string "telephones," and a pattern of drumbeats. **Assessment Boundary:** Assessment does not include technological details for how communication devices work.

Crosscutting Concepts

• N/A

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
W.1.7 Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions).	**MP.5** Use appropriate tools strategically. **1.MD.A.1** Order three objects by length; compare the lengths of two objects indirectly by using a third object. **1.MD.A.2** Express the length of an object as a whole number of length units, by layering multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

1-LS1-1 From Molecules to Organisms: Structure and Processes

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking **❻ Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.** **• Use tools and materials provided to design a device that solves a specific problem.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Structure and Function:** • All organisms have external parts. • Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water and air. • Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow. **Information Processing:** • Animals have body parts that capture and convey different kinds of information needed for growth and survival. • Animals respond to these inputs with behaviors that help them survive. • Plants also respond to some external inputs. ** Connections to Engineering, Technology, and Application of Science* **Influence of Engineering, Technology, and Science, on Society and the Natural World:** • Every human-made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world.	**1-LS1-1** *Students who demonstrate understanding can:* **Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.*** **Clarification Statement:** Examples of human problems that can be solved by mimicking plant or animal solutions could include designing clothing or equipment to protect bicyclists by mimicking turtle shells, acorn shells, and animal scales; stabilizing structures by mimicking animal tails and roots on plants; keeping out intruders by mimicking thorns on branches and animal quills; and, detecting intruders by mimicking eyes and ears. **Assessment Boundary:** N/A

Crosscutting Concepts: Structure and Function
• The shape and stability of structures of natural and designed objects are related to their function(s).

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
W.1.7 Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions).	**N/A**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

1-LS1-2 From Molecules to Organisms: Structure and Processes

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence **❽ Obtaining, evaluating, and communicating information** **Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information.** **• Read grade-appropriate texts and use media to obtain scientific information to determine patterns in the natural world.**	**Growth and Development of Organisms:** • Adult plants and animals can have young. • In many kinds of animals, parents and the offspring themselves engage in behaviors that help the offspring to survive.	**1-LS1-2** *Students who demonstrate understanding can:* **Read text and use media to determine patterns in behavior of parents and offspring that help offspring survive.** **Clarification Statement:** Examples of patterns of behaviors could include the signals that offspring make (such as crying, cheeping, and other vocalizations) and the responses of the parents (such as feeding, comforting, and protecting the offspring). Information may be obtained through observations, media, or text. **Assessment Boundary:** N/A

Crosscutting Concepts: Patterns
• Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RI.1.1 Ask and answer questions about key details in a text. **RI.1.2** Identify the main topic and retell key details of a text. **RI.1.10** With prompting and support read informational texts appropriately complex for grade.	**1.NBT.B.3** Compare two two-digit numbers based on the meanings of the tens and one digits, recording the results of comparisons with the symbols >, =, and <. **1.NBT.C.4** Add within 100, including adding a two-digit number and a one-digit number, and adding a two-digit number and a multiple of 10, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning uses. Understand that in adding two-digit numbers, one adds tens and tens, ones and ones; and sometimes it is necessary to compose a ten. **1.NBT.C.5** Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used. **1.NBT.C.6** Subtract multiples of 10 in the range 10-90 from multiples of 10 in the range 10-90 (positive or zero differences), using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

1-LS3-1 Heredity: Inheritance and Variation of Traits

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking **❻ Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.** **• Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Inheritance of Traits:** • Young animals are very much, but not exactly like, their parents. • Plants also are very much, but not exactly, like their parents. **Variation of Traits:** • Individuals of the same kind of plant or animal are recognizable as similar but can also vary in many ways.	**1-LS3-1** *Students who demonstrate understanding can:* **Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.** **Clarification Statement:** Examples of patterns could include features plants or animals share. Examples of observations could include leaves from the same kind of plant are the same shape but can differ in size; and, a particular breed of dog looks like its parents but is not exactly the same. **Assessment Boundary:** Assessment does not include inheritance or animals that undergo metamorphosis or hybrids.

Crosscutting Concepts: Patterns
• Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RI.1.1 Ask and answer questions about key details in a text. **W.1.7** Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions). **W.1.8** With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.	**MP.2** Reason abstractly and quantitatively. **MP.5** Use appropriate tools strategically. **1.MD.A.1** Order three objects by length; compare the lengths of two objects indirectly by using a third object.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

K-2 3-5 6-8 9-12

1-ESS1-1 Earth's Place in the Universe

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations **❹ Analyzing and interpreting data** **Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.** **• Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions.** ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**The Universe and its Stars:** • Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted.	**1-ESS1-1** *Students who demonstrate understanding can:* **Use observations of the sun, moon, and stars to describe patterns that can be predicted.** **Clarification Statement:** Examples of patterns could include that the sun and moon appear to rise in one part of the sky, move across the sky, and set; and stars other than our sun are visible at night but not during the day. **Assessment Boundary:** Assessment of star patterns is limited to stars being seen at night and not during the day.

Crosscutting Concepts: Patterns
• Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
W.1.8 With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.	**N/A**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

1-ESS1-2 Earth's Place in the Universe

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ **Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, which provide data to support explanations or design solutions.** • **Make observations (firsthand or from media) to collect data that can be used to make comparisons.** ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Earth and the Solar System:** • Seasonal patterns of sunrise and sunset can be observed, described, and predicted.	**1-ESS1-2** *Students who demonstrate understanding can:* **Make observations at different times of year to relate the amount of daylight and relative temperature to the time of year.** **Clarification Statement:** Emphasis is on relative comparisons of the amount of daylight and temperature in the winter to the amount in the spring, fall or summer. **Assessment Boundary:** Assessment is limited to relative amounts of daylight, not quantifying the hours or time of daylight.

Crosscutting Concepts: Patterns
• Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
W.1.7 Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions). **W.1.8** With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **1.OA.A.1** Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using objects, drawings, and equations to represent the problem. **1.MD.C.4** Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

1-ESS3-1 Earth and Human Activity

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence **❽ Obtaining, evaluating, and communicating information** **Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information.** **• Communicate solutions with others in oral and/or written forms using models and/or drawings that provide detail about scientific ideas.**	**Human Impacts on Earth Systems:** • Things that people do to live comfortably can affect the world around them. But, they can make choices that reduce their impacts on the land, water, air, and other living things. **Developing Possible Solutions:** • Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people.	**1-ESS3-1** *Students who demonstrate understanding can:* **Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.*** **Clarification Statement:** Examples of human impact on the land could include cutting trees to produce paper and using resources to produce bottles. Examples of solutions could include reusing paper and recycling cans and bottles. **Assessment Boundary:** N/A

Crosscutting Concepts: Cause and Effect
• Events have causes that generate observable patterns.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
W.K.2 Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic.	**N/A**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

2-PS1-1 Matter and Its Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ **Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, which provide data to support explanations or design solutions.** • **Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question.** ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Structure and Properties of Matter:** • Different kinds of matter exist and many of them can be either solid or liquid, depending on temperature. • Matter can be described and classified by its observable properties. • Different properties are suited to different puposes.	**2-PS1-1** *Students who demonstrate understanding can:* **Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.** **Clarification Statement:** Observations could include color, texture, hardness, and flexibility. Patterns could include the similar properties that different materials share. Investigations could include ice and snow melting or frozen objects thawing. **Assessment Boundary:** N/A

Crosscutting Concepts: Patterns
• Patterns in the natural and human designed world can be observed.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
W.2.7 Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations). **W.2.8** Recall information from experiences or gather information from provided sources to answer a question.	**MP.4** Model with mathematics. **2.MD.D.10** Draw a picture graph and a bar graph (with single unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

2-PS1-2 Matter and Its Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ **Analyzing and interpreting data** **Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.** • **Analyze data from tests of an object or tool to determine if it works as intended.** ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Structure and Properties of Matter:** • Different properties are suited to different purposes. --- ** Connections to Engineering, Technology, and Application of Science* **Influence of Engineering, Technology, and Science, on Society and the Natural World:** • Every human-made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world.	**2-PS1-2** *Students who demonstrate understanding can:* **Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.*** **Clarification Statement:** Examples of properties could include, strength, flexibility, hardness, texture, and absorbency (e.g. paper towels could be utilized to measure absorbency and strength). **Assessment Boundary:** Assessment of quantitative measurements is limited to length.

Crosscutting Concepts: Cause and Effect
• Simple tests can be designed to gather evidence to support or refute student ideas about causes.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RI.2.8 Describe how reasons support specific points the author makes in a text. **W.2.7** Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations). **W.2.8** Recall information from experiences or gather information from provided sources to answer a question.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **2.MD.D.10** Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

2-PS1-3 Matter and Its Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking **❻ Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.** **• Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Structure and Properties of Matter:** • Different properties are suited to different purposes. • A great variety of objects can be built up from a small set of pieces.	**2-PS1-3** *Students who demonstrate understanding can:* **Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object.** **Clarification Statement:** Examples of pieces could include blocks, building bricks, or other assorted small objects. Provide students with the same number of objects to create a different object. **Assessment Boundary:** Do not introduce terminology associated with the Law of Conservation of Matter just concepts. Chemical change is outside of this performance expectation.

Crosscutting Concepts: Energy and Matter

• Objects may break into smaller pieces and be put together into larger pieces, or change shapes.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
W.2.7 Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations). **W.2.8** Recall information from experiences or gather information from provided sources to answer a question.	**N/A**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

2-PS1-4 Matter and Its Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) **❼ Engaging in argument from evidence in K–2 builds on prior experiences and progresses to comparing ideas and representations about the natural and designed world(s).** **• Construct an argument with evidence to support a claim.** ❽ Obtaining, evaluating, and communicating information	**Chemical Reactions:** • Heating or cooling a substance may cause changes that can be observed. • Sometimes these changes are reversible, and sometimes they are not.	**2-PS1-4** *Students who demonstrate understanding can:* **Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.** **Clarification Statement:** Demonstrations of reversible changes could include materials such as water, butter or crayons at different temperatures. Demonstrations of irreversible changes could include cooking an egg, freezing a plant leaf, and heating paper. **Assessment Boundary:** N/A

Crosscutting Concepts: Cause and Effect

• Events have causes that generate observable patterns.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RI.2.1 Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text. **RI.2.3** Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text. **RI.2.8** Describe how reasons support specific points the author makes in a text. **W.2.1** Write opinion pieces in which they introduce the topic or book they are writing about, state an opinion, supply reasons that support the opinion, use linking words (e.g., because, and, also) to connect opinion and reasons, and provide a concluding statement or section.	**N/A**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

2-LS2-1 Ecosystems: Interactions, Energy, and Dynamics

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models **❸ Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, which provide data to support explanations or design solutions.** **• Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question.** ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Interdependent Relationships in Ecosystems:** • Plants depend on water and light to grow.	**2-LS2-1** *Students who demonstrate understanding can:* **Plan and conduct an investigation to determine if plants need sunlight and water to grow.** **Clarification Statement:** Investigations should be limited to testing one variable at a time. **Assessment Boundary:** Assessment is limited to testing one variable at a time.

Crosscutting Concepts: Cause and Effect

• Events have causes that generate observable patterns.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
W.2.7 Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations). **W.2.8** Recall information from experiences or gather information from provided sources to answer a question.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

2-LS2-2 Ecosystems: Interactions, Energy, and Dynamics

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ **Developing and using models** **Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, storyboard) that represent concrete events or design solutions.** • **Develop a simple model based on evidence to represent a proposed object or tool.** ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Interdependent Relationships in Ecosystems:** • Plants depend on animals for pollination or to move their seeds around. **Developing Possible Solutions:** (secondary to 2-LS2-2) • Designs can be conveyed through sketches, drawings, or physical models. • These representations are useful in communicating ideas for a problem's solutions to other people.	**2-LS2-2** *Students who demonstrate understanding can:* **Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.*** **Clarification Statement:** Examples include: placing socks on the outside of students' shoes and walking outside allows socks to gather seeds; plant sock(s) to see what grows; using an eyedropper to move liquids from one container to another emulating hummingbirds or bees pollinating plants. **Assessment Boundary:** N/A

Crosscutting Concepts: Structure and Function
• The shape and stability of structures of natural and designed objects are related to their function(s).

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
SL.2.5 Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings.	**MP.4** Model with mathematics. **2.MD.D.10** Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

2-LS4-1 Biological Unity and Diversity

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ **Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, which provide data to support explanations or design solutions.** • **Make observations (firsthand or from media) to collect data which can be used to make comparisons.** ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Biodiversity and Humans:** • There are many different kinds of living things in any area, and they exist in different places on land and in water.	**2-LS4-1** *Students who demonstrate understanding can:* **Make observations of plants and animals to compare the diversity of life in different habitats.** **Clarification Statement:** Emphasis is on the diversity of living things in each of a variety of different habitats. Students could explore different habitats around their school, aquariums, neighborhoods. **Assessment Boundary:** Assessment does not include specific animal and plant names in specific habitats.

Crosscutting Concepts: N/A
• N/A

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
W.2.7 Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations). **W.2.8** Recall information from experiences or gather information from provided sources to answer a question.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **2.MD.D.10** Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

2ND GRADE

2-ESS1-1 Earth's Place in the Universe

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ **Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.** • **Make observations from several sources to construct an evidence-based account for natural phenomena.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**The History of Planet Earth:** • Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe.	**2-ESS1-1** *Students who demonstrate understanding can:* **Use information from several sources to provide evidence that Earth events can occur quickly or slowly.** **Clarification Statement:** Examples of events and timescales could include volcanic explosions and earthquakes, which happen quickly and erosion of rocks, which occurs slowly. **Assessment Boundary:** Assessment does not include quantitative measurements of timescales.

Crosscutting Concepts: Stability and Change
- Things may change slowly or rapidly.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RI.2.1 Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text. **RI.2.3** Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text. **W.2.6** With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers. **W.2.7** Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations). **W.2.8** Recall information from experiences or gather information from provided sources to answer a question. **SL.2.2** Recount or describe key ideas or details from a text read aloud or information presented orally or through other media.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **2.NBT.A** Understand place value.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

2-ESS2-1 Earth's Systems

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking **❻ Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.** **• Compare multiple solutions to a problem.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Earth Materials and Systems:** • Wind and water can change the shape of the land. **Optimizing the Design Solution:** (secondary to 2-ESS2-1) • Because there is always more than one possible solution to a problem, it is useful to compare and test designs. ** Connections to Engineering, Technology, and Application of Science* **Influence of Engineering, Technology, and Science on Society and the Natural World:** • Developing and using technology has impacts on the natural world.	**2-ESS2-1** *Students who demonstrate understanding can:* **Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.*** **Clarification Statement:** Examples of solutions could include different designs of dikes and wind-breaks to hold back wind and water, and different designs for using shrubs, grass, and trees to hold back the land. Students could explore these ideas with sand tables or soil and water in large containers. **Assessment Boundary:** N/A

Crosscutting Concepts: Stability and Change
• Things may change slowly or rapidly.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RI.2.3 Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text. **RI.2.9** Compare and contrast the most important points presented by two texts on the same topic.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **2.MD.B.5** Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units, e.g., by using drawings (such as drawings of rulers) and equations with a symbol for the unknown number to represent the problem.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

2-ESS2-2 Earth's Systems

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ **Developing and using models Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, storyboard) that represent concrete events or design solutions.** **• Develop a model to represent patterns in the natural world.** ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Plate Tectonics and Large-Scale System Interactions:** • Maps show where things are located. • One can map the shapes and kinds of land and water in any area.	**2-ESS2-2** *Students who demonstrate understanding can:* **Develop a model to represent the shapes and kind of land and bodies of water in an area.** **Clarification Statement:** See Disciplinary Core Ideas. **Assessment Boundary:** Assessment does not include quantitative scaling in models.

Crosscutting Concepts: Patterns
• Patterns in the natural world can be observed.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
SL.2.5 Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **2.NBT.A.3** Read and write numbers to 1000 using base-ten numerals, number names, and expanded form.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

2-ESS2-3 Earth's Systems

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence **❽ Obtaining, evaluating, and communicating information** **Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information.** **• Obtain information using various texts, text features (e.g., headings, tables, contents, glossaries, electronic menus, icons, and other media that will be useful in answering scientific questions.**	**The Roles of Water in Earth's Surface Processes:** • Water is found in the ocean, rivers, lakes, and ponds. • Water exists as solid ice and liquid form.	**2-ESS2-3** *Students who demonstrate understanding can:* **Obtain information to identify where water is found on Earth and that it can be solid or liquid.** **Clarification Statement:** See Disciplinary Core Ideas. **Assessment Boundary:** N/A

Crosscutting Concepts: Patterns
- Patterns in the natural world can be observed.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
W.2.8 Recall information from experiences or gather information from provided sources to answer questions.	**N/A**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

3-PS2-1 Motion and Stability: Forces and Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models **❸ Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.** **• Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered.** ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Forces and Motion:** • Each force acts on one particular object and has both strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object's speed or direction of motion. (Boundary: Qualitative and conceptual, but not quantitative addition of forces are used at this level.) **Types of Interactions:** • Objects in contact exert forces on each other.	**3-PS2-1** *Students who demonstrate understanding can:* **Plan and conduct investigations on the effects of balanced and unbalanced forces on the motion of an object.** (Connected to 3-PS2-2) **Clarification Statement:** Examples could include an unbalanced force on one side of a ball can make it start moving; and, balanced forces pushing on a box from opposite sides will not produce any motion at all. **Assessment Boundary:** Assessment is limited to one variable at a time: number, size, or direction of forces. Assessment does not include quantitative force size, only qualitative and relative. Assessment is limited to gravity being addressed as a force that pulls objects down.

Crosscutting Concepts: Cause and Effect
• Cause and effect relationships are routinely identified.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. **W.3.7** Conduct short research projects that build knowledge about a topic. **W.3.8** Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.	**MP.2** Reason abstractly and quantitatively. **MP.5** Use appropriate tools strategically. **3.MD.A.2** Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

3-PS2-2 Motion and Stability: Forces and Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ **Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.** • **Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution.** ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Forces and Motion:** • The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it. (Boundary: Technical terms, such as magnitude, velocity, momentum, and vector quantity, are not introduced at this level, but the concept that some quantities need both size and direction to be described is developed.)	**3-PS2-2** *Students who demonstrate understanding can:* **Make observations and/or measurements of the object's motion to provide evidence that a pattern can be used to predict future motion.** (Connected to 3-PS2-1) **Clarification Statement:** Examples of motion with a predictable pattern could include a child swinging in a swing, a ball rolling back and forth in a bowl, and two children on a see-saw. **Assessment Boundary:** Assessment does not include technical terms such as period and frequency.

Crosscutting Concepts: Patterns
• Patterns of change can be used to make predictions.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
W.3.7 Conduct short research projects that build knowledge about a topic. **W.3.8** Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.	**MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **3.MD.B.4** Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units— whole numbers, halves, or quarters. **3.N.F.A** Develop understanding of fractions as numbers.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

3-PS2-3 Motion and Stability: Forces and Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ **Asking questions (for science) and defining problems (for engineering) Asking questions and defining problems in grades 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships.** • **Ask questions that can be investigated based on patterns such as cause and effect relationships.** ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Types of Interactions:** • Electric, and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other.	**3-PS2-3** *Students who demonstrate understanding can:* **Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.** **Clarification Statement:** Examples of an electric force could include the force on hair from an electrically charged balloon and the electrical forces between a charged rod and pieces of paper; examples of a magnetic force could include the force between two permanent magnets, the force between an electromagnet and steel paperclips, and the force exerted by one magnet versus the force exerted by two magnets. Examples of cause and effect relationships could include how the distance between objects affects strength of the force and how the orientation of magnets affects the direction of the magnetic force. **Assessment Boundary:** Assessment is limited to forces produced by objects that can be manipulated by students, and electrical interactions are limited to static electricity.

Crosscutting Concepts: Cause and Effect

• Cause and effect relationships are routinely identified, tested, and used to explain change.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. **RI.3.3** Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. **RI.3.8** Describe the logical connection between particular sentences and paragraphs in a text (e.g., comparison, cause/effect, first/second/third in a sequence). **SL.3.3** Ask and answer questions about information from a speaker, offering appropriate elaboration and detail.	**MP.1** Make sense of problems and persevere in solving them. **3.MD.B.4** Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units— whole numbers, halves, or quarters.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

3-PS2-4 Motion and Stability: Forces and Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) **Asking questions and defining problems in grades 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships.** • **Define a simple problem that can be solved through the development of a new or improved object or tool.** ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Types of Interactions:** • Electric, and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other. ** Connections to Engineering, Technology, and Application of Science* **Interdependence of Science, Engineering, and Technology:** • Scientific discoveries about the natural world can often lead to new and improved technologies, which are developed through the engineering design process.	**3-PS2-4** *Students who demonstrate understanding can:* **Define a simple design problem that can be solved by applying scientific ideas about magnets.*** **Clarification Statement:** Examples of problems could include constructing a latch to keep a door shut and creating a device to keep two moving objects from touching each other. **Assessment Boundary:** N/A

Crosscutting Concepts: N/A

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
N/A	**MP.1** Make sense of problems and persevere in solving them. **MP.4** Model with mathematics. **3.MD.B.4** Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units— whole numbers, halves, or quarters. **3.N.F.A** Develop understanding of fractions as numbers.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

3-LS1-1 From Molecules to Organisms: Structure and Processes

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ **Developing and using models Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.** • **Develop models to describe phenomena.** ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Growth and Development of Organisms:** • Reproduction is essential to the continued existence of every kind of organism. • Plants and animals have unique and diverse life cycles.	**3-LS1-1** *Students who demonstrate understanding can:* **Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.** **Clarification Statement:** Changes different organisms go through during their life form a pattern. **Assessment Boundary:** Assessment of plant life cycles is limited to those of flowering plants. Assessment does not include details of human reproduction or microscopic organisms.

Crosscutting Concepts: Patterns
• Patterns of change can be used to make predictions.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RI.3.7 Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur). **SL.3.5** Create engaging audio recordings of stories or poems that demonstrate fluid reading at an understandable pace; add visual displays when appropriate to emphasize or enhance certain facts or details.	**MP.4** Model with mathematics. **3.NBT** Number and Operations in Base Ten **3.NF** Number and Operations—Fractions

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

3-LS2-1 Ecosystems: Interactions, Energy, and Dynamics

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) **❼ Engaging in argument from evidence** **Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).** **• Construct an argument with evidence, data, and/or a model.** ❽ Obtaining, evaluating, and communicating information	**Social Interactions and Group Behavior:** • Being part of a group helps animals obtain food, defend themselves, and cope with changes. • Groups may serve different functions and vary dramatically in size.	**3-LS2-1** *Students who demonstrate understanding can:* **Construct an argument that some animals form groups that help members survive.** **Clarification Statement:** Arguments could include examples of group behavior such as division of labor in a bee colony, flocks of birds staying together to confuse or intimidate predators, or wolves hunting in packs to more efficiently catch and kill prey. **Assessment Boundary:** N/A

Crosscutting Concepts: Cause and Effect
• Cause and effect relationships are routinely identified and used to explain change.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. **RI.3.3** Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. **W.3.1** Write opinion pieces on topics or texts, supporting a point of view with reasons.	**MP.4** Model with mathematics. **3.NBT** Number and Operations in Base Ten

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

3-LS3-1 Heredity: Inheritance and Variation of Traits

Science & Engineering Practices

❶ Asking questions (for science) and defining problems (for engineering)
❷ Developing and using models
❸ Planning and carrying out investigations
❹ Analyzing and interpreting data
Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.
- **Analyze and interpret data to make sense of phenomena using logical reasoning.**

❺ Using mathematics and computational thinking
❻ Constructing explanations (for science) and designing solutions (for engineering)
❼ Engaging in argument from evidence
❽ Obtaining, evaluating, and communicating information

Disciplinary Core Ideas

Inheritance of Traits:
- Many characteristics of organisms are inherited from their parents.

Variation of Traits:
- Different organisms vary in how they look and function because they have different inherited information.

Performance Expectations

3-LS3-1
Students who demonstrate understanding can:

Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.

Clarification Statement:
Patterns are the similarities and differences in traits shared between offspring and their parents, or among siblings. Emphasis is on organisms other than humans.

Assessment Boundary:
Assessment does not include genetic mechanisms of inheritance and prediction of traits. Assessment is limited to non-human examples.

Crosscutting Concepts: Patterns
- Similarities and differences in patterns can be used to sort and classify natural phenomena.

Oklahoma Academic Standards Connections

ELA/Literacy

RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.

RI.3.2 Determine the main idea of a text; recount the key details and explain how they support the main idea.

RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.

W.3.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

SL.3.4 Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.

Mathematics

MP.2 Reason abstractly and quantitatively.

MP.4 Model with mathematics.

3.MD.B.4 Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

3-LS3-2 Heredity: Inheritance and Variation of Traits

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ **Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.** • **Use evidence (e.g., observations, patterns) to support an explanation.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Inheritance of Traits:** • Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment. **Variation of Traits:** • The environment also affects the traits that an organism develops.	**3-LS3-2** *Students who demonstrate understanding can:* **Use evidence to support the explanation that traits can be influenced by the environment.** **Clarification Statement:** Examples of the environment affecting a trait could include normally tall plants grown with insufficient water are stunted; a pet dog that is given too much food and little exercise may become overweight; and animals who teach their offspring skills like hunting. **Assessment Boundary:** N/A

Crosscutting Concepts: Cause and Effect

• Cause and effect relationships are routinely identified and used to explain change.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. **RI.3.2** Determine the main idea of a text; recount the key details and explain how they support the main idea. **RI.3.3** Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. **W.3.2** Write informative/explanatory texts to examine a topic and convey ideas and information clearly. **SL.3.4** Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **3.MD.B.4** Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

3-LS4-1 Biological Unity and Diversity

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ **Analyzing and interpreting data** **Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.** • **Analyze and interpret data to make sense of phenomena using logical reasoning.** ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Evidence of Common Ancestry and Diversity:** • Some kinds of plants and animals that once lived on Earth are no longer found anywhere. • Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments.	**3-LS4-1** *Students who demonstrate understanding can:* **Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago.** **Clarification Statement:** Examples of data could include type, size, and distributions of fossil organisms. Examples of fossils and environments could include marine fossils found on dry land, tropical plant fossils found in Arctic areas, and fossils of extinct organisms. **Assessment Boundary:** Assessment does not include identification of specific fossils or present plants and animals. Assessment is limited to major fossil types and relative ages.

Crosscutting Concepts: Scale, Proportion, and Quantity

• Observable phenomena exist from very short to very long time periods.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. **RI.3.2** Determine the main idea of a text; recount the key details and explain how they support the main idea. **RI.3.3** Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. **W.3.1** Write opinion pieces on topics or texts, supporting a point of view with reasons. **W.3.2** Write informative/explanatory texts to examine a topic and convey ideas and information clearly. **W.3.9** Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **3.MD.B.4** Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

3-LS4-2 Biological Unity and Diversity

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ **Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.** • **Use evidence (e.g., observations, patterns) to construct an explanation.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Natural Selection:** • Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing.	**3-LS4-2** *Students who demonstrate understanding can:* **Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving and reproducing.** **Clarification Statement:** Examples of cause and effect relationships could be plants that have larger thorns than other plants may be less likely to be eaten by predators; and, animals that have better camouflage coloration than other animals may be more likely to survive and therefore more likely to leave offspring. **Assessment Boundary:** N/A

Crosscutting Concepts: Scale, Proportion, and Quantity
- Observable phenomena exist from very short to very long time periods.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. **RI.3.2** Determine the main idea of a text; recount the key details and explain how they support the main idea. **RI.3.3** Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. **W.3.2** Write informative/explanatory texts to examine a topic and convey ideas and information clearly. **SL.3.4** Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **3.MD.B.4** Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

3-LS4-3 Biological Unity and Diversity

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) **❼ Engaging in argument from evidence** **Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).** **• Construct an argument with evidence.** ❽ Obtaining, evaluating, and communicating information	**Adaptation:** • For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.	**3-LS4-3** *Students who demonstrate understanding can:* **Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.** **Clarification Statement:** Examples of evidence could include needs and characteristics of the organisms and habitats involved. The organisms and their habitat make up a system in which the parts depend on each other. **Assessment Boundary:** N/A

Crosscutting Concepts: Cause and Effect

• Cause and effect relationships are routinely identified and used to explain change.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. **RI.3.2** Determine the main idea of a text; recount the key details and explain how they support the main idea. **RI.3.3** Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. **W.3.1** Write opinion pieces on topics or texts, supporting a point of view with reasons. **W.3.2** Write informative/explanatory texts to examine a topic and convey ideas and information clearly. **SL.3.4** Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **3.MD.B.3** Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

3-LS4-4 Biological Unity and Diversity

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) **❼ Engaging in argument from evidence** **Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).** **• Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem.** ❽ Obtaining, evaluating, and communicating information	**Ecosystem Dynamics, Functioning, and Resilience:** • When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die. (secondary to 3-LS4-4) **Biodiversity and Humans:** • Populations live in a variety of habitats, and change in those habitats affects the organisms living there.	**3-LS4-4** *Students who demonstrate understanding can:* **Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.*** **Clarification Statement:** Examples of environmental changes could include changes in land characteristics, water distribution, temperature, food, and other organisms. **Assessment Boundary:** Assessment is limited to a single environmental change. Assessment does not include the greenhouse effect or climate change.

Crosscutting Concepts: Systems and System Models
- A system can be described in terms of its components and their interactions.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. **RI.3.2** Determine the main idea of a text; recount the key details and explain how they support the main idea. **RI.3.3** Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. **W.3.1** Write opinion pieces on topics or texts, supporting a point of view with reasons. **W.3.2** Write informative/explanatory texts to examine a topic and convey ideas and information clearly. **SL.3.4** Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

3-ESS2-1 Earth's Systems

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ **Analyzing and interpreting data** **Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.** • **Represent data in tables and various graphical displays (bar graphs and pictographs) to reveal patterns that indicate relationships.** ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Weather and Climate:** • Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next.	**3-ESS2-1** *Students who demonstrate understanding can:* **Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.** **Clarification Statement:** Examples of data at this grade level could include average temperature, precipitation, and wind direction. **Assessment Boundary:** Assessment of graphical displays is limited to pictographs and bar graphs. Assessment does not include climate change.

Crosscutting Concepts: Patterns
• Patterns of change can be used to make predictions.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
N/A	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **3.MD.A.2** Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem. **3.MD.B.3** Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in bar graphs.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

3-ESS2-2 Earth's Systems

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence **❽ Obtaining, evaluating, and communicating information** **Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluating the merit and accuracy of ideas and methods.** **• Obtain and combine information from books and other reliable media to explain phenomena.**	**Weather and Climate:** • Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years.	**3-ESS2-2** *Students who demonstrate understanding can:* **Obtain and combine information to describe climates in different regions of the world.** **Clarification Statement:** N/A **Assessment Boundary:** N/A

Crosscutting Concepts: Patterns

• Patterns of change can be used to make predictions.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. **RI.3.9** Compare and contrast the most important points and key details presented in two texts on the same topic. **W.3.9** Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

3-ESS3-1 Earth and Human Activity

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ **Engaging in argument from evidence** **Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).** • **Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem.** ❽ Obtaining, evaluating, and communicating information	**Natural Hazards:** • A variety of natural hazards result from natural processes. • Humans cannot eliminate natural hazards but can take steps to reduce their impacts. (Note: This Disciplinary Core Idea is also addressed by 4-ESS3-2.) ** Connections to Engineering, Technology, and Application of Science* **Influence of Engineering, Technology, and Science on Society and the Natural World:** • Engineers improve existing technologies or develop new ones to increase their benefits (e.g., better artificial limbs), decrease known risks (e.g., seatbelts in cars), and meet societal demands (e.g., cell phones).	**3-ESS3-1** *Students who demonstrate understanding can:* **Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.*** **Clarification Statement:** Examples of design solutions to weather-related hazards could include barriers to prevent flooding, wind resistant roofs, tornado shelters and lighting rods. **Assessment Boundary:** N/A

Crosscutting Concepts: Cause and Effect
- Cause and effect relationships are routinely identified, tested, and used to explain change.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
W.3.1 Write opinion pieces on topics or texts, supporting a point of view with reasons. **W.3.7** Conduct short research projects that build knowledge about a topic.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

4-PS3-1 Energy

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking **❻ Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.** **• Use evidence (e.g., measurements, observations, patterns) to construct an explanation.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Definitions of Energy:** • The faster a given object is moving, the more energy it possesses.	**4-PS3-1** *Students who demonstrate understanding can:* **Use evidence to construct an explanation relating the speed of an object to the energy of that object.** **Clarification Statement:** Energy can be moved from place to place by moving objects or through sound, light, or electric currents. At this grade level, no attempt is made to give a precise or complete definition of energy. **Assessment Boundary:** Assessment does not include quantitative measures of changes in the speed of an object or on any precise or quantitative definition of energy.

Crosscutting Concepts: Energy and Matter
• Energy can be transferred in various ways and between objects.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RI.4.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text. **RI.4.3** Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text. **RI.4.9** Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably. **W.4.2** Write informative/explanatory texts to examine a topic and convey ideas and information clearly. **W.4.8** Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources. **W.4.9** Draw evidence from literary or informational texts to support analysis, reflection, and research.	**MP.2** Reason abstractly and quantitatively. **4.MD.A.1** Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table. **4.MD.A.2** Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement sc. **4.NBT.B.5** Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

4-PS3-2 Energy

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models **❸ Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K– 2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.** **• Make observations to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution.** ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Definitions of Energy:** • Energy can be moved from place to place by moving objects or through sound, light, or electric currents. **Conservation of Energy and Energy Transfer:** • Energy is present whenever there are moving objects, sound, light, or heat. • When objects collide, energy can be transferred from one object to another, thereby changing their motion. • In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. • Light also transfers energy from place to place. • Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. • The currents may have been produced to begin with by transforming the energy of motion into electrical energy.	**4-PS3-2** *Students who demonstrate understanding can:* **Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.** **Clarification Statement:** When energy is transferred it can stay in the same form, change forms, or both. Examples of this can include a moving arm throwing a baseball, the light from the sun warming a window-pane, and two moving objects colliding and changing their motion. **Assessment Boundary:** Assessment does not include quantitative measurements of energy.

Crosscutting Concepts: Energy and Matter
• Energy can be transferred in various ways and between objects.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
W.4.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic. **W.4.8** Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.	**MP.1** Make sense of problems and persevere in solving them. **4.MD.C.6** Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

4-PS3-3 Energy

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ **Asking questions (for science) and defining problems (for engineering)** **Asking questions and defining problems in grades 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships.** • **Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships.** ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Definitions of Energy:** • Energy can be moved from place to place by moving objects or through sound, light, or electric currents. **Conservation of Energy and Energy Transfer:** • Energy is present whenever there are moving objects, sound, light, or heat. • When objects collide, energy can be transferred from one object to another, thereby changing their motion. • In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. **Relationship Between Energy and Forces:** • When objects collide, the contact forces transfer energy so as to change the objects' motions.	**4-PS3-3** *Students who demonstrate understanding can:* **Ask questions and predict outcomes about the changes in energy that occur when objects collide.** **Clarification Statement:** Emphasis is on the change in the energy due to the change in speed, not on the forces, as objects interact. **Assessment Boundary:** Assessment does not include quantitative measurements of energy.

Crosscutting Concepts: Energy and Matter
• Energy can be transferred in various ways and between objects.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
W.4.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic. **W.4.8** Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.	**MP.2** Reason abstractly and quantitatively. **MP.5** Use appropriate tools strategically.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

4-PS3-4 Energy

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ **Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.** • **Apply scientific ideas to solve design problems.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Conservation of Energy and Energy Transfer:** • Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy. **Energy in Chemical Processes and Everyday Life:** • The expression "produce energy" typically refers to the conversion of stored energy into a desired form for practical use. **Defining Engineering Problems** (secondary to 4-PS3-4) • Possible solutions to a problem are limited by available materials and resources (constraints). • The success of a designed solution is determined by considering the desired features of a solution (criteria). • Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. * *Connections to Engineering, Technology, and Application of Science* **Influence of Engineering, Technology, and Science on Society and the Natural World:** • Engineers improve existing technologies or develop new ones.	**4-PS3-4** *Students who demonstrate understanding can:* **Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.*** **Clarification Statement:** Examples of devices could include electric circuits that convert electrical energy into motion energy of a vehicle, light, or sound; and, a passive solar heater that converts light into heat, mousetrap cars, rubber band-powered vehicles. Examples of constraints could include the materials, cost, or time to design the device. **Assessment Boundary:** N/A

Crosscutting Concepts: Energy and Matter
• Energy can be transferred in various ways and between objects.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
W.4.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic. **W.4.8** Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.	**4.OA.A.3** Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

4-PS4-1 Waves and Their Applications in Technologies for Information Transfer

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ **Developing and using models Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.** • **Develop a model using an analogy, example, or abstract representation to describe a scientific principle.** ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Wave Properties:** • Waves, which are regular patterns of motion, can be made in water by disturbing the surface. • When waves move across the surface of deep water, the water goes up and down in place; there is no net motion in the direction of the wave except when the water meets a beach. • Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks).	**4-PS4-1** *Students who demonstrate understanding can:* **Develop a model of waves to describe patterns in terms of amplitude and wavelength and to show that waves can cause objects to move.** **Clarification Statement:** Examples of models could include diagrams, analogies, and physical models using wire to illustrate wavelength and amplitude of waves. Examples of wave patterns could include the vibrating patterns associated with sound; the vibrating patterns of seismic waves produced by earthquakes. **Assessment Boundary:** Assessment does not include interference effects, electromagnetic waves, non-periodic waves, or quantitative models of amplitude and wavelength.

Crosscutting Concepts: Patterns

• Similarities and differences in patterns can be used to sort and classify natural phenomena.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
SL.4.5 Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes.	**MP.4** Model with mathematics. **4.G.A.1** Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

K-2 3-5 6-8 9-12

4-PS4-2 Waves and Their Applications in Technologies for Information Transfer

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ **Developing and using models** **Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.** • **Develop a model to describe phenomena.** ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Electromagnetic Radiation:** • An object can be seen when light reflected from its surface enters the eyes.	**4-PS4-2** *Students who demonstrate understanding can:* **Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.** **Clarification Statement:** N/A **Assessment Boundary:** Assessment does not include knowledge of specific colors reflected and seen, the cellular mechanisms of vision, or how the retina works.

Crosscutting Concepts: Cause and Effect

• Cause and effect relationships are routinely identified.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
SL.4.5 Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes.	**MP.4** Model with mathematics. **4.G.A.1** Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

4-PS4-3 Waves and Their Applications in Technologies for Information Transfer

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ **Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.** • **Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Information Technologies and Instrumentation:** • Digitized information can be transmitted over long distances without significant degradation. • High-tech devices, such as computers or cell phones, can receive and decode information—convert it from digitized form to voice—and vice versa. **Optimizing The Design Solution** (secondary to 4-PS4-3) • Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints.	**4-PS4-3** *Students who demonstrate understanding can:* **Generate and compare multiple solutions that use patterns to transfer information.*** **Clarification Statement:** Examples of solutions could include drums sending coded information through sound waves, using a grid of 1's and 0's representing black and white to send information about a picture, QR codes, barcodes, and using Morse code to send text. **Assessment Boundary:** N/A

Crosscutting Concepts: Patterns
• Similarities and differences in patterns can be used to sort and classify designed products.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RI.4.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text. **RI.4.9** Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably.	**MP.2** Reason abstractly and quantitatively.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

4-LS1-1 From Molecules to Organisms: Structure and Processes

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ **Engaging in argument from evidence** **Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).** **• Construct an argument with evidence, data, and/or a model.** ❽ Obtaining, evaluating, and communicating information	**Structure and Function:** • Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.	**4-LS1-1** *Students who demonstrate understanding can:* **Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.** **Clarification Statement:** Examples of structures could include thorns, stems, roots, colored petals, heart, stomach, lung, brain, and skin. **Assessment Boundary:** Assessment is limited to macroscopic structures within plant and animal systems.

Crosscutting Concepts: Systems and System Models

• A system can be described in terms of its components and their interactions.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
W.4.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information.	**4.G.A.3** Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded across the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

4-LS1-2 From Molecules to Organisms: Structure and Processes

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ **Developing and using models Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.** • **Use a model to test interactions concerning the functioning of a natural system.** ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Information Processing:** • Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. • Animals are able to use their perceptions and memories to guide their actions.	**4-LS1-2** *Students who demonstrate understanding can:* **Use a model to describe that animals' receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.** **Clarification Statement:** Emphasis is on systems of information transfer. Examples of response to stimuli include animals running from predators and plant leaves turning toward the sun. **Assessment Boundary:** Assessment does not include the mechanisms by which the brain stores and recalls information or the mechanisms of how sensory receptors function.

Crosscutting Concepts: Systems and System Models
• A system can be described in terms of its components and their interactions.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
SL.4.5 Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes.	**N/A**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

4-ESS1-1 Earth's Place in the Universe

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking **❻ Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in 3-5 builds on K-2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.** **• Identify the evidence that supports particular points in an explanation.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**The History of Planet Earth:** • Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. • The presence and location of certain fossil types indicate the order in which rock layers were formed.	**4-ESS1-1** *Students who demonstrate understanding can:* **Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.** **Clarification Statement:** Examples of evidence from patterns could include rock layers with marine shell fossils above rock layers with plant fossils and no shells, indicating a change from land to water over time; and, a canyon with different rock layers in the walls and a river in the bottom, indicating that over time a river cut through the rock. **Assessment Boundary:** Assessment does not include specific knowledge of the mechanism of rock formation or memorization of specific rock formations and layers. Assessment is limited to relative time.

Crosscutting Concepts: Patterns

• Patterns can be used as evidence to support an explanation.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
W.4.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic. **W.4.8** Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources. **W.4.9** Draw evidence from literary or informational texts to support analysis, reflection, and research.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **4.MD.A.1** Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

4-ESS2-1 Earth's Systems

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models **❸ Planning and carrying out investigations** **Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.** **• With guidance, plan and conduct an investigation with peers.** ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Earth Materials and Systems:** • Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around.	**4-ESS2-1** *Students who demonstrate understanding can:* **Plan and conduct investigations on the effects of water, ice, wind, and vegetation on the relative rate of weathering and erosion.** **Clarification Statement:** Examples of variables to test could include angle of slope in the downhill movement of water, amount of vegetation, speed of wind, relative rate of deposition, cycles of freezing and thawing of water, cycles of heating and cooling, and volume of water flow. **Assessment Boundary:** Assessment is limited to a single form of weathering or erosion.

Crosscutting Concepts: Cause and Effect

• Cause and effect relationships are routinely identified, tested, and used to explain change.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
W.4.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic. **W.4.8** Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **4.MD.A.1** Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table. **4.MD.A.2** Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

4-ESS2-2 Earth's Systems

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ **Analyzing and interpreting data** **Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.** • **Analyze and interpret data to make sense of phenomena using logical reasoning.** ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Plate Tectonics and Large-Scale System Interactions:** • The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. • Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. • Major mountain chains form inside continents or near their edges. • Maps can help locate the different land and water features areas of Earth.	**4-ESS2-2** *Students who demonstrate understanding can:* **Analyze and interpret data from maps to describe patterns of Earth's features.** **Clarification Statement:** Maps can include topographic maps of Earth's land and ocean floor, as well as maps of the locations of mountains, continental boundaries, volcanoes, and earthquakes. **Assessment Boundary:** N/A

Crosscutting Concepts: Patterns

• Patterns can be used as evidence to support an explanation.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RI.4.7 Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.	**4.MD.A.2** Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

4-ESS3-1 Earth and Human Activity

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence **❽ Obtaining, evaluating, and communicating information** **Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluate the merit and accuracy of ideas and methods.** **• Obtain and combine information from books and other reliable media to explain phenomena.**	**Natural Resources:** • Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. • Some resources are renewable over time, and others are not.	**4-ESS3-1** *Students who demonstrate understanding can:* **Obtain and combine information to describe that energy and fuels are derived from renewable and non-renewable resources and how their uses affect the environment.** **Clarification Statement:** Examples of renewable energy resources could include wind energy, water behind dams, and sunlight; non-renewable energy resources are fossil fuels and fissile materials. Examples of environmental effects could include loss of habitat due to dams, loss of habitat due to surface mining, and air pollution from burning of fossil fuels. **Assessment Boundary:** N/A

Crosscutting Concepts: Cause and Effect

• Cause and effect relationships are routinely identified and used to explain change.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
W.4.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic. **W.4.8** Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources. **W.4.9** Draw evidence from literary or informational texts to support analysis, reflection, and research.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **4.OA.A.1** Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 × 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

4-ESS3-2 Earth and Human Activity

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ **Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.** • **Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Natural Hazards:** • A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). • Humans cannot eliminate the hazards but can take steps to reduce their impacts. **Designing Solutions to Engineering Problems:** • Testing a solution involves investigating how well it performs under a range of likely conditions. (secondary to 4-ESS3-2) ** Connections to Engineering, Technology, and Application of Science* **Influence of Engineering, Technology, and Science on Society and the Natural World:** • Engineers improve existing technologies or develop new ones to increase their benefits, to decrease known risks, and to meet societal demands.	**4-ESS3-2** *Students who demonstrate understanding can:* **Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.*** **Clarification Statement:** Examples of solutions could include designing an earthquake resistant building and improving monitoring of volcanic activity. **Assessment Boundary:** Assessment is limited to earthquakes, floods, tsunamis, and volcanic eruptions.

Crosscutting Concepts: Cause and Effect
- Cause and effect relationships are routinely identified and used to explain change.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RI.4.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text. **RI.4.9** Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **4.OA.A.1** Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 × 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

5-PS1-1 Matter and Its Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ **Developing and using models Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. Develop a model to describe phenomena.** ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Structure and Properties of Matter:** • Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. • A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon; the effects of air on larger particles or objects.	**5-PS1-1** *Students who demonstrate understanding can:* **Develop a model to describe that matter is made of particles too small to be seen.** **Clarification Statement:** Examples of evidence that could be utilized in building models include adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water. **Assessment Boundary:** Assessment does not include atomic-scale mechanism of evaporation and condensation or defining the unseen particles.

Crosscutting Concepts: Scale, Proportion, and Quantity
• Natural objects exist from the very small to the immensely large.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **5.NBT.A.1** Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10. **5.NF.B.7** Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. **5.MD.C.3** Recognize volume as an attribute of solid figures and understand concepts of volume measurement. **5.MD.C.4** Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

5-PS1-2 Matter and Its Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ **Using mathematics and computational thinking** **Mathematical and computational thinking in 3–5 builds on K–2 experiences and progresses to extending quantitative measurements to a variety of physical properties and using computation and mathematics to analyze data and compare alternative design solutions.** • **Measure and graph quantities such as weight to address scientific and engineering questions and problems.** ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Structure and Properties of Matter:** • The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish. **Chemical Reactions:** • No matter what reaction or change in properties occurs, the total weight of the substances does not change. (Boundary: Mass and weight are not distinguished at this grade level.)	**5-PS1-2** *Students who demonstrate understanding can:* **Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.** **Clarification Statement:** Examples of reactions or changes could include phase changes, dissolving, and mixing that forms new substances. **Assessment Boundary:** Assessment does not include distinguishing mass and weight.

Crosscutting Concepts: Scale, Proportion, and Quantity
- Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
W.5.7 Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. **W.5.8** Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. **W.5.9** Draw evidence from literary or informational texts to support analysis, reflection, and research.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **5.MD.A.1** Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real-world problems.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

5-PS1-3 Matter and Its Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ **Planning and carrying out investigations** **Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.** • **Make observations and measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon.** ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Structure and Properties of Matter:** • Measurements of a variety of properties can be used to identify materials. (Boundary: At this grade level, mass and weight are not distinguished, and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation.)	**5-PS1-3** *Students who demonstrate understanding can:* **Make observations and measurements to identify materials based on their properties.** **Clarification Statement:** Examples of materials to be identified could include baking soda and other powders, metals, minerals, and liquids. Examples of properties could include color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, and solubility; density is not intended as an identifiable property. **Assessment Boundary:** Assessment does not include density or distinguishing mass and weight.

Crosscutting Concepts: Scale, Proportion, and Quantity
• Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
W.5.7 Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. **W.5.8** Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. **W.5.9** Draw evidence from literary or informational texts to support analysis, reflection, and research.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

5-PS1-4 Matter and Its Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models **❸ Planning and carrying out investigations** **Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.** **• Conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered.** ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Chemical Reactions:** • When two or more different substances are mixed, a new substance with different properties may be formed.	**5-PS1-4** *Students who demonstrate understanding can:* **Conduct an investigation to determine whether the mixing of two or more substances results in new substances.** **Clarification Statement:** Examples of interactions forming new substances can include mixing baking soda and vinegar. Examples of interactions not forming new substances can include mixing baking soda and water.

Crosscutting Concepts: Cause and Effect
- Cause and effect relationships are routinely identified, tested, and used to explain change.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
W.5.7 Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. **W.5.8** Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. **W.5.9** Draw evidence from literary or informational texts to support analysis, reflection, and research.	**N/A**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

5-PS2-1 Motion and Stability: Forces and Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) **❼ Engaging in argument from evidence** **Engaging in argument from evidence in 3-5 builds on K-2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).** ❽ Obtaining, evaluating, and communicating information	**Types of Interactions:** • The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center.	**5-PS2-1** *Students who demonstrate understanding can:* **Support an argument that the gravitational force exerted by the Earth is directed down.** **Clarification Statement:** "Down" is a local description of the direction that points toward the center of the spherical earth. Earth causes objects to have a force on them that point toward the center of the Earth, "down". Support for arguments can be drawn from diagrams, evidence, and data that are provided. **Assessment Boundary:** Mathematical representation of gravitational force is not assessed.

Crosscutting Concepts: Cause and Effect

• Cause and effect relationships are routinely identified, tested, and used to explain change.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RI.5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. **RI.5.9** Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. **W.5.1** Write opinion pieces on topics or texts, supporting a point of view with reasons and information.	**N/A**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

5TH GRADE

5-PS3-1 Energy

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ **Developing and using models Modeling in 3-5 builds on K-2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.** • **Use models to describe phenomena.** ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Energy in Chemical Processes and Everyday Life:** • The energy released [from] food was once energy from the sun that was captured by plants in the chemical process that forms plant matter (from air and water). **Organization of Matter and Energy Flow in Organisms:** • Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion.	**5-PS3-1** *Students who demonstrate understanding can:* **Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.** **Clarification Statement:** Examples of models could include diagrams, and flow charts. **Assessment Boundary:** Assessment does not include cellular mechanisms of digestive absorption.

Crosscutting Concepts: Energy and Matter
• Energy can be transferred in various ways and between objects.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. **SL.5.5** Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes.	**N/A**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

5-LS1-1 From Molecules to Organisms: Structure and Processes

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ **Engaging in argument from evidence** **Engaging in argument from evidence in 3-5 builds on K-2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world.** • **Support an argument with evidence, data, or a model.** ❽ Obtaining, evaluating, and communicating information	**Organization for Matter and Energy Flow in Organisms:** • Plants acquire their material for growth chiefly from air and water.	**5-LS1-1** *Students who demonstrate understanding can:* **Support an argument that plants get the materials they need for growth chiefly from air and water.** **Clarification Statement:** Emphasis is on the idea that plant matter comes mostly from air and water, not from the soil.

Crosscutting Concepts: Energy and Matter

• Matter is transported into, out of, and within systems.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RI.5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. **RI.5.9** Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. **W.5.1** Write opinion pieces on topics or texts, supporting a point of view with reasons and information.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **5.MD.A.1** Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

5-LS2-1 Ecosystems: Interactions, Energy, and Dynamics

Science & Engineering Practices

❶ Asking questions (for science) and defining problems (for engineering)
❷ **Developing and using models**
Modeling in 3-5 builds on K-2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.
- **Develop a model to describe phenomena.**

❸ Planning and carrying out investigations
❹ Analyzing and interpreting data
❺ Using mathematics and computational thinking
❻ Constructing explanations (for science) and designing solutions (for engineering)
❼ Engaging in argument from evidence
❽ Obtaining, evaluating, and communicating information

Disciplinary Core Ideas

Interdependent Relationships in Ecosystems:
- The food of almost any kind of animal can be traced back to plants.
- Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants.
- Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as "decomposers."
- Decomposition eventually restores (recycles) some materials back to the soil.
- Organisms can survive only in environments in which their particular needs are met.
- A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life.
- Newly introduced species can damage the balance of an ecosystem.

Cycles of Matter and Energy Transfer in Ecosystems:
- Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die.
- Organisms obtain gases, and water, from the environment, and release waste matter (gas, liquid, or solid) back into the environment.

Performance Expectations

5-LS2-1
Students who demonstrate understanding can:

Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

Clarification Statement:
Emphasis is on the idea that matter that is not food (air, water, decomposed materials in soil) is changed by plants into matter that is food. Examples of systems could include organisms, ecosystems, and the Earth.

Assessment Boundaries:
Assessment does not include molecular explanations.

Crosscutting Concepts: Systems and System Models
- A system can be described in terms of its components and their interactions.

Oklahoma Academic Standards Connections

ELA/Literacy

RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.

SL.5.5 Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes.

Mathematics

MP.2 Reason abstractly and quantitatively.

MP.4 Model with mathematics.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

5-LS2-2 Ecosystems: Interactions, Energy, and Dynamics

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ **Developing and using models** **Modeling in 3-5 builds on K-2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.** • **Use models to describe phenomena.** ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Interdependent Relationships in Ecosystems:** • Organisms can survive only in environments in which their particular needs are met. • A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. • Newly introduced species can damage the balance of an ecosystem.	**5-LS2-2** *Students who demonstrate understanding can:* **Use models to explain factors that upset the stability of local ecosystems.** **Clarification Statement:** Factors that upset an ecosystem's stability includes: invasive species, drought, human development, and removal of predators. Models could include simulations, and representations, etc. **Assessment Boundaries:** Assessment does not include molecular explanations.

Crosscutting Concepts: Systems and System Models
• A system can be described in terms of its components and their interactions.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. **SL.5.5** Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

5TH GRADE

5-ESS1-1 Earth's Place in the Universe

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ **Engaging in argument from evidence** **Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).** • **Support an argument with evidence, data, or a model.** ❽ Obtaining, evaluating, and communicating information	**The Universe and Its Stars:** • The sun is a star that appears larger and brighter than other stars because it is closer. Stars range greatly in their distance from Earth.	**5-ESS1-1** *Students who demonstrate understanding can:* **Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from Earth.** **Assessment Boundary:** Assessment is limited to relative distances, not sizes, of stars. Assessment does not include other factors that affect apparent brightness (such as stellar masses, age, stage).

Crosscutting Concepts: Scale, Proportion and Quantity
• Natural objects exist from the very small to the immensely large.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RI.5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. **RI.5.7** Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. **RI.5.8** Explain how an author uses reasons and evidence to support particular points in a text, identifying which reasons and evidence support which point(s). **RI.5.9** Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. **W.5.1** Write opinion pieces on topics or texts, supporting a point of view with reasons and information.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **5.NBT.A.2** Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

5-ESS1-2 Earth's Place in the Universe

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations **❹ Analyzing and interpreting data Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.** **• Represent data in graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships.** ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Earth and the Solar System:** • The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the sun, moon, and stars at different times of the day, month, and year.	**5-ESS1-2** *Students who demonstrate understanding can:* **Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.** **Clarification Statement:** Examples of patterns could include the position and motion of Earth with respect to the sun and selected stars that are visible only in particular months. **Assessment Boundary:** Assessment does not include causes of seasons.

Crosscutting Concepts: Patterns

• Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
SL.5.5 Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **5.G.A.2** Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

5-ESS2-1 Earth's Systems

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ **Developing and using models Modeling in 3-5 builds on K-2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.** • **Develop a model using an example to describe phenomena.** ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Earth Materials and System:** • Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth's surface materials and processes. • The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. • Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather.	**5-ESS2-1** *Students who demonstrate understanding can:* **Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.** **Clarification Statement:** Examples could include the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere on landforms and ecosystems through weather and climate; and the influence of mountain ranges on winds and clouds in the atmosphere. The geosphere, hydrosphere, atmosphere, and biosphere are each a system. **Assessment Boundary:** Assessment is limited to the interactions of two systems at a time.

Crosscutting Concepts: System and System Models
• A system can be described in terms of its components and their interactions.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. **SL.5.5** Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **5.G.A.2** Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

5-ESS2-2 Earth's Systems

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ **Using mathematics and computational thinking** **Mathematical and computational thinking in 3–5 builds on K–2 experiences and progresses to extending quantitative measurements to a variety of physical properties and using computation and mathematics to analyze data and compare alternative design solutions.** • **Describe and graph quantities such as area and volume to address scientific questions.** ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**The Roles of Water in Earth's Surface Processes:** • Nearly all of Earth's available water is in the ocean. • Most fresh water is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere.	**5-ESS2-2** *Students who demonstrate understanding can:* **Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.** **Assessment Boundary:** Assessment is limited to oceans, lakes, rivers, glaciers, ground water, and polar ice caps, and does not include the atmosphere. Only a tiny fraction is in streams, lakes, wetlands, and the atmosphere.

Crosscutting Concepts: Scale, Proportion, and Quantity
• Standard units are used to measure and describe physical quantities such as weight and volume.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. **W.5.8** Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. **SL.5.5** Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

5-ESS3-1 Earth and Human Activity

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ **Obtaining, evaluating, and communicating information** **Obtaining, evaluating, and communicating information in 3– 5 builds on K–2 experiences and progresses to evaluating the merit and accuracy of ideas and methods.** • **Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem.**	**Human Impacts on Earth Systems:** • Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments.	**5-ESS3-1** *Students who demonstrate understanding can:* **Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.** **Clarification Statement:** Examples of information might include the use of natural fertilizers or biological pest control by farmers, replanting trees after cutting them by the logging industry, and the institution of recycling programs in cities. **Assessment Boundary:** N/A

Crosscutting Concepts: System and System Models
• A system can be described in terms of its components and their interactions.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RI.5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. **RI.5.7** Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. **RI.5.9** Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. **W.5.8** Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. **W.5.9** Draw evidence from literary or informational texts to support analysis, reflection, and research.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

6-12 Overview

The 6th – 12th Grade Oklahoma Academic Standards for Science include the following Domains:

❶ **Physical Science (PS)**
❷ **Life Science (LS)**
❸ **Earth & Space Science (ESS)**

Each Domain has a set of Topics in science that fit within that Domain:

❶ **Physical Science (PS)**
- Matter and Its Interactions (PS1)
- Motion and Stability: Forces and Interactions (PS2)
- Energy (PS3)
- Waves and Their Applications in Technologies for Information

❷ **Life Science (LS)**
- From Molecules to Organisms: Structure and Processes (LS1)
- Ecosystems: Interactions, Energy, and Dynamics (LS2)
- Heredity: Inheritance and Variation of Traits (LS3)
- Biological Unity and Diversity (LS4)

❸ **Earth & Space Science (ESS)**
- Earth's Place in the Universe (ESS1)
- Earth's Systems (ESS2)
- Earth and Human Activity (ESS4)

The abbreviations for the Domains and Topics are utilized in the naming system of each Performance Expectation found in the Oklahoma Academic Standards for Science.

For example, the Performance Expectation **MS-PS1-4** represents the following:

GRADE: Middle School
DOMAIN: Physical Science
TOPIC: Matter and its Interactions
STANDARD: 4

Each grade level contains Performance Expectations from each Domain. The progressions are unique from other grade spans in that Performance Expectations for a particular Topic are distributed across the 6th-8th grade. Performance Expectations for Physical Science Topic 1, "Matter and its Interactions," are highlighted in green. The standards are unique to each grade and their distribution ensures students will have obtained a collection of experiences that assists them in fully understanding Topic 1 before they enter High School.

Grade 6	Grade 7	Grade 8
MS-PS1-4	MS-PS1-1	MS-PS1-3
MS-PS2-3	MS-PS1-2	MS-PS1-5
MS-PS2-5	MS-PS2-4	MS-PS1-6
MS-PS3-1	MS-PS3-6	MS-PS2-1
MS-PS3-2	MS-LS1-4	MS-PS2-2
MS-PS3-3	MS-LS1-5	MS-PS4-1
MS-PS3-4	MS-LS1-8	MS-PS4-2
MS-LS1-1	MS-LS3-1	MS-PS4-3
MS-LS1-2	MS-LS3-2	MS-LS1-7
MS-LS1-3	MS-LS4-3	MS-LS4-1
MS-LS1-6	MS-LS4-4	MS-LS4-2
MS-LS2-1	MS-LS4-5	MS-ESS1-4
MS-LS2-2	MS-LS4-6	MS-ESS2-1
MS-LS2-3	MS-ESS1-1	MS-ESS2-2
MS-LS2-4	MS-ESS1-2	MS-ESS2-3
MS-LS2-5	MS-ESS1-3	MS-ESS3-1
MS-ESS2-4	MS-ESS2-5	MS-ESS3-2
MS-ESS3-3	MS-ESS2-6	MS-ESS3-4

In 9th-12th grade, each course contains Performance Expectations that may appear in other courses and does not necessarily integrate Performance Expectations from each Domain. The Performance Expectations for Physical Science Topic 1, "Matter and its Interactions," for high school are found in Physical Science, Chemistry, and Physics, and are highlighted in green in the table below. The Performance Expectations may be duplicated considering not every student will take all three courses. In some cases, the Performance Expectations appear in multiple courses with minor differences (see HS-PS4-1 in Physical Science, Chemistry, and Physics highlighted in blue) and sometimes the Performance Expectation is duplicated exactly (see HS-PS2-2 in Physical Science and Physics, highlighted in red). In some cases, Performance Expectations may only appear in one course (see HS-PS2-6 in Chemistry).

Physical Science	Chemistry	Physics
HS-PS1-1	HS-PS1-1	HS-PS1-8
HS-PS1-2	HS-PS1-2	HS-PS2-1
HS-PS1-5	HS-PS1-3	HS-PS2-2
HS-PS1-7	HS-PS1-4	HS-PS2-3
HS-PS2-1	HS-PS1-5	HS-PS2-4
HS-PS2-2	HS-PS1-6	HS-PS2-5
HS-PS2-3	HS-PS1-7	HS-PS3-1
HS-PS2-5	HS-PS1-8	HS-PS3-2
HS-PS3-1	HS-PS2-6	HS-PS3-3
HS-PS3-2	HS-PS3-3	HS-PS3-4
HS-PS3-3	HS-PS3-4	HS-PS3-5
HS-PS3-4	HS-PS4-1	HS-PS4-1
HS-PS4-1	HS-PS4-3	HS-PS4-2
HS-PS4-2		HS-PS4-3
HS-PS4-4		HS-PS4-4
		HS-PS4-5

MS-PS1-4 Matter and Its Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) **❷ Developing and using models** **Modeling in 6–8 builds on K–5 and progresses to developing, using and revising models to describe, test, and predict more abstract phenomena and design systems.** **• Develop a model to predict and/or describe phenomena.** ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Structure and Properties of Matter:** • Gases and liquids are made of molecules or inert atoms that are moving about relative to each other. In a liquid, the molecules are constantly in contact with others; in a gas, they are widely spaced except when they happen to collide. In a solid, atoms are closely spaced and may vibrate in position but do not change relative locations. • The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter. **Definitions of Energy:** (secondary to MS-PS1-4) • The term "heat" as used in everyday language refers both to thermal energy (the motion of atoms or molecules within a substance) and the transfer of that thermal energy from one object to another. In science, heat is used only for this second meaning; it refers to the energy transferred due to the temperature difference between two objects. • The temperature of a system is proportional to the average internal kinetic energy and potential energy per atom or molecule (whichever is the appropriate building block for the system's material). The details of that relationship depend on the type of atom or molecule and the interactions among the atoms in the material. • Temperature is not a direct measure of a system's total thermal energy. • The total thermal energy (sometimes called the total internal energy) of a system depends jointly on the temperature, the total number of atoms in the system, and the state of the material.	**MS-PS1-4** *Students who demonstrate understanding can:* **Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.** **Clarification Statement:** Emphasis is on qualitative molecular-level models of solids, liquids, and gases to show that adding or removing thermal energy increases or decreases kinetic energy of the particles until a change of state occurs. Examples of models could include drawings and diagrams. Examples of particles could include molecules or inert atoms. Examples of pure substances could include water, carbon dioxide, and helium. **Assessment Boundary:** The use of mathematical formulas is not intended.

Crosscutting Concepts: Cause and Effect

• Cause and effect relationships may be used to predict phenomena in natural or designed systems.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
WHST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).	**6.NS.C.5** Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

MS-PS2-3 Motion and Stability: Forces and Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) Asking questions and defining problems in grades 6–8 builds from grades K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models. **• Ask questions that can be investigated within the scope of the classroom, outdoor environment, and museums and other public facilities with available resources and, when appropriate, frame a hypothesis based on observations and scientific principles.** ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Types of Interactions:** • Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects.	**MS-PS2-3** *Students who demonstrate understanding can:* **Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.** **Clarification Statement:** Examples of devices that use electric and magnetic forces could include electromagnets, electric motors, or generators. Examples of data could include the effect of the number of turns of wire on the strength of an electromagnet, or the effect of increasing the number or strength of magnets on the speed of an electric motor. **Assessment Boundary:** Assessment about questions that require quantitative answers is limited to proportional reasoning and algebraic thinking. Assessment of Coulomb's Law is not intended.

Crosscutting Concepts: Cause and Effect
- Cause and effect relationships may be used to predict phenomena in natural or designed systems.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.	**MP.2** Reason abstractly and quantitatively.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

6TH GRADE

MS-PS2-5 Motion and Stability: Forces and Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models **❸ Planning and carrying out investigations** **Planning and carrying out investigations to answer questions or test solutions to problems in 6–8 builds on K–5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or design solutions.** **• Conduct an investigation and evaluate the experimental design to produce data to serve as the basis for evidence that can meet the goals of the investigation.** ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Types of Interactions:** • Forces that act at a distance (electric, magnetic, and gravitational) can be explained by fields that extend through space and can be mapped by their effect on a test object (a charged object, or a ball, respectively).	**MS-PS2-5** *Students who demonstrate understanding can:* **Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.** **Clarification Statement:** Examples of this phenomenon could include the interactions of magnets, electrically-charged strips of tape, and electrically-charged pith balls. Examples of investigations could include first-hand experiences or simulations. **Assessment Boundary:** Assessment is limited to electric and magnetic fields, and limited to qualitative evidence for the existence of fields.

Crosscutting Concepts: Cause and Effect
- Cause and effect relationships may be used to predict phenomena in natural or designed systems.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. **WHST.6-8.7** Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **6.EE.A.2** Write, read, and evaluate expressions in which letters stand for numbers. **6.RP.A.3** Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

MS-PS3-1 Energy

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ **Analyzing and interpreting data** **Analyzing data in 6–8 builds on K–5 and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.** • **Construct and interpret graphical displays of data to identify linear and nonlinear relationships.** ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Definitions of Energy:** • Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed.	**MS-PS3-1** *Students who demonstrate understanding can:* **Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.** **Clarification Statement:** Emphasis is on descriptive relationships between kinetic energy and mass separately from kinetic energy and speed. Examples could include riding a bicycle at different speeds, rolling different sizes of rocks downhill, and getting hit by a wiffle ball versus a tennis ball. **Assessment Boundary:** Does not include mathematical calculations of kinetic energy.

Crosscutting Concepts: Scale, Proportion, and Quantity

- Proportional relationships (e.g. speed as the ratio of distance traveled to time taken) among different types of quantities provide information about the magnitude of properties and processes.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. **RST.6-8.7** Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).	**MP.2** Reason abstractly and quantitatively. **6.RP.A.1** Understand the concept of ratio and use ratio language to describe a ratio relationship between two quantities. **6.RP.A.2** Understand the concept of a unit rate a/b associated with a ratio a:b with $b \neq 0$, and use rate language in the context of a ratio relationship. **7.RP.A.2** Recognize and represent proportional relationships between quantities. **8.EE.A.1** Know and apply the properties of integer exponents to generate equivalent numerical expressions. **8.EE.A.2** Use square root and cube root symbols to represent solutions to equations of the form $x^2=p$ and $x^3=p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational. **8.F.A.3** Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

MS-PS3-2 Energy

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ **Developing and using models** **Modeling in 6–8 builds on K–5 and progresses to developing, using and revising models to describe, test, and predict more abstract phenomena and design systems.** **• Develop a model to predict and/or describe phenomena.** ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Definitions of Energy:** • A system of objects may also contain stored (potential) energy, depending on their relative positions. **Relationship Between Energy and Forces:** • When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object.	**MS-PS3-2** *Students who demonstrate understanding can:* **Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.** **Clarification Statement:** Emphasis is on relative amounts of potential energy, not on calculations of potential energy. Examples of objects within systems interacting at varying distances could include: the Earth and either a roller coaster cart at varying positions on a hill or objects at varying heights on shelves, changing the direction/orientation of a magnet, and a balloon with static electrical charge being brought closer to a classmate's hair. Examples of models could include representations, diagrams, pictures, and written descriptions of systems. **Assessment Boundary:** Assessment is limited to two objects and electric, magnetic, and gravitational interactions.

Crosscutting Concepts: Systems and System Models
- Models can be used to represent systems and their interactions – such as inputs, processes, and outputs – and energy and matter flows within systems.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.	**6.NS.C.7a** Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. **6.NS.C7b** Write, interpret, and explain statements of order for rational numbers in real-world contexts.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

MS-PS3-3 Energy

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking **❻ Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.** **• Apply scientific ideas or principles to design, construct, and test a design of an object, tool, process or system.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Definitions of Energy:** • Temperature is a measure of the average kinetic energy of particles of matter. • The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present. **Conservation of Energy and Energy Transfer:** • Energy is spontaneously transferred out of hotter regions or objects and into colder ones. **Defining and Delimiting an Engineering Problem:** (secondary to MS-PS3-3) • The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that is likely to limit possible solutions. **Developing Possible Solutions:** (secondary to MS-PS3-3) • A solution needs to be tested, and then modified on the basis of the test results in order to improve it. • There are systematic processes for evaluating solutions with respect to how well they meet criteria and constraints of a problem.	**MS-PS3-3** *Students who demonstrate understanding can:* **Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.*** **Clarification Statement:** Examples of devices could include an insulated box, a solar cooker, and a Styrofoam cup. Care should be taken with devices that concentrate significant amounts of energy, e.g. conduction, convection, and/or radiation. **Assessment Boundary:** Assessment does not include calculating the total amount of thermal energy transferred.

Crosscutting Concepts: Energy and Matter
• The transfer of energy can be tracked as energy flows through a designed or natural system.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. **WHST.6-8.7** Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.	**6.EE.C.9** Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. **6.G.G** Understand congruence and similarity using physical models, transparencies, or geometry software.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

MS-PS3-4 Energy

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models **❸ Planning and carrying out investigations** **Planning and carrying out investigations to answer questions or test solutions to problems in 6–8 builds on K–5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or design solutions.** **• Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim.** ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Definitions of Energy:** • Temperature is a measure of the average kinetic energy of particles of matter. • The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present. **Conservation of Energy and Energy Transfer:** • The amount of energy transfer needed to change the temperature of a matter sample by a given amount depends on the nature of the matter, the size of the sample, and the environment.	**MS-PS3-4** *Students who demonstrate understanding can:* **Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.** **Clarification Statement:** Examples of experiments could include comparing final water temperatures after different masses of ice melted in the same volume of water with the same initial temperature, the temperature change of samples of different materials with the same mass as they cool or heat in the environment, or the same material with different masses when a specific amount of energy is added. **Assessment Boundary:** Assessment does not include calculating the total amount of thermal energy transferred.

Crosscutting Concepts: Scale, Proportion, and Quantity

• Proportional relationships (e.g. speed as the ratio of distance traveled to time taken) among different types of quantities provide information about the magnitude of properties and processes.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. **WHST.6-8.7** Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.	**MP.2** Reason abstractly and quantitatively. **6.SP.B.5** Summarize numerical data sets in relation to their context.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

MS-LS1-1 From Molecules to Organisms: Structure and Processes

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ **Planning and carrying out investigations** **Planning and carrying out investigations in 6-8 builds on K- 5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or solutions.** • **Conduct an investigation to produce data to serve as the basis for evidence that meet the goals of an investigation.** ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Structure and Function:** • All living things are made up of cells, which is the smallest unit that can be said to be alive. • An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular).	**MS-LS1-1** *Students who demonstrate understanding can:* **Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.** **Clarification Statement:** Emphasis is on developing evidence that living things are made of cells, distinguishing between living and non-living cells, and understanding that living things may be made of one cell or many and varied cells. **Assessment Boundary:** Assessments should provide evidence of students' abilities to identify evidence that living things are made of cells and distinguish between living and nonliving cells.

Crosscutting Concepts: Scale, Proportion, and Quantity
• Phenomena that can be observed at one scale may not be observable at another scale.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
WHST.6-8.7 Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.	**6.EE.C.9** Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation.

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MS-LS1-2 From Molecules to Organisms: Structure and Processes

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ **Developing and using models** **Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.** • **Develop and use a model to describe phenomena.** ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Structure and Function:** • Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell.	**MS-LS1-2** *Students who demonstrate understanding can:* **Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.** **Clarification Statement:** Emphasis is on the cell functioning as a whole system and the primary role of identified parts of the cell, specifically the nucleus, chloroplasts, mitochondria, cell membrane, and cell wall. Other organelles should be introduced while covering this concept. **Assessment Boundary:** Assessment of organelle structure/function relationships is limited to the cell wall and cell membrane. Assessment of the function of the other organelles is limited to their relationship to the whole cell. Assessment does not include the biochemical function of cells or cell parts.

Crosscutting Concepts: Structure and Function

- Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they function.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.	**6.EE.C.9** Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation.

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MS-LS1-3 From Molecules to Organisms: Structure and Processes

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) **❼ Engaging in argument from evidence** **Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).** **• Use an oral and written argument supported by evidence to support or refute an explanation or a model for a phenomenon.** ❽ Obtaining, evaluating, and communicating information	**Structure and Function:** • In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions.	**MS-LS1-3** *Students who demonstrate understanding can:* **Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.** **Clarification Statement:** Emphasis is on the conceptual understanding that cells form tissues and tissues form organs specialized for particular body functions. Examples could include the interaction of subsystems within a system and the normal functioning of those systems. **Assessment Boundary:** Assessment does not include the mechanism of one body system independent of others. Assessment is limited to the circulatory, excretory, digestive, respiratory, muscular, and nervous systems.

Crosscutting Concepts: Systems and System Models
• Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. **RI.6.8** Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not. **WHST.6-8.1** Write arguments focused on discipline content.	**6.EE.C.9** Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

MS-LS1-6 From Molecules to Organisms: Structure and Processes

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking **❻ Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific knowledge, principles, and theories.** **• Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Organization for Matter and Energy Flow in Organisms:** • Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use. **Energy in Chemical Processes and Everyday Life:** (secondary to MS-LS1-6): • The chemical reaction by which plants produce complex food molecules (sugars) requires an energy input (i.e., from sunlight) to occur. • In this reaction, carbon dioxide and water combine to form carbon-based organic molecules and release oxygen.	**MS-LS1-6** *Students who demonstrate understanding can:* **Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.** **Clarification Statement:** Emphasis is on tracing movement of matter and flow of energy. **Assessment Boundary:** Assessment does not include the biochemical mechanisms of photosynthesis.

Crosscutting Concepts: Energy and Matter
• Within a natural system, the transfer of energy drives the motion and/or cycling of matter.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. **RST.6-8.2** Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. **WHST.6-8.2** Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. **WHST.6-8.9** Draw evidence from informational texts to support analysis, reflection, and research.	**6.EE.C.9** Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

MS-LS2-1 Ecosystems: Interactions, Energy, and Dynamics

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations **❹ Analyzing and interpreting data Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.** **• Analyze and interpret data to provide evidence for phenomena.** ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Interdependent Relationships in Ecosystems:** • Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. • In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction. • Growth of organisms and population increases are limited by access to resources.	**MS-LS2-1** *Students who demonstrate understanding can:* **Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.** **Clarification Statement:** Emphasis is on cause and effect relationships between resources and growth of individual organisms and the numbers of organisms in ecosystems during periods of abundant and scarce resources. **Assessment Boundary:** The model should focus on organisms' needs and how resources in the ecosystem meet those needs. Determining the carrying capacity of ecosystems is beyond the intent.

Crosscutting Concepts: Cause and Effect
• Cause and effect relationships may be used to predict phenomena in natural or designed systems.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. **RST.6-8.7** Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **6.SP** Develop understanding of statistical variability.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

6TH GRADE

MS-LS2-2 Ecosystems: Interactions, Energy, and Dynamics

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking **❻ Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.** **• Construct an explanation that includes qualitative or quantitative relationships between variables that predict phenomena.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Interdependent Relationships in Ecosystems:** • Predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared.	**MS-LS2-2** *Students who demonstrate understanding can:* **Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.** **Clarification Statement:** Emphasis is on predicting consistent patterns of interactions in different ecosystems in terms of the relationships among and between organisms and abiotic components of ecosystems. Examples of types of interactions could include competitive, predatory, and mutually beneficial (e.g., competition, predation, parasitism, commensalism, mutualism). **Assessment Boundary:** Assessment should provide evidence that students can explain the consistency for the interactions of organisms with other organisms and/or the environment across different ecosystems (e.g., ocean, forests, wetlands, deserts, terrariums, cities).

Crosscutting Concepts: Patterns

• Patterns can be used to identify cause and effect relationships.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. **WHST.6-8.2** Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. **WHST.6-8.9** Draw evidence from literary or informational texts to support analysis, reflection, and research. **SL.8.1** Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly. **SL.8.4** Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.	**6.SP.B.5** Summarize numerical data sets in relation to their context.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

MS-LS2-3 Ecosystems: Interactions, Energy, and Dynamics

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ **Developing and using models Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.** • **Develop a model to describe phenomena.** ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Cycle of Matter and Energy Transfer in Ecosystems:** • Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. • Transfers of matter into and out of the physical environment occur at every level. • Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. • The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem.	**MS-LS2-3** *Students who demonstrate understanding can:* **Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.** **Clarification Statement:** Emphasis is on describing the conservation of matter and flow of energy into and out of various ecosystems, and on defining the boundaries of the system. **Assessment Boundary:** Assessment does not include the use of chemical reactions to describe the processes.

Crosscutting Concepts: Energy and Matter

• The transfer of energy can be tracked as energy flows through a natural system.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
SL.8.5 Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points.	**6.EE.C.9** Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

MS-LS2-4 Ecosystems: Interactions, Energy, and Dynamics

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) **❼ Engaging in argument from evidence** **Engaging in argument from evidence in 6–8 builds on K– 5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).** **• Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem.** ❽ Obtaining, evaluating, and communicating information	**Ecosystem Dynamics, Functioning, and Resilience:** • Ecosystems are dynamic in nature; their characteristics can vary over time. • Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations.	**MS-LS2-4** *Students who demonstrate understanding can:* **Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.** **Clarification Statement:** Emphasis is on recognizing patterns in data and making warranted inferences about changes in populations, and on evaluating empirical evidence supporting arguments about changes to ecosystems. **Assessment Boundary:** N/A

Crosscutting Concepts: Stability and Change
- Small changes in one part of a system might cause large changes in another part.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. **RI.8.8** Trace and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient to support the claims. **WHST.6-8.1** Write arguments to support claims with clear reasons and relevant evidence. **WHST.6-8.9** Draw evidence from literary or informational texts to support analysis, reflection, and research.	**MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **6.SP** Develop understanding of statistical variability.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

MS-LS2-5 Ecosystems: Interactions, Energy, and Dynamics

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) **❼ Engaging in argument from evidence** **Engaging in argument from evidence in 6–8 builds on K– 5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).** • **Evaluate competing design solutions based on jointly developed and agreed-upon design criteria.** ❽ Obtaining, evaluating, and communicating information	**Ecosystem Dynamics, Functioning, and Resilience:** • Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems. • The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health. **Biodiversity and Humans:** (secondary to MS-LS2-5) • Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling. **Developing Possible Solutions:** (secondary to MS-LS2-5) • There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. * *Connections to Engineering, Technology, and Application of Science* **Influence of Engineering, Technology, and Science on Society and the Natural World:** • The use of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time.	**MS-LS2-5** *Students who demonstrate understanding can:* **Evaluate competing design solutions for maintaining biodiversity and ecosystem services.*** **Clarification Statement:** Examples of ecosystem services could include water purification, nutrient recycling, and prevention of soil erosion. Examples of design solution constraints could include scientific, economic, and social considerations. **Assessment Boundary:** N/A

Crosscutting Concepts: Stability and Change

• Small changes in one part of a system might cause large changes in another part.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.6-8.8 Distinguish among facts, reasoned judgment based on research findings, and speculation in a text. **RI.8.8** Trace and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient to support the claims.	**MP.4** Model with Mathematics. **6.RP.A.3** Use ratio and rate reasoning to solve real-world and mathematical problems.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

MS-ESS2-4 Earth's Systems

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ **Developing and using models** **Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.** • **Develop a model to describe unobservable mechanisms.** ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**The Roles of Water in Earth's Surface Processes:** • Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land. • Global movements of water and its changes in form are propelled by sunlight and gravity.	**MS-ESS2-4** *Students who demonstrate understanding can:* **Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.** **Clarification Statement:** Emphasis is on the ways water changes its state as it moves through the multiple pathways of the hydrologic cycle. Examples of models can be conceptual or physical. **Assessment Boundary:** A quantitative understanding of the latent heats of vaporization and fusion is not assessed.

Crosscutting Concepts: Energy and Matter

• Within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
N/A	**N/A**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

MS-ESS3-3 Earth and Human Activity

Science & Engineering Practices

❶ Asking questions (for science) and defining problems (for engineering)
❷ Developing and using models
❸ Planning and carrying out investigations
❹ Analyzing and interpreting data
❺ Using mathematics and computational thinking
❻ Constructing explanations (for science) and designing solutions (for engineering)
Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.
- **Apply scientific principles to design an object, tool, process or system.**

❼ Engaging in argument from evidence
❽ Obtaining, evaluating, and communicating information

Disciplinary Core Ideas

Human Impacts on Earth Systems:
- Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things.
- Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise.

** Connections to Engineering, Technology, and Application of Science*

Influence of Engineering, Technology, and Science on Society and the Natural World:
- The use of technologies and any limitations on their use are driven by individual or societal needs, desires, and differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time.

Performance Expectations

MS-ESS3-3

Students who demonstrate understanding can:

Apply scientific principles to design a method for monitoring and minimizing human impact on the environment.*

Clarification Statement:
Examples of the design process include examining human environmental impacts, assessing the kinds of solutions that are feasible, and designing and evaluating solutions that could reduce that impact. Examples of human impacts can include water usage (such as the withdrawal of water from streams and aquifers or the construction of dams and levees), land usage (such as urban development, agriculture, or the removal of wetlands), and pollution (such as of the air, water, or land).

Crosscutting Concepts: Cause and Effect

- Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation.

Oklahoma Academic Standards Connections

ELA/Literacy

WHST. 6-8.8 Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

WHST. 6-8.8 Gather relevant information from multiple print and digital sources; assess the credibility of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources.

WHST. 6-8.9 Draw evidence from informational texts to support analysis, reflection, and research. (MS-ESS3-1),(MS-ESS3-4)

Mathematics

6.RP.A.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.

7.RP.A.2 Recognize and represent proportional relationships between quantities.

6.EE.B.6 Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.

7.EE.B.4 Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

MS-PS1-1 Matter and Its Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ **Developing and using models** **Modeling in 6–8 builds on K–5 and progresses to developing, using and revising models to describe, test, and predict more abstract phenomena and design systems.** • **Develop a model to predict and/or describe phenomena.** ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Structure and Properties of Matter:** • Substances are made from different types of atoms, which combine with one another in various ways. • Atoms form molecules that range in size from two to thousands of atoms. • Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals).	**MS-PS1-1** *Students who demonstrate understanding can:* **Develop models to describe the atomic composition of simple molecules and extended structures.** **Clarification Statement:** Emphasis is on developing models of molecules that vary in complexity. Examples of simple molecules could include ammonia and methanol. Examples of extended structures could include sodium chloride or diamonds. Examples of molecular-level models could include drawings, 3D ball and stick structures, or computer representations showing different molecules with different types of atoms. **Assessment Boundary:** Assessment does not include valence electrons and bonding energy, discussing the ionic nature of subunits of complex structures, or a complete depiction of all individual atoms in a complex molecule or extended structure.

Crosscutting Concepts: Scale, Proportion, and Quantity
• Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **6.RP.A.3** Use ratio and rate reasoning to solve real-world and mathematical problems. **8.EE.A.3** Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

MS-PS1-2 Matter and Its Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations **❹ Analyzing and interpreting data Analyzing data in 6–8 builds on K–5 and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.** **• Analyze and interpret data to determine similarities and differences in findings.** ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Structure and Properties of Matter:** • Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. **Chemical Reactions:** • Substances react chemically in characteristic ways. • In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants.	**MS-PS1-2** *Students who demonstrate understanding can:* **Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.** **Clarification Statement:** Analyze characteristic chemical and physical properties of pure substances. Examples of reactions could include burning sugar or steel wool, fat reacting with sodium hydroxide, and mixing zinc with HCl. **Assessment Boundary:** Assessment is limited to analysis of the following properties: color change, formation of a gas, temperature change, density, melting point, boiling point, solubility, flammability, and odor.

Crosscutting Concepts: Patterns
• Macroscopic patterns are related to the nature of microscopic and atomic-level structure.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. **RST.6-8.7** Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).	**MP.2** Reason abstractly and quantitatively. **6.RP.A.3** Use ratio and rate reasoning to solve real-world and mathematical problems. **8.SP.B.4** Display numerical data in plots on a number line, including dot plots, histograms, and box plots. **8.SP.B.5** Summarize numerical data sets in relation to their context.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

MS-PS2-4 Motion and Stability: Forces and Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) **❼ Engaging in argument from evidence** **Engaging in argument from evidence in 6–8 builds from K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world.** **• Construct and present oral and written arguments supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem.** ❽ Obtaining, evaluating, and communicating information	**Types of Interactions:** • Gravitational forces are always attractive. • There is a gravitational force between any two masses, but it is very small except when one or both of the objects have large mass—e.g., Earth and the sun.	**MS-PS2-4** *Students who demonstrate understanding can:* **Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.** **Clarification Statement:** Examples of evidence for arguments could include data generated from simulations or digital tools; and charts displaying mass, strength of interaction, distance from the Sun, and orbital periods of objects within the solar system. **Assessment Boundary:** Assessment does not include Newton's Law of Gravitation or Kepler's Laws.

Crosscutting Concepts: Systems and System Models

• Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy and matter flows within systems.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
WHST.6-8.1 Write arguments focused on discipline-specific content.	**MP.2** Reason abstractly and quantitatively.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

MS-PS3-6 Energy

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) **❼ Engaging in argument from evidence** **Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed worlds.** **• Construct, use, and present oral and written arguments supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon.** ❽ Obtaining, evaluating, and communicating information	**Conservation of Energy and Energy Transfer:** • When the motion energy of an object changes, there is inevitably some other change in energy at the same time.	**MS-PS3-6** *Students who demonstrate understanding can:* **Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.** **Clarification Statement:** Examples of empirical evidence used in arguments could include an inventory or other representation of the energy before and after the transfer in the form of temperature changes or motion of object. **Assessment Boundary:** Assessment does not include calculations of energy.

Crosscutting Concepts: Energy and Matter

• Energy may take different forms (e.g. energy in fields, thermal energy, energy of motion).

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. (5) **WHST.6-8.1** Write arguments focused on discipline-specific content.	**MP.2** Reason abstractly and quantitatively. **6.RP.A.1** Understand the concept of ratio and use ratio language to describe a ratio relationship between two quantities. **7.RP.A.2** Recognize and represent proportional relationships between quantities. **8.F.A.3** Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

7TH GRADE

MS-LS1-4 From Molecules to Organisms: Structure and Processes

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) **❼ Engaging in argument from evidence** **Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).** **• Use an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem.** ❽ Obtaining, evaluating, and communicating information	**Growth and Development of Organisms:** • Animals engage in characteristic behaviors that increase the odds of reproduction. • Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction.	**MS-LS1-4** *Students who demonstrate understanding can:* **Use arguments based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.** **Clarification Statement:** Examples of behaviors that affect the probability of animal reproduction could include nest building to protect young from cold, herding of animals to protect young from predators, and vocalization of animals and colorful plumage to attract mates for breeding. Examples of animal behaviors that affect the probability of plant reproduction could include transferring pollen or seeds and creating conditions for seed germination and growth. Examples of plant structures could include bright flowers attracting butterflies that transfer pollen, flower nectar and odors that attract insects that transfer pollen, and hard shells on nuts that squirrels bury. **Assessment Boundary:** N/A

Crosscutting Concepts: Cause and Effect

• Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. **RI.6.8** Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not. **WHST.6-8.1** Write arguments focused on discipline content.	**6.SP.A.2** Understand that a set of data collected to answer a statistical question has a distribution, which can be described by its center, spread, and overall shape. **6.SP.B.4** Summarize numerical data sets in relation to their context.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

MS-LS1-5 From Molecules to Organisms: Structure and Processes

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking **❻ Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific knowledge, principles, and theories.** **• Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Growth and Development of Organisms:** • Genetic factors as well as local conditions affect the growth of the adult plant.	**MS-LS1-5** *Students who demonstrate understanding can:* **Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.** **Clarification Statement:** Examples of local environmental conditions could include availability of food, light, space, and water. Examples of genetic factors could include large breed cattle and species of grass affecting growth of organisms. Examples of evidence could include drought decreasing plant growth, fertilizer increasing plant growth, different varieties of plant seeds growing at different rates in different conditions, and fish growing larger in large ponds than they do in small ponds. **Assessment Boundary:** Assessment does not include genetic mechanisms, gene regulation, or biochemical processes.

Crosscutting Concepts: Cause and Effect

• Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. **RST.6-8.2** Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. **WHST.6-8.2** Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. **WHST.6-8.9** Draw evidence from informational texts to support analysis, reflection, and research.	**6.SP.A.2** Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. **6.SP.B.4** Summarize numerical data sets in relation to their context.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

MS-LS1-8 From Molecules to Organisms: Structure and Processes

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ **Obtaining, evaluating, and communicating information** **Obtaining, evaluating, and communicating information in 6-8 builds on K-5 experiences and progresses to evaluating the merit and validity of ideas and methods.** • **Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence.**	**Information Processing:** • Each sense receptor responds to different inputs (electromagnetic, mechanical, chemical), transmitting them as signals that travel along nerve cells to the brain. The signals are then processed in the brain, resulting in immediate behaviors or memories.	**MS-LS1-8** *Students who demonstrate understanding can:* **Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.** **Clarification Statement:** N/A **Assessment Boundary:** The assessment should provide evidence of students' abilities to provide a basic and conceptual explanation that sensory cells respond to stimuli in the environment and send electrical impulses to the brain where they are processed as either response or memory. Assessment does not include mechanisms for the transmission of this information.

Crosscutting Concepts: Cause and Effect
• Cause and effect relationships may be used to predict phenomena in natural systems.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
WHST.6-8.8 Gather relevant information from multiple print and digital sources; assess the credibility of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources.	**N/A**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

MS-LS3-1 Heredity: Inheritance and Variation of Traits

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ **Developing and using models Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.** • **Develop and use a model to describe phenomena.** ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Inheritance of Traits:** • Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual. • Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits. **Variation of Traits:** • In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. • Though rare, mutations may result in changes to the structure and function of proteins. • Some changes are beneficial, others harmful, and some neutral to the organism.	**MS-LS3-1** *Students who demonstrate understanding can:* **Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.** **Clarification Statement:** Emphasis is on conceptual understanding that changes in genetic material may result in making different proteins. Examples: Radiation treated plants, genetically modified organisms (e.g. roundup resistant crops, bioluminescence), mutations both harmful and beneficial. **Assessment Boundary:** Assessment does not include specific changes at the molecular level, mechanisms for protein synthesis, or specific types of mutations.

Crosscutting Concepts: Structure and Function

- Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they function.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. **RST.6-8.4** Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics. **RST.6-8.7** Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). **SL.8.5** Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points.	**N/A**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

7TH GRADE

MS-LS3-2 Heredity: Inheritance and Variation of Traits

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ **Developing and using models** **Modeling in 6–8 builds on K–5 and progresses to developing, using and revising models to describe, test, and predict more abstract phenomena and design systems.** • **Develop and use a model to describe phenomena.** ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Growth and Development of Organisms:** (secondary to MS-LS3-2) • Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring **Inheritance of Traits:** • Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. **Variation of Traits:** • In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other.	**MS-LS3-2** *Students who demonstrate understanding can:* **Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.** **Clarification Statement:** Emphasis is on using models such as Punnett squares, diagrams, and simulations to describe the cause and effect relationship of gene transmission from parent(s) to offspring and resulting genetic variation. **Assessment Boundary:** The assessment should measure the students' abilities to explain the general outcomes of sexual versus asexual reproduction in terms of variation seen in the offspring.

Crosscutting Concepts: Cause and Effect
• Cause and effect relationships may be used to predict phenomena in natural systems.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. **RST.6-8.4** Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics. **RST.6-8.7** Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). **SL.8.5** Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points.	**MP.4** Model with mathematics. **6.SP.B.5** Summarize numerical data sets in relation to their context.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

MS-LS4-3 Biological Unity and Diversity

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations **❹ Analyzing and interpreting data** **Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.** **• Analyze displays of data to identify linear and nonlinear relationships.** ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Evidence of Common Ancestry and Diversity:** • Comparison of the embryological development of different species also reveals similarities that show relationships not evident in the fully-formed anatomy.	**MS-LS4-3** *Students who demonstrate understanding can:* **Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy.** **Clarification Statement:** Emphasis is on inferring general patterns of relatedness among embryos of different organisms by comparing the macroscopic appearance of diagrams or pictures. **Assessment Boundary:** Assessment of comparisons is limited to gross appearance of anatomical structures in embryological development.

Crosscutting Concepts: Patterns
- Graphs, charts, and images can be used to identify patterns in data.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. **RST.6-8.7** Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). **RST.6-8.9** Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.	**N/A**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

MS-LS4-4 Biological Unity and Diversity

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking **❻ Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.** **• Construct an explanation that includes qualitative or quantitative relationships between variables that describe phenomena.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Natural Selection:** • Natural selection leads to the predominance of certain traits in a population, and the suppression of others.	**MS-LS4-4** *Students who demonstrate understanding can:* **Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.** **Clarification Statement:** Emphasis is on using simple probability statements and proportional reasoning to construct explanations. **Assessment Boundary:** The assessment should provide evidence of students' abilities to explain why some traits are suppressed and other traits become more prevalent for those individuals better at finding food, shelter, or avoiding predators.

Crosscutting Concepts: Cause and Effect

• Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. **RST.6-8.9** Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. **WHST.6-8.2** Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. **WHST.6-8.9** Draw evidence from informational texts to support analysis, reflection, and research. **SL.8.1** Engage effectively in a range of collaborative discussions (one-on-one, in groups, teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly. **SL.8.4** Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.	**6.RP.A.1** Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. **6.SP.B.5** Summarize numerical data sets in relation to their context. **7.RP.A.2** Recognize and represent proportional relationships between quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

MS-LS4-5 Biological Unity and Diversity

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence **❽ Obtaining, evaluating, and communicating information** **Obtaining, evaluating, and communicating information in 6–8 builds on K–5 experiences and progresses to evaluating the merit and validity of ideas and methods.** **• Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence.**	**Natural Selection:** • In artificial selection, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed on to offspring. --- ** Connections to Engineering, Technology, and Application of Science* **Interdependence of Science, Engineering, and Technology:** • Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems.	**MS-LS4-5** *Students who demonstrate understanding can:* **Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.*** **Clarification Statement:** Emphasis is on synthesizing information from reliable sources about the influence of humans on genetic outcomes in artificial selection (such as genetic modification, animal husbandry, gene therapy); and, on the impacts these technologies have on society as well as the technologies leading to these scientific discoveries. **Assessment Boundary:** The assessment should provide evidence of students' abilities to understand and communicate how technology affects both individuals and society.

Crosscutting Concepts: Cause and Effect
- Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. (5) **WHST.6-8.8** Gather relevant information from multiple print and digital sources; assess the credibility of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources.	**N/A**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

MS-LS4-6 Biological Unity and Diversity

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ **Using mathematics and computational thinking** **Mathematical and computational thinking in 6–8 builds on K–5 experiences and progresses to identifying patterns in large data sets and using mathematical concepts to support explanations and arguments.** **• Use mathematical representations to support scientific conclusions and design solutions.** ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Adaptation:** • Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. • Traits that support successful survival and reproduction in the new environment become more common; those that do not, become less common. Thus, the distribution of traits in a population changes.	**MS-LS4-6** *Students who demonstrate understanding can:* **Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.** **Clarification Statement:** Emphasis is on using mathematical models, probability statements, and proportional reasoning to support explanations of trends in changes to populations over time. **Assessment Boundary:** The assessment should provide evidence of students' abilities to explain trends in data for the number of individuals with specific traits changing over time. Assessment does not include Hardy Weinberg calculations.

Crosscutting Concepts: Cause and Effect

• Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
N/A	**MP.4** Model with mathematics. **6.RP.A.1** Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. **6.SP.B.5** Summarize numerical data sets in relation to their context. **7.RP.A.2** Recognize and represent proportional relationships between quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

MS-ESS1-1 Earth's Place in the Universe

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ **Developing and using models Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.** • **Develop and use a model to describe phenomena.** ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**The Universe and Its Stars:** • Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models. **Earth and the Solar System:** • The model of the solar system can explain eclipses of the sun and the moon. • Earth's spin axis is fixed in direction over the short-term but tilted relative to its orbit around the sun. • The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year.	**MS-ESS1-1** *Students who demonstrate understanding can:* **Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.** **Clarification Statement:** Earth's rotation relative to the positions of the moon and sun describes the occurrence of tides; the revolution of Earth around the sun explains the annual cycle of the apparent movement of the constellations in the night sky; the moon's revolution around Earth explains the cycle of spring/neap tides and the occurrence of eclipses; the moon's elliptical orbit mostly explains the occurrence of total and annular eclipses. Examples of models can be physical, graphical, or conceptual. **Assessment Boundary:** N/A

Crosscutting Concepts: Patterns
• Patterns can be used to identify cause- and-effect relationships.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
SL.8.5 Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points.	**MP.4** Model with mathematics. **6.RP.A.1** Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. **7.RP.A.2** Recognize and represent relationships between quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

MS-ESS1-2 Earth's Place in the Universe

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ **Developing and using models Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.** • **Develop and use a model to describe phenomena.** ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**The Universe and Its Stars:** • Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe. **Earth and the Solar System:** • The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. • The solar system appears to have formed from a disk of dust and gas, drawn together by gravity.	**MS-ESS1-2** *Students who demonstrate understanding can:* **Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.** **Clarification Statement:** Emphasis for the model is on gravity as the force that holds together the solar system and Milky Way galaxy and controls orbital motions within them. Examples of models can be physical (such as the analogy of distance along a football field or computer visualizations of elliptical orbits) or conceptual (such as mathematical proportions relative to the size of familiar objects such as their school or state). **Assessment Boundary:** Assessment does not include Kepler's Laws of orbital motion or the apparent retrograde motion of the planets as viewed from Earth.

Crosscutting Concepts: Systems and System Models
• Models can be used to represent systems and their interactions.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
SL.8.5 Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points.	**MP.4** Model with mathematics. **6.RP.A.1** Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. **6.EE.B.6** Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or depending on the purpose at hand, any number in a specific set. **7.RP.A.2** Recognize and represent relationships between quantities. **7.EE.B.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

MS-ESS1-3 Earth's Place in the Universe

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ **Analyzing and interpreting data** **Analyzing data in 6–8 builds on K–5 experiences and progresses to e xtending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.** • **Analyze and interpret data to determine similarities and differences in findings.** ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Earth and the Solar System:** • The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. --- ** Connections to Engineering, Technology, and Application of Science* **Interdependence of Science, Engineering, and Technology:** • Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems.	**MS-ESS1-3** *Students who demonstrate understanding can:* **Analyze and interpret data to determine scale properties of objects in the solar system.*** **Clarification Statement:** Emphasis is on the analysis of data from Earth-based instruments, space-based telescopes, and spacecraft to determine similarities and differences among solar system objects. Examples of scale properties include the sizes of an object's layers (such as crust and atmosphere), surface features (such as volcanoes), and orbital radius. Examples of data include statistical information, drawings and photographs, and models. **Assessment Boundary:** Assessment does not include recalling facts about properties of the planets and other solar system bodies.

Crosscutting Concepts: Scale, Proportion, and Quantity

• Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. **RST.6-8.7** Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).	**MP.2** Reason abstractly and quantitatively. **6.RP.A.1** Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. **7.RP.A.2** Recognize and represent proportional relationships between quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

K-2 3-5 6-8 9-12

7TH GRADE

MS-ESS2-5 Earth's Systems

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models **❸ Planning and carrying out investigations** **Planning and carrying out investigations in 6-8 builds on K-5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or solutions.** **• Collect data to produce data to serve as the basis for evidence to answer scientific questions or test design solutions under a range of conditions.** ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Weather and Climate:** • Because these patterns are so complex, weather can only be predicted probabilistically.	**MS-ESS2-5** *Students who demonstrate understanding can:* **Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.** **Clarification Statement:** Emphasis is on how air masses flow from regions of high pressure to low pressure, causing weather (defined by temperature, pressure, humidity, precipitation, and wind) at a fixed location to change over time, and how sudden changes in weather can result when different air masses collide. Emphasis is on how weather can be predicted within probabilistic ranges. Examples of data can be provided to students (such as weather maps, diagrams, and visualizations) or obtained through laboratory experiments (such as with condensation). **Assessment Boundary:** Assessment does not include recalling the names of cloud types or weather symbols used on weather maps or the reported diagrams from weather stations.

Crosscutting Concepts: Cause and Effect

• Cause and effect relationships may be used to predict phenomena in natural or designed systems.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. **RST.6-8.7** Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). **WHST.6-8.8** Gather relevant information from multiple print and digital sources; assess the credibility of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources.	**MP.2** Reason abstractly and quantitatively. **6.NS.C.5** Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

MS-ESS2-6 Earth's Systems

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ **Developing and using models Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.** • **Develop and use a model to describe phenomena.** ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**The Roles of Water in Earth's Surface Processes:** • Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents. **Weather and Climate:** • Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns. • The ocean exerts a major influence on weather and climate by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents.	**MS-ESS2-6** *Students who demonstrate understanding can:* **Develop and use a model to describe how unequal heating and rotation of the Earth causes patterns of atmospheric and oceanic circulation that determine regional climates.** **Clarification Statement:** Emphasis is on how patterns vary by latitude, altitude, and geographic land distribution. Emphasis of atmospheric circulation is on the sunlight-driven latitudinal banding, the Coriolis effect, and resulting prevailing winds; emphasis of ocean circulation (e.g. el niño/la niña) is on the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents. Examples of models can be diagrams, maps and globes, or digital representations. **Assessment Boundary:** Assessment does not include the dynamics of the Coriolis effect.

Crosscutting Concepts: Systems and System Models
- Models can be used to represent systems and their interactions—such as inputs, processes and outputs— and energy, matter, and information flows within systems.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
SL.8.5 Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points.	**N/A**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

MS-PS1-3 Matter and Its Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence **❽ Obtaining, evaluating, and communicating information** **Obtaining, evaluating, and communicating information in 6–8 builds on K–5 and progresses to evaluating the merit and validity of ideas and methods.** • **Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence.**	**Structure and Properties of Matter:** • Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. **Chemical Reactions:** • Substances react chemically in characteristic ways. • In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. ——— ** Connections to Engineering, Technology, and Application of Science* **Interdependence of Science, Engineering, and Technology:** • Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems. **Interdependence of Science, Engineering, and Technology on Society and the Natural World:** • The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions.	**MS-PS1-3** *Students who demonstrate understanding can:* **Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.*** **Clarification Statement:** Emphasis is on natural resources that undergo a chemical process to form the synthetic material. Examples of new materials could include new medicine, foods, and alternative fuels. **Assessment Boundary:** Not assessed at state level*.

Crosscutting Concepts: Structure and Function

• Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. **WHST.6-8.8** Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.	**N/A**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

MS-PS1-5 Matter and Its Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ **Developing and using models** **Modeling in 6–8 builds on K–5 and progresses to developing, using and revising models to describe, test, and predict more abstract phenomena and design systems.** • **Develop a model to describe unobservable mechanisms.** ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Chemical Reactions:** • Substances react chemically in characteristic ways. • In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. • The total number of each type of atom is conserved, and thus the mass does not change. --- ** Connections to Engineering, Technology, and Application of Science* **Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena:** • Laws are regularities or mathematical descriptions of natural phenomena.	**MS-PS1-5** *Students who demonstrate understanding can:* **Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.** **Clarification Statement:** Emphasis is on law of conservation of matter and on physical models or drawings, including digital forms, that represent atoms. **Assessment Boundary:** Assessment does not include the use of atomic masses or intermolecular forces.

Crosscutting Concepts: Energy and Matter
• Matter is conserved because atoms are conserved in physical and chemical processes.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
WHST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **6.RP.A.3** Use ratio and rate reasoning to solve real-world and mathematical problems.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

8TH GRADE

MS-PS1-6 Matter and Its Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ **Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific knowledge, principles, and theories.** • **Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Chemical Reactions:** • Some chemical reactions release energy, others store energy. **Developing Possible Solutions:** (secondary to MS-PS1-6) • A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. **Optimizing the Design Solution:** (secondary to MS-PS1-6) • Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of the characteristics may be incorporated into the new design. • The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution.	**MS-PS1-6** *Students who demonstrate understanding can:* **Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.*** **Clarification Statement:** Emphasis is on the design, controlling the transfer of energy to the environment, and modification of a device using factors such as type and concentration of a substance. Examples of designs could involve chemical reactions such as dissolving ammonium chloride or calcium chloride. **Assessment Boundary:** Assessment is limited to the criteria of amount, time, and temperature of substance in testing the device.

Crosscutting Concepts: Energy and Matter
• The transfer of energy can be tracked as energy flows through a designed or natural system.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. **WHST.6-8.7** Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.	**8.SP** Investigate patterns of association in bivariate data.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

MS-PS2-1 Motion and Stability: Forces and Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking **❻ Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.** **• Apply scientific ideas or principles to design an object, tool, process or system.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Forces and Motion:** • For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first, but in the opposite direction (Newton's third law). ** Connections to Engineering, Technology, and Application of Science* **Interdependence of Science, Engineering, and Technology on Society and the Natural World:** • The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions.	**MS-PS2-1** *Students who demonstrate understanding can:* **Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.*** **Clarification Statement:** Examples of practical problems could include the impact of collisions between two cars, between a car and stationary objects, and between a meteor and a space vehicle. **Assessment Boundary:** Assessment is limited to vertical or horizontal interactions in one dimension.

Crosscutting Concepts: Systems and System Models

• Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy and matter flows within systems.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. **RST.6-8.3** Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. **WHST.6-8.7** Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.	**MP.2** Reason abstractly and quantitatively. **6.NS.C.5** Understand that positive and negative numbers are used together to describe quantities having opposite directions or values; use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. **6.EE.A.2** Write, read, and evaluate expressions in which letters stand for numbers. **7.EE.B.3** Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form, using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. **7.EE.B.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

8TH GRADE

MS-PS2-2 Motion and Stability: Forces and Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ **Planning and carrying out investigations** **Planning and carrying out investigations to answer questions or test solutions to problems in 6–8 builds on K–5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or design solutions.** • **Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim.** ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Forces and Motion:** • The motion of an object is determined by the sum of the forces acting on it; if the total force on the object is not zero, its motion will change. • The greater the mass of the object, the greater the force needed to achieve the same change in motion. • For any given object, a larger force causes a larger change in motion.	**MS-PS2-2** *Students who demonstrate understanding can:* **Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.** **Clarification Statement:** Emphasis is on balanced (Newton's First Law) and unbalanced forces in a system, qualitative comparisons of forces, mass and changes in motion (Newton's Second Law), frame of reference, and specification of units. **Assessment Boundary:** Assessment is limited to forces and changes in motion in one-dimension in an inertial reference frame and to change in one variable at a time. Assessment does not include the use of trigonometry.

Crosscutting Concepts: Stability and Change

• Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and forces at different scales.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. **WHST.6-8.7** Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.	**MP.2** Reason abstractly and quantitatively. **6.EE.A.2** Write, read, and evaluate expressions in which letters stand for numbers. **7.EE.B.3** Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form, using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. **7.EE.B.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

MS-PS4-1 Waves and Their Applications in Technologies for Information Transfer

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ **Using mathematics and computational thinking** **Mathematical and computational thinking at the 6–8 level builds on K–5 and progresses to identifying patterns in large data sets and using mathematical concepts to support explanations and arguments.** • **Use mathematical representations to describe and/or support scientific conclusions and design solutions.** ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Waves Properties:** • A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude.	**MS-PS4-1** *Students who demonstrate understanding can:* **Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.** **Clarification Statement:** Emphasis is on describing waves with both qualitative and quantitative thinking. **Assessment Boundary:** Assessment does not include electromagnetic waves and is limited to standard repeating waves.

Crosscutting Concepts: Patterns
- Graphs and charts can be used to identify patterns in data.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **6.RP.A.1** Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. **6.RP.A.3** Use ratio and rate reasoning to solve real-world and mathematical problems. (MS-PS4-1) **7.RP.A.2** Recognize and represent proportional relationships between quantities. (MS-PS4-1) **8.F.A.3** Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

MS-PS4-2 Waves and Their Applications in Technologies for Information Transfer

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ **Developing and using models Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.** • **Develop and use a model to describe phenomena.** ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Waves Properties:** • A sound wave needs a medium through which it is transmitted. **Electromagnetic Radiation:** • When light shines on an object, it is reflected, absorbed, or transmitted through the object, depending on the object's material and the frequency (color) of the light. • The path that light travels can be traced as straight lines, except at surfaces between different transparent materials (e.g., air and water, air and glass) where the light path bends. • A wave model of light is useful for explaining brightness, color, and the frequency-dependent bending of light at a surface between media. However, because light can travel through space, it cannot be a matter wave, like sound or water waves.	**MS-PS4-2** *Students who demonstrate understanding can:* **Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.** **Clarification Statement:** Emphasis is on both light and mechanical waves. Examples of models could include drawings, simulations, and written descriptions. **Assessment Boundary:** Assessment is limited to qualitative applications pertaining to light and mechanical waves.

Crosscutting Concepts: Structure and Function

• Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.	**N/A**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

MS-PS4-3 Waves and Their Applications in Technologies for Information Transfer

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ **Obtaining, evaluating, and communicating information** **Obtaining, evaluating, and communicating information in 6-8 builds on K-5 and progresses to evaluating the merit and validity of ideas and methods.** • **Integrate qualitative scientific and technical information in written text with that contained in media and visual displays to clarify claims and findings.**	**Information Technologies and Instrumentation:** • Digitized signals (sent as wave pulses) are a more reliable way to encode and transmit information.	**MS-PS4-3** *Students who demonstrate understanding can:* **Integrate qualitative scientific and technical information to support the claim that digitized signals (sent as wave pulses) are a more reliable way to encode and transmit information.*** **Clarification Statement:** Emphasis is on a basic understanding that waves can be used for communication purposes. Examples could include using fiber optic cable to transmit light pulses, radio wave pulses in wifi devices, and conversion of stored binary patterns to make sound or text on a computer screen. **Assessment Boundary:** Assessment does not include binary counting. Assessment does not include the specific mechanism of any given device.

Crosscutting Concepts: Structure and Function
• Structures can be designed to serve particular functions.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. **RST.6-8.2** Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. **RST.6-8.9** Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. **WHST.6-8.9** Draw evidence from informational texts to support analysis, reflection, and research.	**N/A**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

MS-LS1-7 From Molecules to Organisms: Structure and Processes

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ **Developing and using models** **Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.** **• Develop a model to describe unobservable mechanisms.** ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Organization for Matter and Energy Flow in Organisms:** • Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, to support growth, or to release energy. **Energy in Chemical Processes and Everyday Life:** (secondary to MS-LS1-7) • Cellular respiration in plants and animals involve chemical reactions with oxygen that release stored energy. In these processes, complex molecules containing carbon react with oxygen to produce carbon dioxide and other materials.	**MS-LS1-7** *Students who demonstrate understanding can:* **Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.** **Clarification Statement:** Emphasis is on describing that molecules are broken apart and put back together and that in this process, energy is released. **Assessment Boundary:** Assessment does not include details of the chemical reactions for photosynthesis or respiration.

Crosscutting Concepts: Energy and Matter
• Matter is conserved because atoms are conserved in physical and chemical processes.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.	**N/A**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

MS-LS4-1 Biological Unity and Diversity

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations **❹ Analyzing and interpreting data** **Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.** **• Analyze and interpret data to determine similarities and differences in findings.** ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Evidence of Common Ancestry and Diversity:** • The collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth.	**MS-LS4-1** *Students who demonstrate understanding can:* **Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.** **Clarification Statement:** Emphasis is on finding patterns of changes in the level of complexity of anatomical structures in organisms and the chronological order of fossil appearance in the rock layers. **Assessment Boundary:** Assessment does not include the names of individual species or geological eras in the fossil record.

Crosscutting Concepts: Patterns
• Graphs, charts, and images can be used to identify patterns in data.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions **RST.6-8.7** Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).	**6.EE.B.6** Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

MS-LS4-2 Biological Unity and Diversity

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ **Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.** • **Apply scientific ideas to construct an explanation for real- world phenomena, examples, or events.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Evidence of Common Ancestry and Diversity:** • The collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth.	**MS-LS4-2** *Students who demonstrate understanding can:* **Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer ancestral relationships.** **Clarification Statement:** Emphasis is on explanations of the ancestral relationships among organisms in terms of similarity or differences of the gross appearance of anatomical structures. **Assessment Boundary:** N/A

Crosscutting Concepts: Patterns

• Patterns can be used to identify cause and effect relationships.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. **WHST.6-8.2** Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. **WHST.6-8.9** Draw evidence from informational texts to support analysis, reflection, and research. **SL.8.1** Engage effectively in a range of collaborative discussions (one-on-one, in groups, teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly. **SL.8.4** Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.	**6.EE.B.6** Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

MS-ESS1-4 Earth's Place in the Universe

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking **❻ Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in 6– 8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.** **• Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**The History of Planet Earth:** • The geologic time scale interpreted from rock strata provides a way to organize Earth's history. • Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale.	**MS-ESS1-4** *Students who demonstrate understanding can:* **Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's geologic history.** **Clarification Statement:** Emphasis is on analyses of rock formations and fossils they contain to establish relative ages of major events in Earth's history. Major events could include the formation of mountain chains and ocean basins, adaptation and extinction of particular living organisms, volcanic eruptions, periods of massive glaciation, and the development of watersheds and rivers through glaciation and water erosion. The events in Earth's history happened in the past continue today. Scientific explanations can include models. **Assessment Boundary:** Assessment does not include recalling the names of specific periods or epochs and events within them.

Crosscutting Concepts: Scale, Proportion, and Quantity

• Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. **WHST.6-8.2** Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.	**N/A**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

K-2 3-5 6-8 9-12

MS-ESS2-1 Earth's Systems

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ **Developing and using models Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.** • **Develop and use a model to describe phenomena.** ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Earth's Materials and Systems:** • All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms.	**MS-ESS2-1** *Students who demonstrate understanding can:* **Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.** **Clarification Statement:** Emphasis is on the processes of melting, crystallization, weathering, deformation, and sedimentation, which act together to form minerals and rocks through the cycling of Earth's materials. **Assessment Boundary:** Assessment does not include the identification and naming of minerals.

Crosscutting Concepts: Stability and Change

- Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and processes at different scales, including the atomic scale.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
SL.8.5 Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points.	**N/A**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

MS-ESS2-2 Earth's Systems

Science & Engineering Practices

❶ Asking questions (for science) and defining problems (for engineering)
❷ Developing and using models
❸ Planning and carrying out investigations
❹ Analyzing and interpreting data
❺ Using mathematics and computational thinking
❻ Constructing explanations (for science) and designing solutions (for engineering)
Constructing explanations and designing solutions in 6– 8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.
- **Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.**

❼ Engaging in argument from evidence
❽ Obtaining, evaluating, and communicating information

Disciplinary Core Ideas

Earth's Materials and Systems:
- The planet's systems interact over scales that range from microscopic to global in size. These interactions have shaped Earth's history and will determine its future.

The Roles of Water in Earth's Surface Processes:
- Water's movements—both on the land and underground—cause weathering and erosion, which change the land's surface features and create underground formations.

Performance Expectations

MS-ESS2-2
Students who demonstrate understanding can:

Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.

Clarification Statement:
Emphasis is on how processes change Earth's surface at time and spatial scales that can be large (such as slow plate motions or the uplift of a large mountain ranges) or small (such as rapid landslides on microscopic geochemical reactions), and how many geoscience processes usually behave gradually but are punctuated by catastrophic events (such as earthquakes, volcanoes, and meteor impacts). Examples of geoscience processes include surface weathering and deposition by the movements of water, ice, and wind. Emphasis is on geoscience processes that shape local geographic features, where appropriate.

Crosscutting Concepts: Scale, Proportion, and Quantity

- Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.

Oklahoma Academic Standards Connections

ELA/Literacy

RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts.

WHST. 6-8.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.

SL.8.5 Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points.

Mathematics

MP.2 Reason abstractly and quantitatively.

6.EE.B.6 Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.

7.EE.B.4 Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

MS-ESS2-3 Earth's Systems

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ **Analyzing and interpreting data** **Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.** • **Analyze and interpret data to provide evidence for phenomena.** ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**The History of Planet Earth:** (Secondary to 8-ESS2-3) • Tectonic processes continually generate new ocean sea floor at ridges and destroy old sea floor at trenches. **Plate Tectonics and Large-Scale System Interactions:** • Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart.	**MS-ESS2-3** *Students who demonstrate understanding can:* **Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.** **Clarification Statement:** Examples of data include similarities of rock and fossil types on different continents, the shapes of the continents (including continental shelves), and the locations of ocean structures (such as ridges, fracture zones, and trenches). **Assessment Boundary:** Paleomagnetic anomalies in oceanic and continental crust are not assessed.

Crosscutting Concepts: Patterns

• Patterns in rates of change and other numerical relationships can provide information about natural systems.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. **RST.6-8.7** Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). **RST.6-8.7** Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.	**MP.2** Reason abstractly and quantitatively. **6.EE.B.6** Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. **7.EE.B.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

MS-ESS3-1 Earth and Human Activity

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking **❻ Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in 6– 8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.** **• Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Natural Resources:** • Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. • Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. • These resources are distributed unevenly around the planet as a result of past geologic processes.	**MS-ESS3-1** *Students who demonstrate understanding can:* **Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.** **Clarification Statement:** Emphasis is on how these resources are limited and typically non-renewable, and how their distributions are significantly changing as a result of removal by humans. Examples of uneven distributions of resources as a result of past processes include but are not limited to petroleum (locations of the burial of organic marine sediments and subsequent geologic traps), metal ores (locations of past volcanic and hydrothermal activity associated with subduction zones), and soil (locations of active weathering and/or deposition of rock).

Crosscutting Concepts: Cause and Effect
• Cause and effect relationships may be used to predict phenomena in natural or designed systems.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. **WHST. 6-8.2** Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. **WHST. 6-8.9** Draw evidence from informational texts to support analysis, reflection, and research.	**6.EE.B.6** Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. **7.EE.B.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

8TH GRADE

MS-ESS3-2 Earth and Human Activity

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ **Analyzing and interpreting data** **Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.** • **Analyze and interpret data to provide evidence for phenomena.** ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Natural Hazards:** • Mapping the history of natural hazards in a region, combined with an understanding of related geologic forces can help forecast the locations and likelihoods of future events.	**MS-ESS3-2** *Students who demonstrate understanding can:* **Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.** **Clarification Statement:** Emphasis is on how some natural hazards, such as volcanic eruptions and severe weather, are preceded by phenomena that allow for reliable predictions, but others, such as earth-quakes, occur suddenly and with no notice, and thus are not yet predictable. Examples of natural hazards can be taken from interior processes (such as earthquakes and volcanic eruptions), surface processes (such as mass wasting and tsunamis), or severe weather events (such as hurricanes, tornadoes, and floods). Examples of data can include the locations, magnitudes, and frequencies of the natural hazards. Examples of technologies can be global (such as satellite systems to monitor hurricanes or forest fires) or local (such as building basements in tornado-prone regions or reservoirs to mitigate droughts).

Crosscutting Concepts: Patterns
• Graphs, charts, and images can be used to identify patterns in data.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. **RST. 6-8.7** Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).	**MP.2** Reason abstractly and quantitatively. **6.EE.B.6** Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. **7.EE.B.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

MS-ESS3-4 Earth and Human Activity

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) **❼ Engaging in argument from evidence** **Engaging in argument form evidence in 6-8 builds on K-5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).** **• Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or solution to a problem.** ❽ Obtaining, evaluating, and communicating information	**Human Impacts on Earth Systems:** • Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise.	**MS-ESS3-4** *Students who demonstrate understanding can:* **Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.** **Clarification Statement:** Examples of evidence include grade-appropriate databases on human populations and the rates of consumption of food and natural resources (such as freshwater, mineral, and energy). Examples of impacts can include changes to the appearance, composition, and structure of Earth's systems as well as the rates at which they change. The consequences of increases in human populations and consumption of natural resources are described by science, but science does not make the decisions for the actions society takes.

Crosscutting Concepts: Cause and Effect

• Cause and effect relationships may be used to predict phenomena in natural or designed systems.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. **WHST.6-8.1** Write arguments focused on discipline content. **WHST. 6-8.9** Draw evidence from informational texts to support analysis, reflection, and research.	**6.RP.A.1** Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. **7.RP.A.2** Recognize and represent proportional relationships between quantities. **6.EE.B.6** Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. **7.EE.B.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-PS1-1 Matter and Its Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ **Developing and using models Modeling in 9–12 builds on K–8 and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.** • **Use a model to predict the relationships between systems or between components of a system.** ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Structure and Properties of Matter:** • Each atom has a charged substructure consisting of a nucleus, which is made of protons and neutrons, surrounded by electrons. • The periodic table orders elements horizontally by the number of protons in the atom's nucleus and places those with similar chemical properties in columns. The repeating patterns of this table reflect patterns of outer electron states.	**HS-PS1-1** *Students who demonstrate understanding can:* **Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.** **Clarification Statement:** Examples of properties that could be predicted from patterns could include reactivity of metals, types of bonds formed, numbers of bonds formed, and reactions with oxygen. **Assessment Boundary:** Assessment is limited to main group elements. Assessment does not include quantitative understanding of ionization energy beyond relative trends.

Crosscutting Concepts: Patterns

• Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.9-10.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.	**N/A**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-PS1-2 Matter and Its Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking **❻ Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student- generated sources of evidence consistent with scientific ideas, principles, and theories.** **• Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Structure and Properties of Matter:** • The periodic table orders elements horizontally by the number of protons in the atom's nucleus and places those with similar chemical properties in columns. The repeating patterns of this table reflect patterns of outer electron states. **Chemical Reactions:** • The fact that atoms are conserved, together with knowledge of the chemical properties of the elements involved, can be used to describe and predict chemical reactions.	**HS-PS1-2** *Students who demonstrate understanding can:* **Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, knowledge of the patterns of chemical properties, and formation of compounds.** **Clarification Statement:** Examples of chemical reactions could include the reaction of sodium and chlorine, of carbon and oxygen, or of carbon and hydrogen. Reaction classification aids in the prediction of products (e.g. synthesis/combustion, decomposition, single displacement, double displacement). **Assessment Boundary:** Assessment is limited to chemical reactions involving main group elements and combustion reactions.

Crosscutting Concepts: Patterns

• Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. **WHST.9-12.5** Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.	**HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-PS1-5 Matter and Its Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking **❻ Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student- generated sources of evidence consistent with scientific ideas, principles, and theories.** • **Apply scientific principles and evidence to provide an explanation of phenomena and solve design problems, taking into account possible unanticipated effects.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Chemical Reactions:** • Chemical processes, their rates, and whether or not energy is stored or released can be understood in terms of the collisions of molecules and the rearrangements of atoms into new molecules, with consequent changes in the sum of all bond energies in the set of molecules that are matched by changes in kinetic energy.	**HS-PS1-5** *Students who demonstrate understanding can:* **Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.** **Clarification Statement:** Emphasis is on student reasoning that focuses on the number and energy of collisions between molecules. **Assessment Boundary:** Assessment is limited to simple reactions in which there are only two reactants; evidence from temperature and concentration.

Crosscutting Concepts: Patterns

- Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.9-10.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. **WHST.9-12.2** Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.	**MP.2** Reason abstractly and quantitatively. **HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-PS1-7 Matter and Its Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data **❺ Using mathematics and computational thinking** **Mathematical and computational thinking at the 9–12 level builds on K–8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.** **• Use mathematical representations of phenomena to support claims.** ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Chemical Reactions:** • The fact that atoms are conserved, together with knowledge of the chemical properties of the elements involved, can be used to describe and predict chemical reactions.	**HS-PS1-7** *Students who demonstrate understanding can:* **Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.** **Clarification Statement:** Emphasis is on using mathematical ideas to communicate the proportional relationships between masses of atoms in the reactants and the products, and the translation of these relationships to the macroscopic scale using the mole as the conversion from the atomic to the macroscopic scale (e.g. Law of Conservation of Mass). Emphasis is on assessing students' use of mathematical thinking and not on memorization and rote application of problem-solving techniques. **Assessment Boundary:** Assessment does not include complex chemical reactions.

Crosscutting Concepts: Energy and Matter

• The total amount of energy and matter in closed systems is conserved.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
N/A	**MP.2** Reason abstractly and quantitatively. **HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **HSN-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling. **HSN-Q.A.2** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

K-2 3-5 6-8 9-12

HS-PS2-1 Motion and Stability: Forces and Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations **❹ Analyzing and interpreting data Analyzing data in 9–12 builds on K–8 and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data.** **• Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution.** ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Forces and Motion:** • Newton's second law accurately predicts changes in the motion of macroscopic objects.	**HS-PS2-1** *Students who demonstrate understanding can:* **Analyze data and use it to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.** **Clarification Statement:** Examples of data could include tables or graphs of position or velocity as a function of time for objects subject to a net unbalanced force, such as a falling object, an object rolling down a ramp, or a moving object being pulled by a constant force. **Assessment Boundary:** Assessment is limited to one-dimensional motion and to macroscopic objects moving at non-relativistic speeds.

Crosscutting Concepts: Cause and Effect
- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

Oklahoma Academic Standards Connections

ELA/Literacy

RST.9-10.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanation and descriptions.

RST.9-10.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

WHST.9-12.9 Draw evidence from informational texts to support analysis, reflection, and research.

Mathematics

MP.2 Reason abstractly and quantitatively.

MP.4 Model with mathematics.

HSN-Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

HSN-Q.A.2 Define appropriate quantities for the purpose of descriptive modeling.

Mathematics (continued)

HSN-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

HSA-SSE.A.1 Interpret expressions that represent a quantity in terms of its context.

HSA-SSE.B.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.

HSA-CED.A.1 Create equations and inequalities in one variable and use them to solve problems.

HSA-CED.A.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

HSA-CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

HSF-IF.C.7 Graph functions expressed symbolically and show key features of the graph, by in hand in simple cases and using technology for more complicated cases.

HSS-ID.A.1 Represent data with plots on the real number line (dot plots, histograms, and box plots).

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-PS2-2 Motion and Stability: Forces and Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ **Using mathematics and computational thinking Mathematical and computational thinking at the 9–12 level builds on K–8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.** • **Use mathematical representations of phenomena to describe explanations.** ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Forces and Motion:** • Momentum is defined for a particular frame of reference; it is the mass times the velocity of the object. • If a system interacts with objects outside itself, the total momentum of the system can change; however, any such change is balanced by changes in the momentum of objects outside the system.	**HS-PS2-2** *Students who demonstrate understanding can:* **Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.** **Clarification Statement:** Emphasis is on the quantitative conservation of momentum in interactions and the qualitative meaning of this principle. **Assessment Boundary:** Assessment is limited to systems of two macroscopic bodies moving in one dimension.

Crosscutting Concepts: Systems and System Models

• When investigating or describing a system, the boundaries and initial conditions of the system need to be defined.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
N/A	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **HSN-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling. **HSN-Q.A3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. **HSA-CED.A.1** Create equations and inequalities in one variable and use them to solve problems. **HSA-CED.A.2** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. **HSA-CED.A.4** Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-PS2-3 Motion and Stability: Forces and Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking **❻ Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student- generated sources of evidence consistent with scientific ideas, principles, and theories.** • **Apply scientific ideas to solve a design problem, taking into account possible unanticipated effects.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Forces and Motion:** • If a system interacts with objects outside itself, the total momentum of the system can change; however, any such change is balanced by changes in the momentum of objects outside the system. **Defining and Delimiting Engineering Problems:** (secondary to HS-PS2-3) • Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them.	**HS-PS2-3** *Students who demonstrate understanding can:* **Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.*** **Clarification Statement:** Examples of evaluation and refinement could include determining the success of the device at protecting an object from damage and modifying the design to improve it. Examples of a device could include a football helmet or a parachute. **Assessment Boundary:** Assessment is limited to qualitative evaluations and/or algebraic manipulations.

Crosscutting Concepts: Cause and Effect
• Systems can be designed to cause a desired effect.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
WHST.9-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.	**MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-PS2-5 Motion and Stability: Forces and Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models **❸ Planning and carrying out investigations** **Planning and carrying out investigations to answer questions or test solutions to problems in 9–12 builds on K–8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical and empirical models.** • **Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.** ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Types of Interactions:** • Forces at a distance are explained by fields (gravitational, electric, and magnetic) permeating space that can transfer energy through space. • Magnets or electric currents cause magnetic fields; electric charges or changing magnetic fields cause electric fields. **Definitions of Energy:** (secondary to HS-PS2-4) • "Electrical energy" may mean energy stored in a battery or energy transmitted by electric currents.	**HS-PS2-5** *Students who demonstrate understanding can:* **Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.** **Clarification Statement:** N/A **Assessment Boundary:** Assessment is limited to designing and conducting investigations with provided materials and tools.

Crosscutting Concepts: Cause and Effect
• Systems can be designed to cause a desired effect.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
WHST.9-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. **WHST.9-12.9** Draw evidence from informational texts to support analysis, reflection, and research.	**HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **HSN-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling. **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-PS3-1 Energy

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ **Using mathematics and computational thinking** **Mathematical and computational thinking at the 9–12 level builds on K–8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.** • **Create a computational model or simulation of a phenomenon, designed device, process, or system.** ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Definitions of Energy:** • Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system. That there is a single quantity called energy is due to the fact that a system's total energy is conserved, even as, within the system, energy is continually transferred from one object to another and between its various possible forms. **Conservation of Energy and Energy Transfer:** • Conservation of energy means that the total change of energy in any system is always equal to the total energy transferred into or out of the system. • Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems. • Mathematical expressions, which quantify how the stored energy in a system depends on its configuration (e.g. relative positions of charged particles, compression of a spring) and how kinetic energy depends on mass and speed, allow the concept of conservation of energy to be used to predict and describe system behavior. • The availability of energy limits what can occur in any system.	**HS-PS3-1** *Students who demonstrate understanding can:* **Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.** **Clarification Statement:** Emphasis is on explaining the meaning of mathematical expressions used in the model. **Assessment Boundary:** Assessment is limited to basic algebraic expressions or computations; to systems of two or three components; and to thermal energy, kinetic energy, and potential energy.

Crosscutting Concepts: Systems and System Models

• Models can be used to predict the behavior of a system, but these predictions have limited precision and reliability due to the assumptions and approximations inherent in models.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
SL.9-12.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.	**MP.2 R**eason abstractly and quantitatively. **MP.4** Model with mathematics. **HSN-Q.A.1** Use units as away to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **HSN-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling. **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-PS3-2 Energy

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ **Developing and using models Modeling in 9–12 builds on K–8 and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.** • **Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system.** ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Definitions of Energy:** • Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system. That there is a single quantity called energy is due to the fact that a system's total energy is conserved, even as, within the system, energy is continually transferred from one object to another and between its various possible forms. • At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy. • These relationships are better understood at the microscopic scale, at which all of the different manifestations of energy can be modeled as a combination of energy associated with the motion of particles and energy associated with the configuration (relative position of the particles). In some cases the relative position energy can be thought of as stored in fields (which mediate interactions between particles). This last concept includes radiation, a phenomenon in which energy stored in fields moves across space.	**HS-PS3-2** *Students who demonstrate understanding can:* **Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as either motions of particles or energy stored in fields.** **Clarification Statement:** Examples of phenomena at the macroscopic scale could include the conversion of kinetic energy to thermal energy, the energy stored due to position of an object above the earth, and the energy stored between two electrically-charged plates. Examples of models could include diagrams, drawings, descriptions, and computer simulations. **Assessment Boundary:** Assessment does not include quantitative calculations.

Crosscutting Concepts: Energy and Matter

• Energy cannot be created or destroyed—only moves between one place and another place, between objects and/or fields, or between systems.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
SL.9-12.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-PS3-3 Energy

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ **Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student- generated sources of evidence consistent with scientific ideas, principles, and theories.** • **Design, evaluate, and/or refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Definitions of Energy:** • At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy. **Defining and Delimiting Engineering Problems:** • Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. ** Connections to Engineering, Technology, and Application of Science* **Interdependence of Science, Engineering, and Technology:** • Modern civilization depends on major technological systems. Engineers continuously modify these technological systems by applying scientific knowledge and engineering design practices to increase benefits while decreasing costs and risks.	**HS-PS3-3** *Students who demonstrate understanding can:* **Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.*** **Clarification Statement:** Emphasis is on both qualitative and quantitative evaluations of devices. Examples of devices could include Rube Goldberg devices, wind turbines, solar cells, solar ovens, and generators. Examples of constraints could include use of renewable energy forms and efficiency. **Assessment Boundary:** Assessment for quantitative evaluations is limited to total output for a given input. Assessment is limited to devices constructed with materials provided to students.

Crosscutting Concepts: Energy and Matter

• Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
WH ST .9 -12.7 Conduct short as w ell as more sustained re-search projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.	**MP.2 R**eason abstractly and quantitatively. **MP.4** Model with mathematics. **HSN-Q.A.1** Use units as away to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **HSN-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling. **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-PS3-4 Energy

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ **Planning and carrying out investigations** **Planning and carrying out investigations to answer questions or test solutions to problems in 9–12 builds on K–8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical and empirical models.** • **Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.** ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Conservation of Energy and Energy Transfer:** • Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems. • Uncontrolled systems always evolve toward more stable states— that is, toward more uniform energy distribution (e.g., water flows downhill, objects hotter than their surrounding environment cool down).	**HS-PS3-4** *Students who demonstrate understanding can:* **Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).** **Clarification Statement:** Emphasis is on analyzing data from student investigations and using mathematical thinking to describe the energy changes both quantitatively and conceptually. Examples of investigations could include mixing liquids at different initial temperatures or adding objects at different temperatures to water. **Assessment Boundary:** Assessment is limited to investigations based on materials and tools provided to students.

Crosscutting Concepts: System and System Models

• When investigating or describing a system, the boundaries and initial conditions of the system need to be defined and their inputs and outputs analyzed and described using models.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.9-10.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise detail s of explanations or descriptions. **WHST .9 -12.7** Conduct short as w ell as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. **WHST.11-12.8** Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. **WHST.9-12.9** Draw evidence from informational texts to support analysis, reflection, and research.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-PS4-1 Waves and Their Applications in Technologies for Information Transfer

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ **Using mathematics and computational thinking** **Mathematical and computational thinking at the 9–12 level builds on K–8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.** • **Use mathematical representations of phenomena or design solutions to describe and/or support claims and/or explanations.** ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Wave Properties:** • The wavelength and frequency of a wave are related to one another by the speed of travel of the wave, which depends on the type of wave and the medium through which it is passing.	**HS-PS4-1** *Students who demonstrate understanding can:* **Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.** **Clarification Statement:** Examples of data could include electromagnetic radiation traveling in a vacuum and glass, sound waves traveling through air and water, and seismic waves traveling through the Earth. **Assessment Boundary:** Assessment is limited to algebraic relationships and describing those relationships qualitatively.

Crosscutting Concepts: Cause and Effect

• Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.9-10.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g. table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **HAS-SSE.A.1** Interpret expressions that represent a quantity in terms of its context. **HAS-SSE.A.3** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. **HAS.CED.A.4** Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-PS4-2 Waves and Their Applications in Technologies for Information Transfer

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ **Asking questions (for science) and defining problems (for engineering)** **Asking questions and defining problems in grades 9–12 builds from grades K–8 experiences and progresses to formulating, refining, and evaluating empirically testable questions and design problems using models and simulations.** • **Evaluate questions that challenge the premise(s) of an argument, the interpretation of a data set, or the suitability of a design.** ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Wave Properties:** • Information can be digitized (e.g., a picture stored as the values of an array of pixels); in this form, it can be stored reliably in computer memory and sent over long distances as a series of wave pulses. __________ ** Connections to Engineering, Technology, and Application of Science* **Interdependence of Science, Engineering, and Technology:** • Modern civilization depends on major technological systems. • Engineers continuously modify these technological systems by applying scientific knowledge and engineering design practices to increase benefits while decreasing costs and risks.	**HS-PS4-2** *Students who demonstrate understanding can:* **Evaluate questions about the advantages and disadvantages of using a digital transmission and storage of information.*** **Clarification Statement:** Examples of advantages could include that digital information is stable because it can be stored reliably in computer memory, transferred easily, and copied and shared rapidly. Disadvantages could include issues of easy deletion, security, and theft. **Assessment Boundary:** N/A

Crosscutting Concepts: Stability and Changes

• Systems can be designed for greater or lesser stability.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.9-10.8 Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. **RST.9-10.1** Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.	**N/A**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-PS4-4 Waves and Their Applications in Technologies for Information Transfer

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ **Obtaining, evaluating, and communicating information** **Obtaining, evaluating, and communicating information in 9–12 builds on K –8 and progresses to evaluating the validity and reliability of the claims, methods, and designs.** • **Evaluate the validity and reliability of multiple claims that appear in scientific and technical texts or media reports, verifying the data when possible.**	**Electromagnetic Radiation:** • When light or longer wavelength electromagnetic radiation is absorbed in matter, it is generally converted into thermal energy (heat). • Shorter wavelength electromagnetic radiation (ultraviolet, X-ray s, gamma rays) can ionize atoms and cause damage to living cells. • Photoelectric materials emit electrons when they absorb light of a high-enough frequency.	**HS-PS4-4** *Students who demonstrate understanding can:* **Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.** **Clarification Statement:** Emphasis is on the idea that different frequencies of light have different energies, and the damage to living tissue from electromagnetic radiation depends on the energy of the radiation. Examples of published materials could include trade books, magazines, web resources, videos, and other passages that may reflect bias. **Assessment Boundary:** Assessment is limited to qualitative descriptions.

Crosscutting Concepts: Cause and Effect

• Cause and effect relationships can be suggested and predicted for complex natural and human designed systems by examining what is known about smaller scale mechanisms within the system.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.9-10.8 Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. **RST.9-10.1** Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. **RST.9-10.7** Translate quantitative or technical information expressed in worlds in a text into visual forms (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. **WHST. 9-10.8** Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.	**N/A**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-PS1-1 Matter and Its Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ **Developing and using models Modeling in 9–12 builds on K–8 and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.** • **Use a model to predict the relationships between systems or between components of a system.** ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Structure and Properties of Matter:** • Each atom has a charged substructure consisting of a nucleus, which is made of protons and neutrons, surrounded by electrons. • The periodic table orders elements horizontally by the number of protons in the atom's nucleus and places those with similar chemical properties in columns. The repeating patterns of this table reflect patterns of outer electron states.	**HS-PS1-1** *Students who demonstrate understanding can:* **Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.** **Clarification Statement:** Examples of properties that could be predicted from patterns could include reactivity of metals, types of bonds formed, numbers of bonds formed, and reactions with oxygen. **Assessment Boundary:** Assessment is limited to main group elements. Assessment does not include quantitative understanding of ionization energy beyond relative trends.

Crosscutting Concepts: Patterns

• Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.9-10.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.	**N/A**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-PS1-2 Matter and Its Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking **❻ Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student- generated sources of evidence consistent with scientific ideas, principles, and theories.** • **Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Structure and Properties of Matter:** • The periodic table orders elements horizontally by the number of protons in the atom's nucleus and places those with similar chemical properties in columns. The repeating patterns of this table reflect patterns of outer electron states. **Chemical Reactions:** • The fact that atoms are conserved, together with knowledge of the chemical properties of the elements involved, can be used to describe and predict chemical reactions.	**HS-PS1-2** *Students who demonstrate understanding can:* **Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, knowledge of the patterns of chemical properties, and formation of compounds.** **Clarification Statement:** Examples of chemical reactions could include the reaction of sodium and chlorine, of carbon and oxygen, or of carbon and hydrogen. Reaction classification aids in the prediction of products (e.g. synthesis/combination decomposition, single displacement, double displacement, oxidation/reduction, acid/base). **Assessment Boundary:** Assessment is limited to chemical reactions involving main group elements and combustion reactions.

Crosscutting Concepts: Patterns

- Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. **WHST.9-12.5** Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.	**HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-PS1-3 Matter and Its Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ **Planning and carrying out investigations** **Planning and carrying out investigations to answer questions or test solutions to problems in 9–12 builds on K–8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical and empirical models.** **• Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.** ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Structure and Properties of Matter:** • The structure and interactions of matter at the bulk scale are determined by electrical forces within and between atoms.	**HS-PS1-3** *Students who demonstrate understanding can:* **Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.** **Clarification Statement:** Emphasis is on understanding the strengths of forces between particles, not on naming specific intermolecular forces (such as dipole-dipole). Examples of particles could include ions, atoms, molecules, and networked materials (such as graphite). Examples of bulk properties of substances could include the melting point and boiling point, vapor pressure, and surface tension. The intent of the performance expectation is limited to evaluation of bulk scale properties and not micro scale properties. **Assessment Boundary:** Assessment does not include Raoult's law calculations of vapor pressure.

Crosscutting Concepts: Patterns

• Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. **WHST.9-12.7** Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. **WHST.11-12.8** Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. **WHST.9-12.7.9** Draw evidence from informational texts to support analysis, reflection, and research.	**HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-PS1-4 Matter and Its Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ **Developing and using models** **Modeling in 9–12 builds on K–8 and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.** • **Develop a model based on evidence to illustrate the relationships between systems or between components of a system.** ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Structure and Properties of Matter:** • A stable molecule has less energy than the same set of atoms separated; one must provide at least this energy in order to take the molecule apart. **Chemical Reactions:** • Chemical processes, their rates, and whether or not energy is stored or released can be understood in terms of the collisions of molecules and the rearrangements of atoms into new molecules, with consequent changes in the sum of all bond energies in the set of molecules that are matched by changes in kinetic energy.	**HS-PS1-4** *Students who demonstrate understanding can:* **Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.** **Clarification Statement:** Emphasis is on the idea that a chemical reaction is a system that affects the energy change. Examples of models could include molecular-level drawings and diagrams of reactions, graphs showing the relative energies of reactants and products, and representations showing energy is conserved. **Assessment Boundary:** N/A

Crosscutting Concepts: Energy and Matter

• Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
SL.11-12.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.	**MP.4** Model with mathematics. **HS-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **HS-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling. **HS-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-PS1-5 Matter and Its Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking **❻ Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student- generated sources of evidence consistent with scientific ideas, principles, and theories.** **• Apply scientific principles and evidence to provide an explanation of phenomena and solve design problems, taking into account possible unanticipated effects.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Chemical Reactions:** • Chemical processes, their rates, and whether or not energy is stored or released can be understood in terms of the collisions of molecules and the rearrangements of atoms into new molecules, with consequent changes in the sum of all bond energies in the set of molecules that are matched by changes in kinetic energy.	**HS-PS1-5** *Students who demonstrate understanding can:* **Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.** **Clarification Statement:** Emphasis is on student reasoning that focuses on the number and energy of collisions between molecules. **Assessment Boundary:** Assessment is limited to simple reactions in which there are only two reactants; evidence from temperature, concentration, and rate data; and qualitative relationships between rate and temperature.

Crosscutting Concepts: Patterns

• Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. **WHST.9-12.2** Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.	**MP.2** Reason abstractly and quantitatively. **HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-PS1-6 Matter and Its Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking **❻ Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student- generated sources of evidence consistent with scientific ideas, principles, and theories.** **• Refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Chemical Reactions:** • In many situations, a dynamic and condition-dependent balance between a reaction and the reverse reaction determines the numbers of all types of molecules present. **Optimizing the Design Solution:** • Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain over others (trade-offs) may be needed.	**HS-PS1-6** *Students who demonstrate understanding can:* **Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.*** **Clarification Statement:** Emphasis is on the application of Le Chatlier's Principle and on refining designs of chemical reaction systems, including descriptions of the connection between changes made at the macro-scopic level and what happens at the molecular level. Examples of designs could include different ways to increase product formation including adding reactants or removing products. **Assessment Boundary:** Assessment is limited to specifying the change in only one variable at a time. Assessment does not include calculating equilibrium constants and concentrations.

Crosscutting Concepts: Stability and Change

• Much of science deals with constructing explanations of how things change and how they remain stable.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
WHST. 9-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.	**N/A**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-PS1-7 Matter and Its Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ **Using mathematics and computational thinking** **Mathematical and computational thinking at the 9–12 level builds on K–8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.** **• Use mathematical representations of phenomena to support claims.** ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Chemical Reactions:** • The fact that atoms are conserved, together with knowledge of the chemical properties of the elements involved, can be used to describe and predict chemical reactions.	**HS-PS1-7** *Students who demonstrate understanding can:* **Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.** **Clarification Statement:** Emphasis is on using mathematical ideas to communicate the proportional relationships between masses of atoms in the reactants and the products, and the translation of these relationships to the macroscopic scale using the mole as the conversion from the atomic to the macroscopic scale (i.e., Conservation of Mass and Stoichiometry). Emphasis is on assessing students' use of mathematical thinking and not on memorization and rote application of problem-solving techniques. **Assessment Boundary:** Assessment does not include complex chemical reactions.

Crosscutting Concepts: Energy and Matter
• The total amount of energy and matter in closed systems is conserved.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
N/A	**MP.2** Reason abstractly and quantitatively. **HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **HSN-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling. **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

CHEMISTRY

HS-PS1-8 Matter and Its Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ **Developing and using models Modeling in 9–12 builds on K–8 and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.** • **Develop a model based on evidence to illustrate the relationships between systems or between components of a system.** ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Nuclear Processes:** • Nuclear processes, including fusion, fission, and radioactive decays of unstable nuclei, involve release or absorption of energy.	**HS-PS1-8** *Students who demonstrate understanding can:* **Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.** **Clarification Statement:** Emphasis is on simple qualitative models, such as pictures or diagrams, and on the scale of energy released in nuclear processes relative to other kinds of transformations. **Assessment Boundary:** Assessment does not include quantitative calculation of energy released. Assessment is limited to alpha, beta, and gamma radioactive decays.

Crosscutting Concepts: Energy and Matter
• In nuclear processes, atoms are not conserved, but the total number of protons plus neutrons is conserved.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
N/A	**MP.2** Reason abstractly and quantitatively. **HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **HSN-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling. **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-PS2-6 Motion and Stability: Forces and Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ **Obtaining, evaluating, and communicating information** **Obtaining, evaluating, and communicating information in 9–12 builds on K –8 and progresses to evaluating the validity and reliability of the claims, methods, and designs.** • **Communicate scientific and technical information (e.g. about the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically).**	**Types of Interactions:** • Attraction and repulsion between electric charges at the atomic scale explain the structure, properties, and transformations of matter, as well as the contact forces between material objects.	**HS-PS2-6** *Students who demonstrate understanding can:* **Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.*** **Clarification Statement:** Emphasis is on the attractive and repulsive forces that determine the functioning of the material. Examples could include why electrically conductive materials are often made of metal, flexible but durable materials are made up of long chained molecules, and pharmaceuticals are designed to interact with specific receptors. **Assessment Boundary:** Assessment is limited to provided molecular structures of specific designed materials.

Crosscutting Concepts: Structure and Function

• Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. **WHST.9-12.2** Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.	**HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **HSN-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling. **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

K-2

3-5

6-8

9-12

CHEMISTRY

HS-PS3-3 Energy

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ **Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student- generated sources of evidence consistent with scientific ideas, principles, and theories.** • **Design, evaluate, and/or refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Definitions of Energy:** • At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy. **Defining and Delimiting Engineering Problems:** (secondary to HS-PS3-3) • Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. ** Connections to Engineering, Technology, and Application of Science* **Interdependence of Science, Engineering, and Technology:** • Modern civilization depends on major technological systems. Engineers continuously modify these technological systems by applying scientific knowledge and engineering design practices to increase benefits while decreasing costs and risks.	**HS-PS3-3** *Students who demonstrate understanding can:* **Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.*** **Clarification Statement:** Emphasis is on both qualitative and quantitative evaluations of devices. Examples of devices could include Rube Goldberg devices, wind turbines, solar cells, solar ovens, and generators. Examples of constraints could include use of renewable energy forms and efficiency. **Assessment Boundary:** Assessment for quantitative evaluations is limited to total output for a given input. Assessment is limited to devices constructed with materials provided to students.

Crosscutting Concepts: Energy and Matter

• Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
WH ST .9 -12.7 Conduct short as w ell as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **HSN-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling. **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-PS3-4 Energy

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ **Planning and carrying out investigations** **Planning and carrying out investigations to answer questions or test solutions to problems in 9–12 builds on K–8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical and empirical models.** **• Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.** ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Conservation of Energy and Energy Transfer:** • Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems. • Uncontrolled systems always evolve toward more stable states— that is, toward more uniform energy distribution (e.g., water flows downhill, objects hotter than their surrounding environment cool down).	**HS-PS3-4** *Students who demonstrate understanding can:* **Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).** **Clarification Statement:** Emphasis is on analyzing data from student investigations and using mathematical thinking to describe the energy changes both quantitatively and conceptually. Examples of investigations could include mixing liquids at different initial temperatures or adding objects at different temperatures to water. **Assessment Boundary:** Assessment is limited to investigations based on materials and tools provided to students.

Crosscutting Concepts: System and System Models

- When investigating or describing a system, the boundaries and initial conditions of the system need to be defined and their inputs and outputs analyzed and described using models.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. **WHST .9 -12.7** Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. **WHST.11-12.8** Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. **WHST.9-12.9** Draw evidence from informational texts to support analysis, reflection, and research.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

K-2 3-5 6-8 9-12

HS-PS4-1 Waves and Their Applications in Technologies for Information Transfer

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data **❺ Using mathematics and computational thinking** **Mathematical and computational thinking at the 9–12 level builds on K–8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.** **• Use mathematical representations of phenomena or design solutions to describe and/or support claims and/or explanations.** ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Wave Properties:** • The wavelength and frequency of a wave are related to one another by the speed of travel of the wave, which depends on the type of wave and the medium through which it is passing.	**HS-PS4-1** *Students who demonstrate understanding can:* **Use mathematical representations to describe relationships among the frequency, wavelength, and speed of waves.** **Clarification Statement:** Examples of data could include relationship to the electromagnetic spectrum. **Assessment Boundary:** Assessment is limited to algebraic relationships and describing those relationships qualitatively.

Crosscutting Concepts: Cause and Effect

• Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **HAS-SSE.A.1** Interpret expressions that represent a quantity in terms of its context. **HAS-SSE.A.3** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. **HAS.CED.A.4** Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-PS4-3 Waves and Their Applications in Technologies for Information Transfer

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) **❼ Engaging in argument from evidence** **Engaging in argument from evidence in 9-12 builds on K-8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about natural and designed worlds. Arguments may also come from current scientific or historical episodes in science.** **• Evaluate the claims, evidence, and reasoning behind currently accepted explanations or solutions to determine the merits of arguments.** ❽ Obtaining, evaluating, and communicating information	**Wave Properties:** • Waves can add or cancel one another as they cross, depending on their relative phase (i.e., relative position of peaks and troughs of the waves), but they emerge unaffected by each other. • Boundary: The discussion at this grade level is qualitative only; it can be based on the fact that two different sounds can pass a location in different directions without getting mixed up. **Electromagnetic Radiation:** • Electromagnetic radiation (e.g., radio, microwaves, light) can be modeled as a wave of changing electric and magnetic fields or as particles called photons. The wave model is useful for explaining many features of electromagnetic radiation, and the particle model explains other features.	**HS-PS4-3** *Students who demonstrate understanding can:* **Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.** **Clarification Statement:** Emphasis is on how the experimental evidence supports the claim and how a theory is generally modified in light of new evidence. Examples of a phenomenon could include resonance, interference, diffraction, and photoelectric effect. **Assessment Boundary:** Assessment does not include using quantum theory.

Crosscutting Concepts: Cause and Effect

• Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions— including energy, matter, and information flows—within and between systems at different scales.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.9-10.8 Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. (H S - **RST.11-12.1** Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. **RST.11-12.8** Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.	**MP.2** Reason abstractly and quantitatively. **HAS-SSE.A.1** Interpret expressions that represent a quantity in terms of its context. **HAS-SSE.A.3** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. **HAS.CED.A.4** Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-PS1-8 Matter and Its Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ **Developing and using models Modeling in 9–12 builds on K–8 and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.** • **Develop a model based on evidence to illustrate the relationships between systems or between components of a system.** ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Nuclear Processes:** • Nuclear processes, including fusion, fission, and radioactive decays of unstable nuclei, involve release or absorption of energy. The total number of neutrons plus protons does not change in any nuclear process.	**HS-PS1-8** *Students who demonstrate understanding can:* **Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.** **Clarification Statement:** Emphasis is on simple qualitative models, such as pictures or diagrams, and on the scale of energy released in nuclear processes relative to other kinds of transformations. **Assessment Boundary:** Assessment does not include quantitative calculation of energy released. Assessment is limited to alpha, beta, and gamma radioactive decays.

Crosscutting Concepts: Energy and Matter
• In nuclear processes, atoms are not conserved, but the total number of protons plus neutrons is conserved.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
N/A	**MP.4** Model with mathematics. **HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **HSN-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling. **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-PS2-1 Motion and Stability: Forces and Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ **Analyzing and interpreting data Analyzing data in 9–12 builds on K–8 and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data.** • **Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution.** ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Forces and Motion:** • Newton's second law accurately predicts changes in the motion of macroscopic objects.	**HS-PS2-1** *Students who demonstrate understanding can:* **Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.** **Clarification Statement:** Examples of data could include tables or graphs of position or velocity as a function of time for objects subject to a net unbalanced force, such as a falling object, an object rolling down a ramp, or a moving object being pulled by a constant force. **Assessment Boundary:** Assessment is limited to one-dimensional motion and to macroscopic objects moving at non-relativistic speeds.

Crosscutting Concepts: Cause and Effect
- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. **RST.11-12.7** Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. **WHST.9-12.9** Draw evidence from informational texts to support analysis, reflection, and research.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **HSN-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling. **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. **HSA-SSE.A.1** Interpret expressions that represent a quantity in terms of its context. **HSA-SSE.B.3** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. **HSA-CED.A.1** Create equations and inequalities in one variable and use them to solve problems. **HSA-CED.A.2** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. **HSA-CED.A.4** Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. **HSF-IF.C.7** Graph functions expressed symbolically and show key features of the graph, by in hand in simple cases and using technology for more complicated cases. **HSS-ID.A.1** Represent data with plots on the real number line (dot plots, histograms, and box plots).

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-PS2-2 Motion and Stability: Forces and Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ **Using mathematics and computational thinking** **Mathematical and computational thinking at the 9–12 level builds on K–8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.** • **Use mathematical representations of phenomena to describe explanations.** ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Forces and Motion:** • Momentum is defined for a particular frame of reference; it is the mass times the velocity of the object. • If a system interacts with objects outside itself, the total momentum of the system can change; however, any such change is balanced by changes in the momentum of objects outside the system.	**HS-PS2-2** *Students who demonstrate understanding can:* **Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.** **Clarification Statement:** Emphasis is on the quantitative conservation of momentum in interactions and the qualitative meaning of this principle. **Assessment Boundary:** Assessment is limited to systems of two macroscopic bodies moving in one dimension.

Crosscutting Concepts: Systems and System Models

• When investigating or describing a system, the boundaries and initial conditions of the system need to be defined.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.9-10.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanation and descriptions. **RST.9-10.7** Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. **WHST.9-12.9** Draw evidence from informational texts to support analysis, reflection, and research.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **HSN-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling. **HSA-CED.A.1** Create equations and inequalities in one variable and use them to solve problems. **HSA-CED.A.2** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. **HSA-CED.A.4** Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

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HS-PS2-3 Motion and Stability: Forces and Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking **❻ Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student- generated sources of evidence consistent with scientific ideas, principles, and theories.** **• Apply scientific ideas to solve a design problem, taking into account possible unanticipated effects.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Forces and Motion:** • If a system interacts with objects outside itself, the total momentum of the system can change; however, any such change is balanced by changes in the momentum of objects outside the system. **Defining and Delimiting Engineering Problems:** • Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them.	**HS-PS2-3** *Students who demonstrate understanding can:* **Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.*** **Clarification Statement:** Examples of evaluation and refinement could include determining the success of the device at protecting an object from damage and modifying the design to improve it. Examples of a device could include a football helmet or a parachute. **Assessment Boundary:** Assessment is limited to qualitative evaluations and/or algebraic manipulations.

Crosscutting Concepts: Cause and Effect
• Systems can be designed to cause a desired effect.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
WHST.11-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.	**MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-PS2-4 Motion and Stability: Forces and Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data **❺ Using mathematics and computational thinking** **Mathematical and computational thinking at the 9–12 level builds on K–8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.** **• Use mathematical representations of phenomena to describe explanations.** ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Types of Interactions:** • Newton's law of universal gravitation and Coulomb's law provide the mathematical models to describe and predict the effects of gravitational and electrostatic forces between distant objects. • Forces at a distance are explained by fields (gravitational, electric, and magnetic) permeating space that can transfer energy through space. • Magnets or electric currents cause magnetic fields; electric charges or changing magnetic fields cause electric fields.	**HS-PS2-4** *Students who demonstrate understanding can:* **Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.** **Clarification Statement:** Emphasis is on both quantitative and conceptual descriptions of gravitational and electric fields. **Assessment Boundary:** Assessment is limited to systems with two objects.

Crosscutting Concepts: Patterns
- Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
N/A	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **HSN-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling. **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. **HSA-SSE.A.1** Interpret expressions that represent a quantity in terms of its context. **HSA-SSE.B.3** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-PS2-5 Motion and Stability: Forces and Interactions

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ **Planning and carrying out investigations** **Planning and carrying out investigations to answer questions or test solutions to problems in 9–12 builds on K–8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical and empirical models.** • **Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.** ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Types of Interactions:** • Forces at a distance are explained by fields (gravitational, electric, and magnetic) permeating space that can transfer energy through space. • Magnets or electric currents cause magnetic fields; electric charges or changing magnetic fields cause electric fields. **Definitions of Energy:** (secondary to HS-PS2-5). • "Electrical energy" may mean energy stored in a battery or energy transmitted by electric currents.	**HS-PS2-5** *Students who demonstrate understanding can:* **Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.** **Clarification Statement:** N/A **Assessment Boundary:** Assessment is limited to designing and conducting investigations with provided materials and tools.

Crosscutting Concepts: Cause and Effect
- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
WHST.9-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. **WHST.11-12.8** Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of specific tasks, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source following a standard format for citation. **WHST.9-12.9** Draw evidence from informational texts to support analysis, reflection, and research.	**HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **HSN-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling. **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

K-2 3-5 6-8 9-12

HS-PS3-1 Energy

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ **Using mathematics and computational thinking** **Mathematical and computational thinking at the 9–12 level builds on K–8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.** • **Create a computational model or simulation of a phenomenon, designed device, process, or system.** ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Definitions of Energy:** • Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system. That there is a single quantity called energy is due to the fact that a system's total energy is conserved, even as, within the system, energy is continually transferred from one object to another and between its various possible forms. **Conservation of Energy and Energy Transfer:** • Conservation of energy means that the total change of energy in any system is always equal to the total energy transferred into or out of the system. • Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems. • Mathematical expressions, which quantify how the stored energy in a system depends on its configuration (e.g. relative positions of charged particles, compression of a spring) and how kinetic energy depends on mass and speed, allow the concept of conservation of energy to be used to predict and describe system behavior. • The availability of energy limits what can occur in any system.	**HS-PS3-1** *Students who demonstrate understanding can:* **Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.** **Clarification Statement:** Emphasis is on explaining the meaning of mathematical expressions used in the model. **Assessment Boundary:** Assessment is limited to basic algebraic expressions or computations; to systems of two or three components; and to thermal energy, kinetic energy, potential energy and/or the energies in gravitational, magnetic, or electric fields.

Crosscutting Concepts: Systems and System Models

• Models can be used to predict the behavior of a system, but these predictions have limited precision and reliability due to the assumptions and approximations inherent in models.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
SL.11-12.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **HSN-Q.A.1** Use units as away to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **HSN-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling. **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-PS3-2 Energy

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ **Developing and using models** **Modeling in 9–12 builds on K–8 and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.** • **Develop a model based on evidence to illustrate the relationships between systems or between components of a system.** ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Definitions of Energy:** • Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system. That there is a single quantity called energy is due to the fact that a system's total energy is conserved, even as, within the system, energy is continually transferred from one object to another and between its various possible forms. • At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy. • These relationships are better understood at the microscopic scale, at which all of the different manifestations of energy can be modeled as a combination of energy associated with the motion of particles and energy associated with the configuration (relative position of the particles). In some cases the relative position energy can be thought of as stored in fields (which mediate interactions between particles). This last concept includes radiation, a phenomenon in which energy stored in fields moves across space.	**HS-PS3-2** *Students who demonstrate understanding can:* **Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as either motions of particles or energy stored in fields.** **Clarification Statement:** Examples of phenomena at the macroscopic scale could include the conversion of kinetic energy to thermal energy, the energy stored due to position of an object above the earth, and the energy stored between two electrically-charged plates. Examples of models could include diagrams, drawings, descriptions, and computer simulations. **Assessment Boundary:** Assessment does not include quantitative calculations.

Crosscutting Concepts: Energy and Matter
- Energy cannot be created or destroyed—only moves between one place and another place, between objects and/or fields, or between systems.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
SL.11-12.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-PS3-3 Energy

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking **❻ Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student- generated sources of evidence consistent with scientific ideas, principles, and theories.** • **Design, evaluate, and/or refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Definitions of Energy:** • At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy. **Defining and Delimiting Engineering Problems:** • Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. ** Connections to Engineering, Technology, and Application of Science* **Interdependence of Science, Engineering, and Technology:** • Modern civilization depends on major technological systems. Engineers continuously modify these technological systems by applying scientific knowledge and engineering design practices to increase benefits while decreasing costs and risks.	**HS-PS3-3** *Students who demonstrate understanding can:* **Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.*** **Clarification Statement:** Emphasis is on both qualitative and quantitative evaluations of devices. Examples of devices could include Rube Goldberg devices, wind turbines, solar cells, solar ovens, and generators. Examples of constraints could include use of renewable energy forms and efficiency. **Assessment Boundary:** Assessment for quantitative evaluations is limited to total output for a given input. Assessment is limited to devices constructed with materials provided to students.

Crosscutting Concepts: Energy and Matter
- Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
WHST .9 -12.7 Conduct short as w ell as more sustained re-search projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **HSN-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling. **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-PS3-4 Energy

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ **Planning and carrying out investigations** **Planning and carrying out investigations to answer questions or test solutions to problems in 9–12 builds on K–8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical and empirical models.** • **Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.** ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Conservation of Energy and Energy Transfer:** • Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems. • Uncontrolled systems always evolve toward more stable states— that is, toward more uniform energy distribution (e.g., water flows downhill, objects hotter than their surrounding environment cool down).	**HS-PS3-4** *Students who demonstrate understanding can:* **Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).** **Clarification Statement:** Emphasis is on analyzing data from student investigations and using mathematical thinking to describe the energy changes both quantitatively and conceptually. Examples of investigations could include mixing liquids at different initial temperatures or adding objects at different temperatures to water. **Assessment Boundary:** Assessment is limited to investigations based on materials and tools provided to students.

Crosscutting Concepts: System and System Models

• When investigating or describing a system, the boundaries and initial conditions of the sy stem need to be defined and their inputs and outputs analyzed and described using models.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. **WH ST .9 -12.7** Conduct short as w ell as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. **WHST.11-12.8** Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. **WHST.9-12.9** Draw evidence from informational texts to support analysis, reflection, and research.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

PHYSICS

HS-PS3-5 Energy

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ **Developing and using models** **Modeling in 9–12 builds on K–8 and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.** • **Develop a model based on evidence to illustrate the relationships between systems or between components of a system.** ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Relationship Between Energy and Forces:** • When two objects interacting through a field change relative position, the energy stored in the field is changed.	**HS-PS3-5** *Students who demonstrate understanding can:* **Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.** **Clarification Statement:** Examples of models could include drawings, diagrams, and texts, such as drawings of what happens when two charges of opposite polarity are near each other, including an explanation of how the change in energy of the objects is related to the change in energy of the field. **Assessment Boundary:** Assessment is limited to systems containing two objects.

Crosscutting Concepts: Energy and Matter

• Cause and effect relationships can be suggested and predicted for complex natural and human designed systems by examining what is known about smaller scale mechanisms within the system..

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
WHST.9-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. **WHST.11-12.8** Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of specific tasks, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source following a standard format for citation. **WHST.9-12.9** Draw evidence from informational texts to support analysis, reflection, and research. **SL.11-12.5** Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-PS4-1 Waves and Their Applications in Technologies for Information Transfer

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data **❺ Using mathematics and computational thinking** **Mathematical and computational thinking at the 9–12 level builds on K–8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.** **• Use mathematical representations of phenomena or design solutions to describe and/or support claims and/or explanations.** ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Wave Properties:** • The wavelength and frequency of a wave are related to one another by the speed of travel of the wave, which depends on the type of wave and the medium through which it is passing.	**HS-PS4-1** *Students who demonstrate understanding can:* **Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.** **Clarification Statement:** Examples of data could include electromagnetic radiation traveling in a vacuum and glass, sound waves traveling through air and water, and seismic waves traveling through the Earth. **Assessment Boundary:** Assessment is limited to algebraic relationships and describing those relationships qualitatively.

Crosscutting Concepts: Cause and Effect

• Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **HAS-SSE.A.1** Interpret expressions that represent a quantity in terms of its context. **HAS-SSE.A.3** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. **HAS.CED.A.4** Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

PHYSICS

HS-PS4-2 Waves and Their Applications in Technologies for Information Transfer

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) Asking questions and defining problems in grades 9–12 builds from grades K–8 experiences and progresses to formulating, refining, and evaluating empirically testable questions and design problems using models and simulations. • **Evaluate questions that challenge the premise(s) of an argument, the interpretation of a data set, or the suitability of a design.** ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Wave Properties:** • Information can be digitized (e.g., a picture stored as the values of an array of pixels); in this form, it can be stored reliably in computer memory and sent over long distances as a series of wave pulses. ** Connections to Engineering, Technology, and Application of Science* **Interdependence of Science, Engineering, and Technology:** • Modern civilization depends on major technological systems. • Engineers continuously modify these technological systems by applying scientific knowledge and engineering design practices to increase benefits while decreasing costs and risks.	**HS-PS4-2** *Students who demonstrate understanding can:* **Evaluate questions about the advantages and disadvantages of using a digital transmission and storage of information.*** **Clarification Statement:** Examples of advantages could include that digital information is stable because it can be stored reliably in computer memory, transferred easily, and copied and shared rapidly. Disadvantages could include issues of easy deletion, security, and theft. **Assessment Boundary:** N/A

Crosscutting Concepts: Stability and Changes
• Systems can be designed for greater or lesser stability.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.9-10.8 Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. **RST.11-12.1** Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. **RST.11-12.8** Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.	**N/A**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-PS4-3 Waves and Their Applications in Technologies for Information Transfer

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ **Engaging in argument from evidence Engaging in argument from evidence in 9-12 builds on K-8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about natural and designed worlds. Arguments may also come from current scientific or historical episodes in science.** • **Evaluate the claims, evidence, and reasoning behind currently accepted explanations or solutions to determine the merits of arguments.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Wave Properties:** • Waves can add or cancel one another as they cross, depending on their relative phase (i.e., relative position of peaks and troughs of the waves), but they emerge unaffected by each other. • Boundary: The discussion at this grade level is qualitative only; it can be based on the fact that two different sounds can pass a location in different directions without getting mixed up. **Electromagnetic Radiation:** • Electromagnetic radiation (e.g., radio, microwaves, light) can be modeled as a wave of changing electric and magnetic fields or as particles called photons. • The wave model is useful for explaining many features of electromagnetic radiation, and the particle model explains other features.	**HS-PS4-3** *Students who demonstrate understanding can:* **Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.** **Clarification Statement:** Emphasis is on how the experimental evidence supports the claim and how a theory is generally modified in light of new evidence. Examples of a phenomenon could include resonance, interference, diffraction, and photoelectric effect. **Assessment Boundary:** Assessment does not include using quantum theory.

Crosscutting Concepts: Cause and Effect

• Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions— including energy, matter, and information flows—within and between system at different scales.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.9-10.8 Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. **RST.11-12.1** Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. **RST.11-12.8** Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.	**MP.2** Reason abstractly and quantitatively. **HAS-SSE.A.1** Interpret expressions that represent a quantity in terms of its context. **HAS-SSE.A.3** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. **HAS.CED.A.4** Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

■ PHYSICS

HS-PS4-4 Waves and Their Applications in Technologies for Information Transfer

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence **❽ Obtaining, evaluating, and communicating information Obtaining, evaluating, and communicating information in 9–12 builds on K –8 and progresses to evaluating the validity and reliability of the claims, methods, and designs.** **• Evaluate the validity and reliability of multiple claims that appear in scientific and technical texts or media reports, verifying the data when possible.**	**Electromagnetic Radiation:** • When light or longer wavelength electromagnetic radiation is absorbed in matter, it is generally converted into thermal energy (heat). • Shorter wavelength electromagnetic radiation (ultraviolet, X-ray s, gamma rays) can ionize atoms and cause damage to living cells. • Photoelectric materials emit electrons when they absorb light of a high-enough frequency	**HS-PS4-4** *Students who demonstrate understanding can:* **Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electro-magnetic radiation have when absorbed by matter.** **Clarification Statement:** Emphasis is on the idea that different frequencies of light have different energies, and the damage to living tissue from electromagnetic radiation depends on the energy of the radiation. Examples of published materials could include trade books, magazines, web resources, videos, and other passages that may reflect bias. **Assessment Boundary:** Assessment is limited to qualitative descriptions.

Crosscutting Concepts: Cause and Effect

• Cause and effect relationships can be suggested and predicted for complex natural and human designed systems by examining what is know n about smaller scale mechanisms within the system.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.9-10.8 Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. **RST.11-12.1** Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. **RST.11-12.7** Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. **RST.11-12.8** Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. **WHST. 11-12.8** Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.	**N/A**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-PS4-5 Waves and Their Applications in Technologies for Information Transfer

Science & Engineering Practices

❶ Asking questions (for science) and defining problems (for engineering)
❷ Developing and using models
❸ Planning and carrying out investigations
❹ Analyzing and interpreting data
❺ Using mathematics and computational thinking
❻ Constructing explanations (for science) and designing solutions (for engineering)
❼ Engaging in argument from evidence
❽ **Obtaining, evaluating, and communicating information**

Obtaining, evaluating, and communicating information in 9–12 builds on K –8 and progresses to evaluating the validity and reliability of the claims, methods, and designs.

- **Communicate technical information or ideas (e.g. about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically).**

Disciplinary Core Ideas

Energy in Chemical Processes:
(secondary to HS-PS4-5)
- Solar cells are human-made devices that likewise capture the sun's energy and produce electrical energy.

Wave Properties:
- Information can be digitized (e.g., a picture stored as the values of an array of pixels); in this form, it can be stored reliably in computer memory and sent over long distances as a series of wave pulses.

Electromagnetic Radiation:
- Photoelectric materials emit electrons when they absorb light of a high-enough frequency.

Information Technologies and Instrumentation:
- Multiple technologies based on the understanding of waves and their interactions with matter are part of every day experiences in the modern world (e.g., medical imaging, communications, scanners) and in scientific research. They are essential tools for producing, transmitting, and capturing signals and for storing and interpreting the information contained in them.

** Connections to Engineering, Technology, and Application of Science*

Interdependence of Science, Engineering, and Technology:
- Modern civilization depends on major technological systems.

Performance Expectations

HS-PS4-5
Students who demonstrate understanding can:

Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.*

Clarification Statement:
Examples could include solar cells capturing light and converting it to electricity; medical imaging; and communications technology.

Assessment Boundary:
Assessments are limited to qualitative information. Assessments do not include band theory

Crosscutting Concepts: Cause and Effect

- Systems can be designed to cause a desired effect.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
WHST. 9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.	**N/A**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-LS1-1 From Molecules to Organisms: Structure and Processes

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking **❻ Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student- generated sources of evidence consistent with scientific ideas, principles, and theories.** **• Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investiga-tions, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Structure and Function:** • Systems of specialized cells within organisms help them perform the essential functions of life. • All cells contain genetic information in the form of DNA molecules. • Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells.	**HS-LS1-1** *Students who demonstrate understanding can:* **Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins, which carry out the essential functions of life through systems of specialized cells.** **Clarification Statement:** Emphasis is on the conceptual understanding that DNA sequences determine the amino acid sequence, and thus, protein structure. Students can produce scientific writings, oral presentations and or physical models that communicate constructed explanations. **Assessment Boundary:** Assessment does not include identification of specific cell or tissue types, whole body systems, specific protein structures and functions, or the biochemistry of protein synthesis.

Crosscutting Concepts: Structure and Function

- Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. **WHST.9-12.2** Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. **WHST.9-12.9** Draw evidence from informational texts to support analysis, reflection, and research.	**N/A**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-LS1-2 From Molecules to Organisms: Structure and Processes

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ **Developing and using models Modeling in 9–12 builds on K–8 and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.** • **Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system.** ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Structure and Function:** • Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.	**HS-LS1-2** *Students who demonstrate understanding can:* **Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.** **Clarification Statement:** Emphasis is on the levels of organization including cells, tissues, organs, and systems of an organism. **Assessment Boundary:** Assessment does not include interactions and functions at the molecular or chemical level.

Crosscutting Concepts: Systems and System Models

• Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions— including energy, matter, and information flows—within and between systems at different scales.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
SL.9-12.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.	**N/A**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-LS1-3 From Molecules to Organisms: Structure and Processes

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ **Planning and carrying out investigations** **Planning and carrying out investigations to answer questions or test solutions to problems in 9–12 builds on K–8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical and empirical models.** • **Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.** ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Structure and Function:** • Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Outside that range (e.g., at a too high or tool low external temperature, with too little food or water available) the organism cannot survive.	**HS-LS1-3** *Students who demonstrate understanding can:* **Plan and conduct an investigation to provide evidence of the importance of maintaining homeostasis in living organisms.** **Clarification Statement:** A state of homeostasis must be maintained for organisms to remain alive and functional even as external conditions change within some range. Examples of investigations could include heart rate response to exercise, stomate response to moisture and temperature, root development in response to water levels, and cell response to hyper and hypotonic environments. **Assessment Boundary:** Assessment does not include the cellular processes involved in the feedback mechanism.

Crosscutting Concepts: Stability and Change
• Feedback (negative or positive) can stabilize or destabilize a system.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
WHST.9-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. **WHST.9-10.8** Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.	**N/A**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-LS1-4 From Molecules to Organisms: Structure and Processes

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ **Developing and using models Modeling in 9–12 builds on K–8 and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.** **• Use a model based on evidence to illustrate the relationships between systems or between components of a system.** ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Growth and Development of Organisms:** • In multicellular organisms individual cells grow and then divide via a process called mitosis, thereby allowing the organism to grow. • The organism begins as a single cell (fertilized egg) that divides successively to produce many cells, with each parent cell passing identical genetic material (two variants of each chromosome pair) to both daughter cells. • Cellular division and differentiation produce and maintain a complex organism, composed of systems of tissues and organs that work together to meet the needs of the whole organism.	**HS-LS1-4** *Students who demonstrate understanding can:* **Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.** **Clarification Statement:** Emphasis is on conceptual understanding that mitosis passes on genetically identical materials via replication, not on the details of each phase in mitosis. **Assessment Boundary:** Assessment does not include specific gene control mechanisms or rote memorization of the steps of mitosis.

Crosscutting Concepts: Systems and System Models
- Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions— including energy, matter, and information flows—within and between systems at different scales.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
SL.9-12.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.	**MP.4** Model with mathematics. **HSF-IF.C.7** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. **HSF-BF.A.1** Write a function that describes a relationship between two quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-LS1-5 From Molecules to Organisms: Structure and Processes

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ **Developing and using models Modeling in 9–12 builds on K–8 and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.** • **Use a model based on evidence to illustrate the relationships between systems or between components of a system.** ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Organization for Matter and Energy Flow in Organisms:** • The process of photosynthesis converts light energy to stored chemical energy by converting carbon dioxide plus water into sugars plus released oxygen.	**HS-LS1-5** *Students who demonstrate understanding can:* **Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.** **Clarification Statement:** Emphasis is on illustrating inputs and outputs of matter and the transfer and transformation of energy in photosynthesis by plants and other photosynthesizing organisms. Examples of models could include diagrams, chemical equations, conceptual models, and/or laboratory investigations. **Assessment Boundary:** The assessment should provide evidence of students' abilities to describe the inputs and outputs of photosynthesis, not the specific biochemical steps. (e.g. photosystems, electron transport, and Calvin cycle).

Crosscutting Concepts: Energy and Matter
• Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
SL.9-12.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.	**N/A**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-LS1-6 From Molecules to Organisms: Structure and Processes

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking **❻ Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student- generated sources of evidence consistent with scientific ideas, principles, and theories.** **• Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Organization for Matter and Energy Flow:** • (Builds on HS-LS1-5) The sugar molecules thus formed contain carbon, hydrogen, and oxygen: their hydrocarbon backbones are used to make amino acids and other carbon-based molecules that can be assembled into large molecules that can be assembled into large molecules (such as proteins or DNA), used for example to form new cells. • As matter and energy flow through different organization levels of living systems, chemical elements are recombined in different ways to form different products.	**HS-LS1-6** *Students who demonstrate understanding can:* **Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.** **Clarification Statement:** Emphasis is on students constructing explanations for how sugar molecules are formed through photosynthesis and the components of the reaction (i.e., carbon, hydrogen, oxygen). This hydrocarbon backbone is used to make amino acids and other carbon-based molecules that can be assembled (anabolism) into larger molecules (such as proteins or DNA). **Assessment Boundary:** Assessment does not include the details of the specific chemical reactions or identification of macromolecules.

Crosscutting Concepts: Energy and Matter

• Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.9-10.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations and descriptions. **WHST.9-12.2** Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. **WHST.9-12.5** Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. **WHST.9-12.9** Draw evidence from informational texts to support analysis, reflection, and research.	**N/A**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

BIOLOGY I

HS-LS1-7 From Molecules to Organisms: Structure and Processes

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ **Developing and using models** **Modeling in 9–12 builds on K–8 and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.** • **Use a model based on evidence to illustrate the relationships between systems or between components of a system.** ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Organization for Matter and Energy Flow in Organisms:** (Builds on HS-LS1-6) • As matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different ways to form different products. • As a result of these chemical reactions, energy is transferred from one system of interacting molecules to another. • Cellular respiration is a chemical process in which the bonds of food molecules and oxygen molecules are broken and new compounds are formed that can transport energy to muscles. • Cellular respiration also releases the energy needed to maintain body temperature despite ongoing energy transfer to the surrounding environment.	**HS-LS1-7** *Students who demonstrate understanding can:* **Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.** **Clarification Statement:** Emphasis is on the conceptual understanding of the inputs and outputs of the process of cellular respiration. Examples of models could include diagrams, chemical equations, conceptual models, and/or laboratory investigations. **Assessment Boundary:** Assessment should not include identification of the steps or specific processes involved in cellular respiration (e.g. glycolysis and Kreb's Cycle).

Crosscutting Concepts: Energy and Matter

- Energy cannot be created or destroyed—it only moves between one place and another place, between objects and/or fields, or between systems.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
SL.9-12.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.	**N/A**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-LS2-1 Ecosystems: Interactions, Energy, and Dynamics

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data **❺ Using mathematics and computational thinking** **Mathematical and computational thinking at the 9–12 level builds on K–8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.** **• Use mathematical and/or computational representations of phenomena or design solutions to support explanations.** ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Interdependent Relationships in Ecosystems:** • Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. These limits result from such factors as the availability of living and nonliving resources and from such challenges such as predation, competition, and disease. • Organisms would have the capacity to produce populations of great size were it not for the fact that environments and resources are finite. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem.	**HS-LS2-1** *Students who demonstrate understanding can:* **Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.** **Clarification Statement:** Emphasis is on quantitative analysis and comparison of the relationships among interdependent factors including boundaries, resources, climate and competition. Examples of mathematical comparisons could include graphs, charts, histograms, or population changes gathered from simulations or historical data sets. **Assessment Boundary:** Assessment does not include deriving mathematical equations to make comparisons.

Crosscutting Concepts: Scale, Proportion, and Quantity
• The significance of a phenomenon is dependent on the scale, proportion, and quantity at which it occurs.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.9-10.1 Cite specific textual evidence to support analysis of science and technical texts, attending to precise details and explanations or descriptions. **WHST.9-12.2** Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **HSN-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling. **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-LS2-2 Ecosystems: Interactions, Energy, and Dynamics

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data **❺ Using mathematics and computational thinking** **Mathematical and computational thinking at the 9–12 level builds on K–8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.** **• Use mathematical representations of phenomena or design solutions to support and revise explanations.** ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Interdependent Relationships in Ecosystems:** • Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. These limits result from such factors as the availability of living and nonliving resources and from such challenges such as predation, competition, and disease. • Organisms would have the capacity to produce populations of great size were it not for the fact that environments and resources are finite. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem. **Ecosystem Dynamics, Functioning, and Resilience:** • A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. • If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. • Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability.	**HS-LS2-2** *Students who demonstrate understanding can:* **Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.** **Clarification Statement:** Examples of mathematical representations include finding the average, determining trends, and using graphical comparisons of multiple sets of data. **Assessment Boundary:** Assessment is limited to provided data.

Crosscutting Concepts: Scale, Proportion, and Quantity
• Using the concept of orders of magnitude allows one to understand how a model at one scale relates to a model at another scale.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.9-10.1 Cite specific textual evidence to support analysis of science and technical texts, attending to precise details and explanations or descriptions. **WHST.9-12.2** Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **HSN-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling. **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-LS2-3 Ecosystems: Interactions, Energy, and Dynamics

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking **❻ Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student- generated sources of evidence consistent with scientific ideas, principles, and theories.** **• Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Cycles of Matter and Energy Transfer in Ecosystems:** • Photosynthesis and cellular respiration (including anaerobic processes) provide most of the energy for life processes.	**HS-LS2-3** *Students who demonstrate understanding can:* **Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.** **Clarification Statement:** Emphasis is on conceptual understanding of the role of aerobic and anaerobic respiration in different environments (e.g., chemosynthetic bacteria, yeast, and muscle cells). **Assessment Boundary:** Assessment does not include the specific chemical processes of either aerobic or anaerobic respiration.

Crosscutting Concepts: Energy and Matter
• Energy drives the cycling of matter within and between systems.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.9-10.1 Cite specific textual evidence to support analysis of science and technical texts, attending to precise details and explanations or descriptions. **WHST.9-12.2** Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. **WHST.9-12.5** Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.	**N/A**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-LS2-4 Ecosystems: Interactions, Energy, and Dynamics

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ **Using mathematics and computational thinking** **Mathematical and computational thinking at the 9–12 level builds on K–8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.** • **Use mathematical representations of phenomena or design solutions to support claims.** ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Cycles of Matter and Energy Transfer in Ecosystems:** • Plants or algae form the lowest level of the food web. • At each link upward in a food web, only a small fraction of the matter consumed at the lower level is transferred upward, to produce growth and release energy in cellular respiration at the higher level. • Given this inefficiency, there are generally fewer organisms at higher levels of a food web. • Some matter reacts to release energy for life functions, some matter is stored in newly made structures, and much is discarded. • The chemical elements that make up the molecules of organisms pass through food webs and into and out of the atmosphere and soil, and they are combined and recombined in different ways. • At each link in an ecosystem, matter and energy are conserved.	**HS-LS2-4** *Students who demonstrate understanding can:* **Use a mathematical representation to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.** **Clarification Statement:** Emphasis is on using a mathematical model of stored energy in biomass to describe the transfer of energy from one trophic level to another and that matter and energy are conserved as matter cycles and energy flows through ecosystems. Emphasis is on atoms and molecules such as carbon, oxygen, hydrogen and nitrogen being conserved as they move through an ecosystem. **Assessment Boundary:** The assessment should provide evidence of students' abilities to develop and use energy pyramids, food chains, food webs, and other models from data sets.

Crosscutting Concepts: Energy and Matter
- Energy cannot be created or destroyed- it only moves between one place and another place, between objects and/or fields, or between systems.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
N/A	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **HSN-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling. **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-LS2-5 Ecosystems: Interactions, Energy, and Dynamics

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ **Developing and using models Modeling in 9–12 builds on K–8 and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.** • **Develop a model based on evidence to illustrate the relationships between systems or components of a system.** ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Cycles of Matter and Energy Transfer in Ecosystems:** • Photosynthesis and cellular respiration are important components of the carbon cycle, in which carbon is exchanged among the biosphere, atmosphere, oceans, and geosphere through chemical, physical, geological, and biological processes. **Energy in Chemical Processes:** (secondary to HS-LS2-5) • The main way that solar energy is captured and stored on Earth is through the complex chemical process known as photosynthesis.	**HS-LS2-5** *Students who demonstrate understanding can:* **Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.** **Clarification Statement:** Examples of models could include simulations and mathematical models (e.g., chemical equations that demonstrate the relationship between photosynthesis and cellular respiration. **Assessment Boundary:** Assessment does not include the specific chemical steps of photosynthesis and respiration.

Crosscutting Concepts: Systems and Models

• Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions— including energy, matter, and information flows—within and between systems at different scales.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
N/A	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-LS2-6 Ecosystems: Interactions, Energy, and Dynamics

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) **❼ Engaging in argument from evidence** **Engaging in argument from evidence in 9-12 builds on K-8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about natural and designed worlds. Arguments may also come from current scientific or historical episodes in science.** **• Evaluate the claims, evidence, and reasoning behind currently accepted explanations or solutions to determine the merits of arguments.** ❽ Obtaining, evaluating, and communicating information	**Ecosystem Dynamics, Functioning, and Resilience:** • A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. • If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. • Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability.	**HS-LS2-6** *Students who demonstrate understanding can:* **Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.** **Clarification Statement:** Examples of changes in ecosystem conditions could include modest biological or physical changes, such as moderate hunting or a seasonal flood; and extreme changes, such as volcanic eruption or sea level rise. **Assessment Boundary:** The assessment should provide evidence of students' abilities to derive trends from graphical representations of population trends. Assessments should focus on describing drivers of ecosystem stability and change, not on the organismal mechanisms of responses and interactions.

Crosscutting Concepts: Stability and Change

• Much of science deals with constructing explanations of how things change and how they remain stable.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.9-10.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations and descriptions. **RST.9-10.7** Translate quantitative or technical information expressed in words in a text into visual form (e.g. a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. **RST.9-10.8** Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.	**MP.2** Reason abstractly and quantitatively. **HSS-ID.A.1** Represent data with plots on the real number line. **HSS-IC.A.1** Understand statistics as a process for making inferences about population parameters based on a random sample from that population. **HSS-IC.B.6** Evaluate reports based on data.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-LS2-8 Ecosystems: Interactions, Energy, and Dynamics

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) **❼ Engaging in argument from evidence** **Engaging in argument from evidence in 9-12 builds on K-8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about natural and designed worlds. Arguments may also come from current scientific or historical episodes in science.** **• Evaluate the claims, evidence, and reasoning behind currently accepted explanations or solutions to determine the merits of arguments.** ❽ Obtaining, evaluating, and communicating information	**Social Interactions and Group Behavior:** • Group behavior has evolved because membership can increase the chances of survival for individuals and their genetic relatives.	**HS-LS2-8** *Students who demonstrate understanding can:* **Evaluate evidence for the role of group behavior on individual and species' chances to survive and reproduce.** **Clarification Statement:** Emphasis is on advantages of grouping behaviors (e.g., flocking, schooling, herding) and cooperative behaviors (e.g., hunting, migrating, swarming) on survival and reproduction. **Assessment Boundary:** The assessment should provide evidence of students' abilities to: (1) distinguish between group versus individual behavior, (2) identify evidence supporting the outcomes of group behavior, and (3) develop logical and reasonable arguments based on evidence.

Crosscutting Concepts: Cause and Effect

• Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.9-10.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations and descriptions. **RST.9-10.7** Translate quantitative or technical information expressed in words in a text into visual form (e.g. a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. **RST.9-10.8** Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.	**N/A**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-LS3-1 Heredity: Inheritance and Variation of Traits

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ **Asking questions (for science) and defining problems (for engineering)** **Asking questions and defining problems in grades 9–12 builds from grades K–8 experiences and progresses to formulating, refining, and evaluating empirically testable questions and design problems using models and simulations.** • **Ask question that arise from examining models or a theory to clarify relationships** ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Structure and Function:** (secondary to HS-LS3-1) • All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins. **Inheritance of Traits:** • Each chromosome consists of a single very long DNA molecule, and each gene on the chromosome is a particular segment of that DNA. • The instructions for forming species' characteristics are carried in DNA. • All cells in an organism have the same genetic content, but the genes used (expressed) by the cell may be regulated in different ways. • Not all DNA codes for protein, some segments of DNA are involved in regulatory or structural functions, and some have no as-yet known functions.	**HS-LS3-1** *Students who demonstrate understanding can:* **Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.** **Clarification Statement:** Emphasis should be on asking questions and making predictions to obtain reliable information about the role of DNA and chromosomes in coding the instructions for traits (e.g., pedigrees, karyotypes, genetic disorders, Punnett squares). **Assessment Boundary:** Assessments may include codominance, incomplete dominance, and sex-linked traits, but should not include dihybrid crosses.

Crosscutting Concepts: Cause and Effect

• Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.9-10.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations and descriptions.	**N/A**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-LS3-2 Heredity: Inheritance and Variation of Traits

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) **❼ Engaging in argument from evidence** **Engaging in argument from evidence in 9-12 builds on K-8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about natural and designed worlds. Arguments may also come from current scientific or historical episodes in science.** • **Make and defend a claim based on evidence about the natural world that reflects scientific knowledge, and student-generated evidence.** ❽ Obtaining, evaluating, and communicating information	**Variation of Traits:** • In sexual reproduction, chromosomes can sometimes swap sections during the process of meiosis (cell division), thereby creating new genetic combinations and thus more genetic variation. • Although DNA replication is tightly regulated and remarkably accurate, errors do occur and result in mutations, which are also cause mutations in genes, and variables mutations are inherited. • Environmental factors also affect expression of traits, and hence affect the probability of occurrences of traits in the population. Thus the variation and distribution of traits observe depends on both genetic and environmental factors.	**HS-LS3-2** *Students who demonstrate understanding can:* **Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.** **Clarification Statement:** Emphasis is on using data to support arguments for the way variation occurs. **Assessment Boundary:** Assessment does not include the phases of meiosis or the biochemical mechanisms of specific steps in the process.

Crosscutting Concepts: Cause and Effect

• Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.9-10.1 Cite specific textual evidence to support analysis of science and technical texts, attending to precise details or explanations or descriptions. **WHST.9-12.1** Write arguments focused on discipline-specific content.	**MP.2** Reason abstractly and quantitatively.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-LS3-3 Heredity: Inheritance and Variation of Traits

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ **Analyzing and interpreting data** **Analyzing data in 9–12 builds on K–8 and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data.** • **Apply concepts of statistics and probability (including determining function fits to data, slope, intercept, and correlation coefficient for linear fits) to scientific and engineering questions and problems, using digital tools when feasible.** ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Variation of Traits:** • Environmental factors also affect expression of traits, and hence affect the probability of occurrences of traits in the population. Thus the variation and distribution of traits observed depends on both genetic and environmental factors.	**HS-LS3-3** *Students who demonstrate understanding can:* **Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.** **Clarification Statement:** Emphasis is on distribution and variation of traits in a population and the use of mathematics (e.g., calculations of frequencies in Punnett squares, graphical representations) to describe the distribution. **Assessment Boundary:** The assessment should provide evidence of students' abilities to use mathematical reasoning to explain the variation observed in a population as a combination of genetic and environmental factors. Hardy-Weinberg calculations are beyond the intent.

Crosscutting Concepts: Scale, Proportion and Quantity
• Algebraic thinking is used to examine scientific data and predict the effect of a change in one variable on another (e.g., linear growth vs. exponential growth).

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
N/A	**MP.2** Reason abstractly and quantitatively.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-LS4-1 Biological Unity and Diversity

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ **Analyzing and interpreting data** **Analyzing data in 9-12 builds on K-8 experiences and progress to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data.** • **Analyze and interpret data to determine similarities and differences in findings.** ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Evidence of Common Ancestry and Diversity:** • Genetic information provides evidence of common ancestry and diversity. DNA sequences vary among species, but there are many overlaps; in fact, the ongoing branching that produces multiple lines of descent can be inferred by comparing the DNA sequences of different organisms. Such information is also derivable from the similarities and differences in amino acid sequences and from anatomical and embryological evidence.	**HS-LS4-1** *Students who demonstrate understanding can:* **Analyze and evaluate how evidence such as similarities in DNA sequences, anatomical structures, and order of appearance of structures during embryo-logical development contribute to the scientific explanation of biological diversity.** **Clarification Statement:** Emphasis is on identifying sources of scientific evidence. **Assessment Boundary:** The assessment should provide evidence of students' abilities to evaluate and analyze evidence (e.g. cladograms, analogous/homologous structures, and fossil records).

Crosscutting Concepts: Patterns

• Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. **WHST.9-12.2** Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. **WHST.9-12.9** Draw evidence from informational texts to support analysis, reflection, and research. **SL.11-12.4** Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.	**MP.2** Reason abstractly and quantitatively.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-LS4-2 Biological Unity and Diversity

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking **❻ Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student- generated sources of evidence consistent with scientific ideas, principles, and theories.** **• Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Natural Selection:** • Natural selection occurs only if there is both (1) variation in the genetic information between organisms in a population and (2) variation in the expression of that genetic information—that is, trait variation—that leads to differences in performance among individuals.	**HS-LS4-2** *Students who demonstrate understanding can:* **Construct an explanation based on evidence that biological diversity is influenced by (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.** **Clarification Statement:** Emphasis is on using evidence to explain the influence each of the four factors has on number of organisms, behaviors, morphology, or physiology in terms of ability to compete for limited resources and subsequent survival of individuals and adaptation of species. Examples of evidence could include mathematical models such as simple distribution graphs and proportional reasoning. **Assessment Boundary:** Assessment does not include genetic drift, gene flow through migration, and co-evolution.

Crosscutting Concepts: Cause and Effect
• Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. **WHST.9-12.2** Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. **WHST.9-12.9** Draw evidence from informational texts to support analysis, reflection, and research. **SL.11-12.4** Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.	**MP.2** Reason abstractly and quantitatively. **MP. 4** Model with mathematics.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-LS4-3 Biological Unity and Diversity

Science & Engineering Practices

❶ Asking questions (for science) and defining problems (for engineering)
❷ Developing and using models
❸ Planning and carrying out investigations
❹ **Analyzing and interpreting data**
Analyzing data in 9–12 builds on K–8 and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data.
- **Apply concepts of statistics and probability (including determining function fits to data, slope, intercept, and correlation coefficient for linear fits) to scientific and engineering questions and problems, using digital tools when feasible.**

❺ Using mathematics and computational thinking
❻ Constructing explanations (for science) and designing solutions (for engineering)
❼ Engaging in argument from evidence
❽ Obtaining, evaluating, and communicating information

Disciplinary Core Ideas

Natural Selection:
- Natural selection occurs only if there is both (1) variation in the genetic information between organisms in a population and (2) variation in the expression of that genetic information—that is, trait variation—that leads to differences in performance among individuals.
- The traits that positively affect survival are more likely to be reproduced, and thus are more common in the population.

Adaptation:
- Natural selection leads to adaptation, that is, to a population dominated by organisms that are anatomically, behaviorally, and physiologically well suited to survive and reproduce in a specific environment. That is, the differential survival and reproduction of organisms in a population that have an advantageous heritable trait leads to an increase in the proportion of individuals in future generations that have the trait and to a decrease in the proportion of individuals that do not.
- Adaptation also means that the distribution of traits in a population can change when conditions change.

Performance Expectations

HS-LS4-3
Students who demonstrate understanding can:

Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.

Clarification Statement:
Emphasis is on analyzing shifts in numerical distribution of traits and using these shifts as evidence to support explanations for adaptations.

Assessment Boundary:
The assessment should provide evidence of students' abilities to analyze shifts in numerical distribution of traits as evidence to support explanations. Analysis is limited to basic statistical and graphical analysis, not gene frequency calculations.

Crosscutting Concepts: Patterns
- Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations and phenomena.

Oklahoma Academic Standards Connections

ELA/Literacy

RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

WHST.9-12.9 Draw evidence from informational texts to support analysis, reflection, and research.

Mathematics

MP.2 Reason abstractly and quantitatively.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-LS4-4 Biological Unity and Diversity

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ **Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student- generated sources of evidence consistent with scientific ideas, principles, and theories.** • **Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Adaptation:** • Natural selection leads to adaptation, that is, to a population dominated by organisms that are anatomically, behaviorally, and physiologically well suited to survive and reproduce in a specific environment. • That is, the differential survival and reproduction of organisms in a population that have an advantageous heritable trait leads to an increase in the proportion of individuals in future generations that have the trait and to a decrease in the proportion of individuals that do not. • Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline–and sometimes the extinction–of some species.	**HS-LS4-4** *Students who demonstrate understanding can:* **Construct an explanation based on evidence for how natural selection leads to adaptation of populations.** **Clarification Statement:** Emphasis is on using data to provide evidence for how specific biotic and abiotic differences in ecosystems (such as ranges of seasonal temperature, long-term climate change, acidity, light, geographic barriers, or adaptation of other organisms) contribute to a change in gene frequency over time, leading to adaptation of populations. One example could be that as climate became more arid, grasses replaced forests, which led to adaptation in mammals over time (e.g. Increase tooth enamel and size of teeth in herbivores). **Assessment Boundary:** The assessment should measure students' abilities to differentiate types of evidence used in explanations.

Crosscutting Concepts: Cause and Effect
- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.9-10.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. **WHST.9-12.2** Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. **WHST.9-12.9** Draw evidence from informational texts to support analysis, reflection, and research.	**MP.2** Reason abstractly and quantitatively.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-LS4-5 Biological Unity and Diversity

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) **❼ Engaging in argument from evidence** **Engaging in argument from evidence in 9-12 builds on K-8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about natural and designed worlds. Arguments may also come from current scientific or historical episodes in science.** **• Evaluate the evidence behind currently accepted explanations or solutions to determine the merits of arguments.** ❽ Obtaining, evaluating, and communicating information	**Adaptation:** • Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline–and sometimes the extinction–of some species. • Species become extinct because they can no longer survive and reproduce in their altered environment. If members cannot adjust to change that is too fast or drastic, the opportunity for the species' adaptation over time is lost.	**HS-LS4-5** *Students who demonstrate understanding can:* **Synthesize, communicate, and evaluate the information that describes how changes in environmental conditions can affect the distribution of traits in a population causing: 1) increases in the number of individuals of some species, 2) the emergence of new species over time, and 3) the extinction of other species.** **Clarification Statement:** Emphasis is on determining cause and effect relationships for how changes to the environment such as deforestation, fishing, application of fertilizers, drought, flood, and the rate of change of the environment affect distribution or disappearance of traits in species. **Assessment Boundary:** The assessment should provide evidence of students' abilities to explain the cause and effect for how changes to the environment affect distribution or disappearance of traits in species.

Crosscutting Concepts: Cause and Effect
• Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.11-12.8 Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. **WHST.9-12.9** Draw evidence from informational texts to support analysis, reflection, and research.	**MP.2** Reason abstractly and quantitatively.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

K-2

3-5

6-8

9-12

HS-ESS1-1 Earth's Place in the Universe

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ **Developing and using models Modeling in 9–12 builds on K–8 and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.** • **Develop a model based on evidence to illustrate the relationships between systems or components of a system.** ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**The Universe and Its Stars:** • The star called the sun is changing and will burn out over a lifespan of approximately 10 billion years. **Energy in Chemical Processes and Everyday Life:** (secondary to HS-ESS1-1) • Nuclear Fusion processes in the center of the sun release the energy that ultimately reaches Earth as radiation.	**HS-ESS1-1** *Students who demonstrate understanding can:* **Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation.** **Clarification Statement:** Emphasis is on the energy transfer mechanisms that allow energy from nuclear fusion in the sun's core to reach Earth. Examples of evidence for the model include observations of the masses and lifetimes of other stars, as well as the ways that the sun's radiation varies due to sudden solar flares ("space weather"), the 11-year sunspot cycle, and non-cyclic variations over centuries. **Assessment Boundary:** Assessment does not include details of the atomic and sub-atomic processes involved with the sun's nuclear fusion.

Crosscutting Concepts: Scale, Proportion, and Quantity
• The significance of a phenomenon is dependent on the scale, proportion, and quantity at which it occurs.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **HSN-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling. **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. **HAS-SSE.A.1** Interpret expressions that represent a quantity in terms of its context. **HAS-CED.A.2** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. **HAS-CED.A.2** Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-ESS1-2 Earth's Place in the Universe

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ **Developing and using models Modeling in 9–12 builds on K–8 and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.** • **Develop a model based on evidence to illustrate the relationships between systems or components of a system.** ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Earth and the Solar System:** • The solar system consists of the sun and a collection of objects of varying sizes and conditions – including planets and their moons – that are held in orbit around the sun by its gravitational pull on them.	**HS-ESS1-2** *Students who demonstrate understanding can:* **Develop models to describe the sun's place in relation to the Milky Way galaxy and the distribution of galaxies and galaxy clusters in the Universe.** **Clarification Statement:** Mathematical models can focus on the logarithmic powers-of-ten relationship among the sun, its solar system, the Milky Way galaxy, the local cluster of galaxies, and the universe, these relationships can also be investigated graphically, using 2D or 3D scaled models, or through computer programs, either pre-made or student-written. **Assessment Boundary:** Details about the mapped distribution of galaxies and clusters are not assessed.

Crosscutting Concepts: Scale, Proportion, and Quantity
• The significance of a phenomenon is dependent on the scale, proportion, and quantity at which it occurs.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
N/A	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

K-2 3-5 6-8 9-12

HS-ESS1-3 Earth's Place in the Universe

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence **❽ Obtaining, evaluating, and communicating information** **Obtaining, evaluating, and communicating information in 9–12 builds on K –8 and progresses to evaluating the validity and reliability of the claims, methods, and designs.** **• Communicate scientific (e.g. about phenomena and/or the process of development and the design and performance of a proposed process of system) in multiple formats (including orally, graphically, textually, and mathematically).**	**The Universe and Its Stars:** • The study of stars' light spectra and brightness is used to identify compositional elements of stars, their movements, and their distances from Earth. • Other than the hydrogen and helium, nuclear fusion within stars produces all atomic nuclei lighter than and including iron, and the process releases electro-magnetic energy. • Heavier elements are produced when certain massive stars achieve a supernova stage and explode.	**HS-ESS1-3** *Students who demonstrate understanding can:* **Communicate scientific ideas about the way stars, over their life cycle, produce elements.** **Clarification Statement:** Emphasis is on the way nucleo-synthesis, and therefore the different elements created, depend on the mass of a star and the stage of its lifetime. **Assessment Boundary:** Details of the many different nucleosynthesis pathways for stars of differing masses are not assessed.

Crosscutting Concepts: Energy and Matter

• In nuclear processes, atoms are not conserved, but the total number of protons plus neutrons is conserved.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. **SL.11-12.4** Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and w ell-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.	**MP.2** Reason abstractly and quantitatively.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-ESS1-4 Earth's Place in the Universe

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ **Using mathematics and computational thinking** **Mathematical and computational thinking at the 9–12 level builds on K–8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.** • **Use mathematical representations of phenomena or design solutions to support and revise explanations.** ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Earth and the Solar System:** • Kepler's laws describe common features of the motions of orbiting objects, including their elliptical paths around the sun. Orbits may change due to the gravitational effects from, or collisions with, other objects in the solar system. ——— ** Connections to Engineering, Technology, and Application of Science* **Interdependence of Science, Engineering, and Technology:** • Science and engineering compliment each other in the cycle known as research and development (R&D). Many R&D projects may involve scientists, engineers, and others with wide ranges of expertise.	**HS-ESS1-4** *Students who demonstrate understanding can:* **Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.** **Clarification Statement:** Emphasis is on Newtonian gravitational laws governing orbital motions, which apply to human-made satellites as well as planets and moons. (e.g. graphical representations of orbits) **Assessment Boundary:** Mathematical representations for the gravitational attraction of bodies and Kepler's Laws of orbital motions should not deal with more than two bodies, nor involve calculus.

Crosscutting Concepts: Scale, Proportion, and Quantity
- Algebraic thinking is used to examine scientific data and predict the effect of a change in one variable on another (e.g., linear growth vs. exponential growth).

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
N/A	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **HSN-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling. **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. **HAS-SSE.A.1** Interpret expressions that represent a quantity in terms of its context. **HAS-CED.A.2** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. **HAS-CED.A.2** Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-ESS1-5 Earth's Place in the Universe

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) **❼ Engaging in argument from evidence** **Engaging in argument from evidence in 9-12 builds on K-8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about natural and designed worlds. Arguments may also come from current scientific or historical episodes in science.** **• Apply scientific reasoning to link evidence to the claims to assess the extent to which the reasoning and data support the explanation or conclusion.** ❽ Obtaining, evaluating, and communicating information	**Plate Tectonics and Large-Scale System Interactions:** • Plate tectonics is the unifying theory that explains the past and current movements of the rocks at Earth's surface and provides a framework for understanding its geologic history.	**HS-ESS1-5** *Students who demonstrate understanding can:* **Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.** **Clarification Statement:** Emphasis is on the ability of plate tectonics to explain the ages of crustal rocks. Examples include evidence of the ages of oceanic crust increasing with distance from mid-ocean ridges (a result of plate spreading) and the ages of North American continental crust decreasing with distance away from a central ancient core (a result of past plate interactions). **Assessment Boundary:** N/A

Crosscutting Concepts: Stability and Change

• Much of science deals with constructing explanations of how things change and how they remain stable.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. **RST.11-12.8** Evaluate the hypotheses, data, analysis and conclusion in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. **WHST.9-12.2** Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.	**MP.2** Reason abstractly and quantitatively. **HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **HSN-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling. **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-ESS1-6 Earth's Place in the Universe

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking **❻ Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student- generated sources of evidence consistent with scientific ideas, principles, and theories.** • **Apply scientific reasoning to link evidence to the claims to assess the extent to which the reasoning and data support the explanation or conclusion.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**History of Planet Earth:** • Although active geologic processes, such as plate tectonics and erosion, have destroyed or altered most of the very early rock record on Earth, other objects in the solar system, such as lunar rocks, asteroids, and meteorites, have changed little over years. Studying these objects can provide information about Earth's formation and early history.	**HS-ESS1-6** *Students who demonstrate understanding can:* **Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.** **Clarification Statement:** Emphasis is on using available evidence within the solar system to reconstruct the early history of Earth. Examples of evidence include materials obtained through space exploration, radiometric dating of meteorites and Earth's oldest minerals, the sizes and compositions of solar system objects, and the impact cratering record of planetary surfaces.

Crosscutting Concepts: Stability and Change

• Much of science deals with constructing explanations of how things change and how they remain stable.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. **RST.11-12.8** Evaluate the hypotheses, data, analysis and conclusion in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. **WHST.9-12.1** Write arguments focused on discipline-specific content.	**MP.2** Reason abstractly and quantitatively. **HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **HSN-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling. **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. **HSF-IF.B.5** Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. **HSS-ID.B.6** Represent data on two quantitative variables on a scatter plot, and describe how those variables are related.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-ESS2-1 Earth's Systems

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ **Developing and using models Modeling in 9–12 builds on K–8 and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.** • **Develop a model based on evidence to illustrate the relationships between systems or components of a system.** ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Earth Materials and Systems:** • Earth's systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes. **Plate Tectonics and Large-Scale System Interactions:** • Plate tectonics is the unifying theory that explains the past and current movements of rocks at Earth's surface and provides a framework for understanding its geologic history. • Plate movements are responsible for most continental and ocean-floor features and for the distribution of most rocks and minerals within Earth's crust.	**HS-ESS2-1** *Students who demonstrate understanding can:* **Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.** **Clarification Statement:** Emphasis is on how the appearance of land features (such as mountains, valleys, and plateaus) and sea-floor features (such as trenches, ridges, and seamounts) are a result of both constructive forces (such as volcanism, tectonic uplift, and orogeny) and destructive mechanisms (such as weathering, erosion, and mass wasting). **Assessment Boundary:** Assessment does not include memorization of the details of the formation of specific geographic features of Earth's surface.

Crosscutting Concepts: Stability and Change

• Change and rates of change can be quantified and modeled over very short or very long periods of time. Some system changes are irreversible.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
SL.11-12.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **HSN-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling. **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. **HSF-IF.B.6** Calculate and interpret the average rate of change of function (presented symbolically or as a table) over specified interval. Estimate the rate of change from a graph.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-ESS2-2 Earth's Systems

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations **❹ Analyzing and interpreting data** **Analyzing data in 9–12 builds on K–8 and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data.** **• Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution.** ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Earth Materials and Systems:** • Earth's systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes. **Weather and Climate:** • The foundation for Earth's: global climate system is the electromagnetic radiation from the sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy's re-radiation into space.	**HS-ESS2-2** *Students who demonstrate understanding can:* **Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks and interactions that cause changes to other Earth's systems.** **Clarification Statement:** Examples could be taken from system interactions, such as how the loss of ground vegetation causes an increase in water runoff and soil erosion, which limits additional vegetation patterns; how dammed rivers increase ground-water recharge, decrease sediment transport, and increase coastal erosion; or how the loss of wetlands causes a decrease in local humidity that further reduces the wetland extent. Examples could also include climate feedbacks that increase surface temperatures through geologic time. **Assessment Boundary:** N/A

Crosscutting Concepts: Stability and Change

• Feedback (negative or positive) can stabilize or destabilize a system.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. **RST.11-12.2** Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.	**MP.2** Reason abstractly and quantitatively. **HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-ESS2-3 Earth's Systems

Science & Engineering Practices

❶ Asking questions (for science) and defining problems (for engineering)
❷ **Developing and using models**
Modeling in 9–12 builds on K–8 and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.
- **Develop a model based on evidence to illustrate the relationships between systems or components of a system.**

❸ Planning and carrying out investigations
❹ Analyzing and interpreting data
❺ Using mathematics and computational thinking
❻ Constructing explanations (for science) and designing solutions (for engineering)
❼ Engaging in argument from evidence
❽ Obtaining, evaluating, and communicating information

Disciplinary Core Ideas

Earth Materials and Systems:
- Evidence from deep probes and seismic waves, reconstructions of historical changes in Earth's surface features, its magnetic field, and an understanding of physical and chemical processes lead to a model of Earth with a hot but solid inner core, a liquid outer core, a solid mantle and crust.
- Motions of the mantle and its plates occur primarily through thermal convection, which involves the cycling of matter due to the outward flow of energy from Earth's interior and gravitational movement of denser materials toward the interior.

Plate Tectonics and Large-Scale System Interactions:
- The radioactive decay of unstable isotopes continually generates new energy within Earth's crust and mantle, providing the primary source of the heat that drives mantle convection.
- Plate tectonics can be viewed as the surface expression of mantle convection.

Waves Properties:
(secondary to HS-ESS2-3)
- Geologists use seismic waves and their reflection at interfaces between layers to probe structures deep in the planet.

Performance Expectations

HS-ESS2-3
Students who demonstrate understanding can:

Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.

Clarification Statement:
Emphasis is on both a one-dimensional model of Earth, with radial layers determined by density, and a three-dimensional model, which is controlled by mantle convection and the resulting plate tectonics. Examples of evidence include maps of the Earth's surface features as well as three-dimensional structure in the subsurface, obtained from seismic waves, records of the rate of change of Earth's magnetic field (as constraints on convection in the outer core), and prediction of the composition of Earth's layers from high-pressure laboratory experiments.

Assessment Boundary:
N/A

Crosscutting Concepts: Energy and Matter
- Energy drives the cycling of matter within and between systems.

Oklahoma Academic Standards Connections

ELA/Literacy

RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

SL.11-12.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

Mathematics

MP.2 Reason abstractly and quantitatively.

MP.4 Model with mathematics.

HSN-Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

HSN-Q.A.2 Define appropriate quantities for the purpose of descriptive modeling.

HSN-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-ESS2-4 Earth's Systems

Science & Engineering Practices

❶ Asking questions (for science) and defining problems (for engineering)
❷ Developing and using models
❸ Planning and carrying out investigations
❹ **Analyzing and interpreting data**
Analyzing data in 9–12 builds on K–8 and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data.
- **Analyze data using computational models in order to make valid and reliable scientific claims.**

❺ Using mathematics and computational thinking
❻ Constructing explanations (for science) and designing solutions (for engineering)
❼ Engaging in argument from evidence
❽ Obtaining, evaluating, and communicating information

Disciplinary Core Ideas

Earth and the Solar System:
(secondary to HS-ESS2-4)
- Cyclical changes in the shape of Earth's orbit around the sun, together with changes in the tilt of the planet's axis of rotation, both occurring over hundreds of thousands of years, have altered the intensity and distribution of sunlight falling on the Earth. These phenomena cause a cycle of ice ages and other changes in climate.

Earth Materials and Systems:
- The geological record shows that changes to global and regional climate can be caused by interactions among changes in the sun's energy output or Earth's orbit, tectonic events, ocean circulation, volcanic activity, glaciers, vegetation, and human activities. These changes can occur on a variety of time scales from sudden (e.g., volcanic ash clouds) to intermediate (ice ages) to very long-term tectonic cycles.

Weather and Climate:
- The foundation for Earth's global climate system is the electromagnetic radiation from the sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy's re-radiation into space.

Performance Expectations

HS-ESS2-4
Students who demonstrate understanding can:

Analyze and interpret data to explore how variations in the flow of energy into and out of Earth's systems result in changes in atmosphere and climate.

Clarification Statement:
Changes differ by timescale, from sudden (large volcanic eruption, ocean circulation); to intermediate (ocean circulation, solar output, human activity) and long-term (Earth's orbit and the orientation of its axis and changes in atmospheric composition). Examples of human activities could include fossil fuel combustion, cement production, or agricultural activity and natural processes such as changes in incoming solar radiation or volcanic activity. Examples of data can include tables, graphs, maps of global and regional temperatures, and atmospheric levels of gases.

Assessment Boundary:
N/A

Crosscutting Concepts: Cause and Effect
- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

Oklahoma Academic Standards Connections

ELA/Literacy

SL.11-12.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

Mathematics

MP.2 Reason abstractly and quantitatively.

MP.4 Model with mathematics.

HSN-Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

HSN-Q.A.2 Define appropriate quantities for the purpose of descriptive modeling.

HSN-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-ESS2-5 Earth's Systems

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ **Planning and carrying out investigations** **Planning and carrying out investigations in 9-12 builds on 6-8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models.** • **Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.** ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**The Role of Water in Earth's Surface Processes:** • The abundance of liquid water on Earth's surface and its unique combination of physical and chemical properties are central to the planet's dynamics. These properties include water's exceptional capacity to absorb, store, and release large amounts of energy, transmit sunlight, expand upon freezing, dissolve and transport materials, and lower the viscosities and melting points of rocks.	**HS-ESS2-5** *Students who demonstrate understanding can:* **Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.** **Clarification Statement:** Emphasis is on mechanical and chemical investigations with water and a variety of solid materials to provide the evidence for connections between the hydrologic cycle and system interactions commonly known as the rock cycle. Examples of mechanical investigations include stream transportation and deposition using a stream table, erosion using variations in soil moisture content, or frost wedging by the expansion of water as it freezes. Examples of chemical investigations include chemical weathering and recrystallization (by testing the solubility of different materials) or melt generation (by examining how water lowers the melting temperature of most solids). **Assessment Boundary:** N/A

Crosscutting Concepts: Structure and Function

• The functions and properties of natural and designed objects and systems can be inferred from their overall structure, the way their components are shaped and used, and the molecular substructures of its various materials.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
WHST.9-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.	**HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-ESS2-6 Earth's Systems

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ **Developing and using models** **Modeling in 9–12 builds on K–8 and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.** • **Develop a model based on evidence to illustrate the relationships between systems or components of a system.** ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Biogeology:** • Organisms ranging from bacteria to human beings are a major driver of the global carbon and they influence global climate by modifying the chemical makeup of the atmosphere. • The abundance of carbon in the atmosphere is reduced through the ocean floor accumulation of marine sediments and the accumulation of plant biomass.	**HS-ESS2-6** *Students who demonstrate understanding can:* **Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.** **Clarification Statement:** Emphasis is on modeling biogeochemical cycles that include the cycling of carbon through the ocean, atmosphere, soil, and biosphere (including humans), providing the foundation for living organisms. **Assessment Boundary:** N/A

Crosscutting Concepts: Energy and Matter

• The total amount of energy and matter in closed systems is conserved.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
N/A	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **HSN-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling. **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-ESS2-7 Earth's Systems

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) **❼ Engaging in argument from evidence** **Engaging in argument from evidence in 9-12 builds on K-8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about natural and designed worlds. Arguments may also come from current scientific or historical episodes in science.** **• Construct an oral and written argument or counter- arguments based on data and evidence.** ❽ Obtaining, evaluating, and communicating information	**Weather and Climate:** • Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen. **Biogeology:** • The many dynamic and delicate feedback mechanisms between the biosphere and other Earth systems cause a continual co-evolution of Earth's surface and the life that exists on it.	**HS-ESS2-7** *Students who demonstrate understanding can:* **Construct an argument based on evidence about the simultaneous co-evolution of Earth's systems and life on Earth.** **Clarification Statement:** Emphasis is on the dynamic causes, effects, and feedbacks between the biosphere and Earth's other systems, whereby geoscience factors influence conditions for life, which in turn continuously alters Earth's surface. Examples include how photosynthetic life altered the atmosphere through the production of oxygen, which in turn increased weathering rates and affected animal life; how microbial life on land increased the formation of soil, which in turn allowed for the development of land plant species; or how the changes in coral species created reefs that altered patterns of erosion and deposition along coastlines and provided habitats to support biodiversity. Geo-logic timescale should be considered with the emphases above. **Assessment Boundary:** Assessment does not include a comprehensive understanding of the mechanisms of how the biosphere interacts with all of Earth's other systems.

Crosscutting Concepts: Stability and Change
• Much of science deals with constructing explanations of how things change and how they remain stable.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
WHST.9-12.1 Write arguments focused on discipline-specific content.	**N/A**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-ESS3-1 Earth and Human Activities

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking **❻ Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student- generated sources of evidence consistent with scientific ideas, principles, and theories.** **• Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Natural Resources:** • Resource availability has guided the development of human society. **Natural Hazards:** • Natural hazards and other geologic events have shaped the course of human history; [they] have significantly altered the sizes of human populations and have driven human migrations.	**HS-ESS3-1** *Students who demonstrate understanding can:* **Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.** **Clarification Statement:** Examples of key natural resources include access to fresh water (such as rivers, lakes, and groundwater), regions of fertile soils such as river deltas, and high concentrations of minerals and fossil fuels. Examples of natural hazards can be from interior processes (such as volcanic eruptions and earthquakes), surface processes (such as tsunamis, mass wasting and soil erosion), and severe weather (such as hurricanes, floods, and droughts). Natural hazards and other geologic events exhibit some non-random patterns of occurrence. Examples of the results of changes in climate that can affect populations or drive mass migrations include changes to sea level, regional patterns of temperature and precipitation, and the types of crops and livestock that can be raised. **Assessment Boundary:** N/A

Crosscutting Concepts: Cause and Effect

• Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. **WHST.9-12.2** Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.	**MP.2** Reason abstractly and quantitatively. **HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **HSN-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling. **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-ESS3-2 Earth and Human Activities

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ **Engaging in argument from evidence** **Engaging in argument from evidence in 9-12 builds on K-8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about natural and designed worlds. Arguments may also come from current scientific or historical episodes in science.** • **Evaluate competing design solutions to a real-world problem based on scientific ideas and principles, empirical evidence, and logical arguments regarding relevant factors (e.g. economic, societal, environmental, ethical considerations).** ❽ Obtaining, evaluating, and communicating information	**Natural Resources:** • All forms of energy production and other resource extraction have associated economic, social, environmental, and geopolitical costs and risks as well as benefits. New technologies and social regulations can change the balance of these factors. **Developing Possible Solutions:** (secondary to HS-ESS3-2) • When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts.	**HS-ESS3-2** *Students who demonstrate understanding can:* **Evaluate competing design solutions for developing, managing, and utilizing natural resources based on cost-benefit ratios.*** **Clarification Statement:** Emphasis is on the conservation, recycling, and reuse of resources (such as minerals and metals) where possible, and on minimizing impacts where it is not. Examples include developing best practices for agricultural, soil use, forestry, and mining. **Assessment Boundary:** N/A

Crosscutting Concepts: Cause and Effect
• N/A

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. **RST.11-12.8** Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.	**MP.2** Reason abstractly and quantitatively.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-ESS3-5 Earth and Human Activities

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking **❻ Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student- generated sources of evidence consistent with scientific ideas, principles, and theories.** **• Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Natural Resources:** • Most elements exist in Earth's crust at concentrations too low to be extracted, but in some locations-where geological processes have concentrated them-extraction is economically viable.	**HS-ESS3-5** *Students who demonstrate understanding can:* **Construct a scientific explanation from evidence for how geological processes lead to uneven distribution of natural resources.** **Clarification Statement:** Emphasis is on how geological processes have led to geological sedimentary basins that provide significant accumulations of crude oil and natural gas in some areas and not others and how geological processes lead to diverse soil profiles that support a diversity and range of agricultural crops and how plate-tectonics leads to concentrations of mineral deposits. **Assessment Boundary:** N/A

Crosscutting Concepts: Cause and Effect

• Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. **WHST.9-12.2** Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. **WHST.9-12.9** Draw evidence from informational texts to support analysis, reflection, and research. conclusions with other sources of information.	**N/A**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-LS2-1 Ecosystems: Interactions, Energy, and Dynamics

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data **❺ Using mathematics and computational thinking** **Mathematical and computational thinking at the 9–12 level builds on K–8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.** **• Use mathematical and/or computational representations of phenomena or design solutions to support explanations.** ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Interdependent Relationships in Ecosystems:** • Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. • These limits result from such factors as the availability of living and nonliving resources and from such challenges such as predation, competition, and disease. • Organisms would have the capacity to produce populations of great size were it not for the fact that environments and resources are finite. • This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem.	**HS-LS2-1** *Students who demonstrate understanding can:* **Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.** **Clarification Statement:** Emphasis is on quantitative analysis and comparison of the relationships among interdependent factors including boundaries, resources, climate and competition. Examples of mathematical comparisons could include graphs, charts, histograms, or population changes gathered from simulations or historical data sets. **Assessment Boundary:** Assessment does not include deriving mathematical equations to make comparisons.

Crosscutting Concepts: Scale, Proportion, and Quantity

• The significance of a phenomenon is dependent on the scale, proportion, and quantity at which it occurs.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. **WHST.9-12.2** Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **HSN-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling. **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-LS2-2 Ecosystems: Interactions, Energy, and Dynamics

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data **❺ Using mathematics and computational thinking** **Mathematical and computational thinking at the 9–12 level builds on K–8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.** **• Use mathematical representations of phenomena or design solutions to support and revise explanations.** ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Interdependent Relationships in Ecosystems:** • Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. • These limits result from such factors as the availability of living and nonliving resources and from such challenges such as predation, competition, and disease. • Organisms would have the capacity to produce populations of great size were it not for the fact that environments and resources are finite. • This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem. **Ecosystem Dynamics, Functioning, and Resilience:** • A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. • If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. • Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability.	**HS-LS2-2** *Students who demonstrate understanding can:* **Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.** **Clarification Statement:** Examples of mathematical representations include finding the average, determining trends, and using graphical comparisons of multiple sets of data. **Assessment Boundary:** The assessments should provide evidence of students' abilities to analyze and interpret the effect new information has on explanations (e.g., DDT effects on raptor populations, effects of water temperature below reservoirs on fish spawning, invasive species effects when spread to larger scale).

Crosscutting Concepts: Scale, Proportion, and Quantity
• Using the concept of orders of magnitude allows one to understand how a model at one scale relates to a model at another scale.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. **WHST.9-12.2** Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **HSN-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling. **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-LS2-4 Ecosystems: Interactions, Energy, and Dynamics

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data **❺ Using mathematics and computational thinking** **Mathematical and computational thinking at the 9–12 level builds on K–8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.** **• Use mathematical representations of phenomena or design solutions to support claims.** ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Cycles of Matter and Energy Transfer in Ecosystems:** • Plants or algae form the lowest level of the food web. • At each link upward in a food web, only a small fraction of the matter consumed at the lower level is transferred upward, to produce growth and release energy in cellular respiration at the higher level. • Given this inefficiency, there are generally fewer organisms at higher levels of a food web. • Some matter reacts to release energy for life functions, some matter is stored in newly made structures, and much is discarded. • The chemical elements that make up the molecules of organisms pass through food webs and into and out of the atmosphere and soil, and they are combined and recombined in different ways. • At each link in an ecosystem, matter and energy are conserved.	**HS-LS2-4** *Students who demonstrate understanding can:* **Use a mathematical representation to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.** **Clarification Statement:** Emphasis is on using a mathematical model of stored energy in biomass to describe the transfer of energy from one trophic level to another and that matter and energy are conserved as matter cycles and energy flows through ecosystems. Emphasis is on atoms and molecules such as carbon, oxygen, hydrogen and nitrogen being conserved as they move through an ecosystem. **Assessment Boundary:** The assessment should provide evidence of students' abilities to develop and use energy pyramids, food chains, food webs, and other models from data sets.

Crosscutting Concepts: Stability and Change

• Energy cannot be created or destroyed- it only moves between one place and another place, between objects and/or fields, or between systems.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
N/A	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **HSN-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling. **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-LS2-6 Ecosystems: Interactions, Energy, and Dynamics

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ **Engaging in argument from evidence** **Engaging in argument from evidence in 9-12 builds on K-8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about natural and designed worlds. Arguments may also come from current scientific or historical episodes in science.** • **Evaluate the claims, evidence, and reasoning behind currently accepted explanations or solutions to determine the merits of arguments.** ❽ Obtaining, evaluating, and communicating information	**Ecosystem Dynamics, Functioning, and Resilience:** • A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. • If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. • Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability.	**HS-LS2-6** *Students who demonstrate understanding can:* **Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.** **Clarification Statement:** Examples of changes in ecosystem conditions could include modest biological or physical changes, such as moderate hunting or a seasonal flood; and extreme changes, such as volcanic eruption or sea level rise. **Assessment Boundary:** The assessment should provide evidence of students' abilities to derive trends from graphical representations of population trends. Assessments should focus on describing drivers of ecosystem stability and change, not on the organismal mechanisms of responses and interactions.

Crosscutting Concepts: Stability and Change
- Much of science deals with constructing explanations of how things change and how they remain stable.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.11-12.8 Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. **RST.11-12.1** Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. **RST.11-12.7** Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. **RST.11-12.8** Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.	**MP.2** Reason abstractly and quantitatively. **HSS-ID.A.1** Represent data with plots on the real number line. **HSS-IC.A.1** Understand statistics as a process for making inferences about population parameters based on a random sample from that population. **HSS-IC.B.6** Evaluate reports based on data.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

■ ENVIRONMENTAL SCIENCE

HS-LS2-7 Ecosystems: Interactions, Energy, and Dynamics

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking **❻ Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student- generated sources of evidence consistent with scientific ideas, principles, and theories.** **• Design, evaluate, and refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Ecosystem Dynamics, Functioning, and Resilience:** • Anthropogenic changes (induced by human activity) in the environment can disrupt an ecosystem and threaten the survival of some species. **Biodiversity and Humans:** (secondary to HS-LS2-7) • Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction). • Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity. • Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. • Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value. **Developing Possible Solutions:** • When evaluating solutions it is important to take into account a range of constraints including cost, safety, reliability and aesthetics and to consider social, cultural and environmental impacts.	**HS-LS2-7** *Students who demonstrate understanding can:* **Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment biodiversity.*** **Clarification Statement:** Examples of human activities can include urbanization, building dams, and dissemination of invasive species. **Assessment Boundary:** N/A

Crosscutting Concepts: Stability and Change
- Much of science deals with constructing explanations of how things change and how they remain stable.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.11-12.8 Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. **RST.11-12.7** Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. **RST.11-12.8** Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. **WHST.9-12.7** Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.	**MP.2** Reason abstractly and quantitatively. **HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **HSN-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling. **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

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HS-ESS2-1 Earth's Systems

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ **Developing and using models** **Modeling in 9–12 builds on K–8 and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.** • **Develop a model based on evidence to illustrate the relationships between systems or components of a system.** ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Earth Materials and Systems:** • Earth's systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes. **Plate Tectonics and Large-Scale System Interactions:** • Plate tectonics is the unifying theory that explains the past and current movements of rocks at Earth's surface and provides a framework for understanding its geologic history. • Plate movements are responsible for most continental and ocean-floor features and for the distribution of most rocks and minerals within Earth's crust.	**HS-ESS2-1** *Students who demonstrate understanding can:* **Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.** **Clarification Statement:** Emphasis is on how the appearance of land features (such as mountains, valleys, and plateaus) and sea-floor features (such as trenches, ridges, and seamounts) are a result of both constructive forces (such as volcanism, tectonic uplift, and orogeny) and destructive mechanisms (such as weathering, mass wasting, and coastal erosion). **Assessment Boundary:** Assessment does not include memorization of the details of the formation of specific geographic features of Earth's surface.

Crosscutting Concepts: Stability and Change

• Change and rates of change can be quantified and modeled over very short or very long periods of time. Some system changes are irreversible.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
SL.11-12.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **HSN-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling. **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. **HSF-IF.B.6** Calculate and interpret the average rate of change of function (presented symbolically or as a table) over specified interval. Estimate the rate of change from a graph.

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HS-ESS2-2 Earth's Systems

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations **❹ Analyzing and interpreting data** **Analyzing data in 9–12 builds on K–8 and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data.** **• Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution.** ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Earth Materials and Systems:** • Earth's systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes. **Weather and Climate:** • The foundation for Earth's global climate system is the electromagnetic radiation from the sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy's re-radiation into space.	**HS-ESS2-2** *Students who demonstrate understanding can:* **Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks and interactions that cause changes to other Earth's systems.** **Clarification Statement:** Examples could be taken from system interactions, such as how the loss of ground vegetation causes an increase in water runoff and soil erosion, which limits additional vegetation patterns; how dammed rivers increase ground-water recharge, decrease sediment transport, and increase coastal erosion; or how the loss of wetlands causes a decrease in local humidity that further reduces the wetland extent. Examples could also include climate feedbacks that increase surface temperatures through geologic time. **Assessment Boundary:** N/A

Crosscutting Concepts: Stability and Change
- Feedback (negative or positive) can stabilize or destabilize a system.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. **RST.11-12.2** Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.	**MP.2** Reason abstractly and quantitatively. **HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

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HS-ESS2-3 Earth's Systems

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ **Developing and using models** **Modeling in 9–12 builds on K–8 and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.** • **Develop a model based on evidence to illustrate the relationships between systems or components of a system.** ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Earth Materials and Systems:** • Evidence from deep probes and seismic waves, reconstructions of historical changes in Earth's surface features, its magnetic field, and an understanding of physical and chemical processes lead to a model of Earth with a hot but solid inner core, a liquid outer core, a solid mantle and crust. • Motions of the mantle and its plates occur primarily through thermal convection, which involves the cycling of matter due to the outward flow of energy from Earth's interior and gravitational movement of denser materials toward the interior. **Plate Tectonics and Large-Scale System Interactions:** • The radioactive decay of unstable isotopes continually generates new energy within Earth's crust and mantle, providing the primary source of the heat that drives mantle convection. • Plate tectonics can be viewed as the surface expression of mantle convection. **Waves Properties:** (secondary to HS-ESS2-3) • Geologists use seismic waves and their reflection at interfaces between layers to probe structures deep in the planet.	**HS-ESS2-3** *Students who demonstrate understanding can:* **Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.** **Clarification Statement:** Emphasis is on both a one-dimensional model of Earth, with radial layers determined by density, and a three-dimensional model, which is controlled by mantle convection and the resulting plate tectonics. Examples of evidence include maps of the Earth's surface features as well as three-dimensional structure in the subsurface, obtained from seismic waves, records of the rate of change of Earth's magnetic field (as constraints on convection in the outer core), and identification of the composition of Earth's layers from high-pressure laboratory experiments. **Assessment Boundary:** N/A

Crosscutting Concepts: Energy and Matter

• Energy drives the cycling of matter within and between systems.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. **SL.11-12.5** Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **HSN-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling. **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

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ENVIRONMENTAL SCIENCE

HS-ESS2-4 Earth's Systems

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations **❹ Analyzing and interpreting data** **Analyzing data in 9–12 builds on K–8 and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data.** **• Analyze data using computational models in order to make valid and reliable scientific claims.** ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Earth and the Solar System:** (secondary to HS-ESS2-4) • Cyclical changes in the shape of Earth's orbit around the sun, together with changes in the tilt of the planet's axis of rotation, both occurring over hundreds of thousands of years, have altered the intensity and distribution of sunlight falling on the Earth. These phenomena cause a cycle of ice ages and other changes in climate. **Earth Materials and Systems:** • The geological record shows that changes to global and regional climate can be caused by interactions among changes in the sun's energy output or Earth's orbit, tectonic events, ocean circulation, volcanic activity, glaciers, vegetation, and human activities. These changes can occur on a variety of time scales from sudden (e.g., volcanic ash clouds) to intermediate (ice ages) to very long-term tectonic cycles. **Weather and Climate:** • The foundation for Earth's global climate system is the electromagnetic radiation from the sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy's re-radiation into space.	**HS-ESS2-4** *Students who demonstrate understanding can:* **Analyze and interpret data to explore how variations in the flow of energy into and out of Earth's systems result in changes in atmosphere and climate.** **Clarification Statement:** Changes differ by timescale, from sudden (large volcanic eruption, ocean circulation) to intermediate (ocean circulation, solar output, human activity) and long-term (Earth's orbit and the orientation of its axis and changes in atmospheric composition). Examples of human activities could include fossil fuel combustion, cement production, or agricultural activity and natural processes such as changes in incoming solar radiation or volcanic activity. Examples of data can include tables, graphs, and maps of global and regional temperatures, and atmospheric levels of gases. **Assessment Boundary:** N/A

Crosscutting Concepts: Cause and Effect
- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
SL.11-12.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **HSN-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling. **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

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HS-ESS2-5 Earth's Systems

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ **Planning and carrying out investigations** **Planning and carrying out investigations in 9-12 builds on 6-8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models.** • **Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.** ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**The Role of Water in Earth's Surface Processes:** • The abundance of liquid water on Earth's surface and its unique combination of physical and chemical properties are central to the planet's dynamics. These properties include water's exceptional capacity to absorb, store, and release large amounts of energy, transmit sunlight, expand upon freezing, dissolve and transport materials, and lower the viscosities and melting points of rocks.	**HS-ESS2-5** *Students who demonstrate understanding can:* **Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.** **Clarification Statement:** Emphasis is on mechanical and chemical investigations with water and a variety of solid materials to provide the evidence for connections between the hydrologic cycle and system interactions commonly known as the rock cycle. Examples of mechanical investigations include stream transportation and deposition using a stream table, erosion using variations in soil moisture content, or frost wedging by the expansion of water as it freezes. Examples of chemical investigations include chemical weathering and recrystallization (by testing the solubility of different materials) or melt generation (by examining how water lowers the melting temperature of most solids). **Assessment Boundary:** N/A

Crosscutting Concepts: Structure and Function

• The functions and properties of natural and designed objects and systems can be inferred from their overall structure, the way their components are shaped and used, and the molecular substructures of its various materials.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
WHST.9-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.	**HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-ESS2-6 Earth's Systems

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ **Developing and using models Modeling in 9–12 builds on K–8 and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.** • **Develop a model based on evidence to illustrate the relationships between systems or components of a system.** ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Biogeology:** • Organisms ranging from bacteria to human beings are a major driver of the global carbon and they influence global climate by modifying the chemical makeup of the atmosphere. • The abundance of carbon in the atmosphere is reduced through the ocean floor accumulation of marine sediments and the accumulation of plant biomass.	**HS-ESS2-6** *Students who demonstrate understanding can:* **Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.** **Clarification Statement:** Emphasis is on modeling biogeochemical cycles that include the cycling of carbon through the ocean, atmosphere, soil, and biosphere (including humans), providing the foundation for living organisms. **Assessment Boundary:** N/A

Crosscutting Concepts: Energy and Matter

• The total amount of energy and matter in closed systems is conserved.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
N/A	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics. **HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **HSN-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling. **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-ESS2-7 Earth's Systems

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) **❼ Engaging in argument from evidence** **Engaging in argument from evidence in 9-12 builds on K-8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about natural and designed worlds. Arguments may also come from current scientific or historical episodes in science.** **• Construct an oral and written argument or counter- arguments based on data and evidence.** ❽ Obtaining, evaluating, and communicating information	**Weather and Climate:** • Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen. **Biogeology:** • The many dynamic and delicate feedback mechanisms between the biosphere and other Earth systems cause a continual co-evolution of Earth's surface and the life that exists on it.	**HS-ESS2-7** *Students who demonstrate understanding can:* **Construct an argument based on evidence about the simultaneous co-evolution of Earth's systems and life on Earth.** **Clarification Statement:** Emphasis is on the dynamic causes, effects, and feedbacks between the biosphere and Earth's other systems, whereby geoscience factors influence conditions for life, which in turn continuously alters Earth's surface. Examples include how photosynthetic life altered the atmosphere through the production of oxygen, which in turn increased weathering rates and affected animal life; how microbial life on land increased the formation of soil, which in turn allowed for the development of land plant species; or how the changes in coral species created reefs that altered patterns of erosion and deposition along coastlines and provided habitats to support biodiversity. Geologic timescale should be considered with the emphases above. **Assessment Boundary:** Assessment does not include a comprehensive understanding of the mechanisms of how the biosphere interacts with all of Earth's other systems.

Crosscutting Concepts: Stability and Change
• Much of science deals with constructing explanations of how things change and how they remain stable.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
WHST.9-12.1 Write arguments focused on discipline-specific content.	**N/A**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

ENVIRONMENTAL SCIENCE

HS-ESS3-1 Earth and Human Activities

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ **Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student- generated sources of evidence consistent with scientific ideas, principles, and theories.** • **Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Natural Resources:** • Resource availability has guided the development of human society. **Natural Hazards:** • Natural hazards and other geologic events have shaped the course of human history; [they] have significantly altered the sizes of human populations and have driven human migrations.	**HS-ESS3-1** *Students who demonstrate understanding can:* **Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.** **Clarification Statement:** Examples of key natural resources include access to fresh water (such as rivers, lakes, and groundwater), regions of fertile soils such as river deltas, and high concentrations of minerals and fossil fuels. Examples of natural hazards can be from interior processes (such as volcanic eruptions and earthquakes), surface processes (such as tsunamis, mass wasting and soil erosion), and severe weather (such as hurricanes, floods, and droughts). Natural hazards and other geologic events exhibit some non-random patterns of occurrence. Examples of the results of changes in climate that can affect populations or drive mass migrations include changes to sea level, regional patterns of temperature and precipitation, and the types of crops and livestock that can be raised. **Assessment Boundary:** N/A

Crosscutting Concepts: Cause and Effect

• Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. **WHST.9-12.2** Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.	**MP.2** Reason abstractly and quantitatively. **HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **HSN-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling. **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-ESS3-2 Earth and Human Activities

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking ❻ Constructing explanations (for science) and designing solutions (for engineering) **❼ Engaging in argument from evidence Engaging in argument from evidence in 9-12 builds on K-8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about natural and designed worlds. Arguments may also come from current scientific or historical episodes in science.** • **Evaluate competing design solutions to a real-world problem based on scientific ideas and principles, empirical evidence, and logical arguments regarding relevant factors (e.g. economic, societal, environmental, ethical considerations).** ❽ Obtaining, evaluating, and communicating information	**Natural Resources:** • All forms of energy production and other resource extraction have associated economic, social, environmental, and geopolitical costs and risks as well as benefits. New technologies and social regulations can change the balance of these factors. **Developing Possible Solutions:** (secondary to HS-ESS3-2) • When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts.	**HS-ESS3-2** *Students who demonstrate understanding can:* **Evaluate competing design solutions for developing, managing, and utilizing natural resources based on cost-benefit ratios.*** **Clarification Statement:** Emphasis is on the conservation, recycling, and reuse of resources (such as minerals and metals) where possible, and on minimizing impacts where it is not. Examples include developing best practices for agricultural soil use, mining (for coal, tar sands, and oil shales), and pumping (for petroleum and natural gas). **Assessment Boundary:** N/A

Crosscutting Concepts:
• N/A

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. **RST.11-12.8** Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.	**MP.2** Reason abstractly and quantitatively.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-ESS3-3 Earth and Human Activities

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data **❺ Using mathematics and computational thinking** **Mathematical and computational thinking at the 9–12 level builds on K–8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.** **• Create a computational model or simulation of a phenomenon, design device, process or system.** ❻ Constructing explanations (for science) and designing solutions (for engineering) ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Human Impacts on Earth Systems:** • The sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources.	**HS-ESS3-3** *Students who demonstrate understanding can:* **Create a computational simulation to illustrate the relationship among management of natural resources, the sustainability of human populations, and biodiversity.** **Clarification Statement:** Examples of factors that affect the management of natural resources include costs of resource extraction and waste management, per-capita consumption, and the development of new technologies. Examples of factors that affect human sustainability include agricultural efficiency, levels of consumption, and urban planning. **Assessment Boundary:** Assessment for computational simulations is limited to using provided multi-parameter programs or constructing simplified spreadsheet calculations.

Crosscutting Concepts: Stability and Change
- Change and rates of change can be quantified and modeled over very short or very long periods of time. Some system changes are irreversible.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
N/A	**MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-ESS3-4 Earth and Human Activities

Science & Engineering Practices	Disciplinary Core Ideas	Performance Expectations
❶ Asking questions (for science) and defining problems (for engineering) ❷ Developing and using models ❸ Planning and carrying out investigations ❹ Analyzing and interpreting data ❺ Using mathematics and computational thinking **❻ Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student- generated sources of evidence consistent with scientific ideas, principles, and theories.** • **Design or refine a solution to a complex real-world problem, based on scientific knowledge, student generated sources of evidence, prioritized criteria, and tradeoff considerations.** ❼ Engaging in argument from evidence ❽ Obtaining, evaluating, and communicating information	**Human Impacts on Earth Systems:** • Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation.	**HS-ESS3-4** *Students who demonstrate understanding can:* **Evaluate or refine a technological solution that reduces the impacts of human activities on natural systems.*** **Clarification Statement:** Examples of data on the impacts of human activities could include the quantities and types of pollutants released, changes to biomass and species diversity, or areal changes in land surface use. Examples for limiting future impacts could range from local efforts (such as reducing, reusing, and recycling resources) to large-scale geoengineering design solutions. **Assessment Boundary:** N/A

Crosscutting Concepts: Stability and Change
• Feedback (negative or positive) can stabilize or destabilize a system.

Oklahoma Academic Standards Connections

ELA/Literacy	Mathematics
RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. **RST.11-12.8** Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.	**MP.2** Reason abstractly and quantitatively. **HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **HSN-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling. **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

SCIENCE

OKLAHOMA STATE DEPARTMENT OF EDUCATION

OKLAHOMA ACADEMIC STANDARDS

OKLAHOMA STATE DEPARTMENT OF
EDUCATION

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SOCIAL STUDIES

OKLAHOMA
ACADEMIC
STANDARDS

OKLAHOMA
STATE DEPARTMENT *of* EDUCATION
JOY HOFMEISTER
STATE SUPERINTENDENT *of* PUBLIC INSTRUCTION

NOTE: The Social Studies subject standards were last revised in 2012. These standards contain references to the Common Core Social Studies reading and writing literacy skills. In 2014, House Bill 3399 repealed Common Core standards for Oklahoma. By operation of law, the references to Common Core in the Social Studies subject standards are no longer in effect, but all other elements of the standards apply in their entirety.

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The Use of Coherency Storylines in the Development of Social Studies Standards of Learning and Curriculum Frameworks: *Adding Unity, Specificity, and Transcendency to Social Studies Curricular Decisions*

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Coherency Storylines

Coherency Storylines have been used for the first time in Oklahoma in designing the *Oklahoma Academic Standards for the Social Studies*. Coherency Storylines are a set of *storylines* selected to advance and develop the telling of a *curriculum story*. Coherency Storylines are very fine-grained *curriculum threads* that elaborate, illuminate, and illustrate a larger subject strand such as *Economic Opportunity in United States History*. Coherency Storylines may be used within a single grade level or course, across a grade band, within the spectrum of a multi-grade level subject like United States history, and/or across the entire curriculum framework Pre-K–12.

The purpose of Coherency Storylines is to provide a structure to design a curriculum framework. Coherency Storylines are more specific in nature than strands such as geography, history, etc. and finer-grained than content themes like *Power, Authority, and Governance*. They function as true curriculum threads within a discipline strand (history, geography, etc.), as well as the across the several social studies disciplines strands. They can be made very finely focused and even be thought of as *curriculum fibers*. Curriculum fibers when woven by purposeful design comprise a coherent curriculum strand. Coherency Storylines act as a *plumb line* by which the placement of Social Studies content expectations within the curriculum framework can be more objectively selected or omitted.

Coherency Storylines give *unity of story* within subject disciplines, strands, and courses. Coincidentally, Coherency Storylines allow transcendency of story across themes, strands, and the entire curriculum framework Pre-K–12. Coherency Storylines are threads that provide color, weave, and texture to the curriculum fabric. Taking the analogy of curriculum as a fabric, we can illustrate the concept by asserting that the Coherency Storylines function by giving function, pattern, and unity of design to the curriculum framework. They give purpose to the curriculum stories within and across grade levels and multi-grade content; and provide a *transcendency of design*.

An example of this is the Coherency Storyline of *Foundations, Formations, and Transformations of the American System* within United States History. This Coherency Storyline spans the U.S. History curriculum in Grade 5, Grade 8, and High School. This Coherency Storyline, when pulled through those three distinct parts of the U.S. history curriculum provides a plumb line by which specific U.S. history content may be included or excluded. The Coherency Storyline guides content selection based upon the discussion and decision of whether it *develops* the storyline or *distracts* from the storyline. This thread should be more finely focused only on the political aspects or the economic features of the American system making them a curriculum fiber, or these two fibers can be combined for a more specific Coherency Storyline bi-focus thereby creating a coherent strand.

This Coherency Storyline could function in the lower elementary level to introduce early learners to American civics and history topics like notable Americans, to guide the selection of high-interest non-fiction reading series of foundational, formational, and transformational events in American history, or even the selection of basic domain specific vocabulary terms. Additionally, this Coherency Storyline could guide the selection in the lower elementary grades of national symbols, national historic landmarks, national parks, patriotic music, and national holidays/observances.

What is essential in the use of Coherency Storylines is the parameter descriptor. The Coherency Storyline's purpose needs to be focused and tightly designed. It should tell specifically the kinds of content to be associated with the Coherency Storyline and what cannot be used as it would cause the Coherency Storyline to diverge from its storyline. Content expectation should be held to the standard of "Was the event, person, group, document, etc. *significant and key* to the founding of the nation, to the formation of the nation, and in the continuing transformation of the nation?" The main consideration to answer is *"Was this person or event systemic changing?"* If the specific content was key and significant, then it should be very seriously considered for inclusion in the standards/framework as it helps develop the historic storyline. Conversely, if it did not lead to system-wide change(s), then it should not be included as it is probably minor in comparison. It most likely distracts from the primary storyline. With that in mind, individuals, groups, events, documents, etc. may be interesting to study in their own right *<u>but</u>* should be included only for their significant and key impact upon the American system. To include any interesting person just because the standards do not have a person from a particular "demographic group" is insufficient cause for inclusion because it is *gratuitous inclusion*. It results in a weakened historic narrative. The use of

Coherency Storylines elevates the decision-making process to one of significance and relevance.

To follow this line of design reasoning, consider the following: in the formation and transformation of the United States, many treaties could be included in the curriculum framework. Treaties often covered several topics but often served a particular purpose such as the cessation of fighting, settling territorial disputes, trade rights, etc. Look at the top two treaties included in Figure 1.

Now, a series of questions need to be considered to help determine if this specific content should be added to the framework.

- In what ways was each event systemic changing?
- Should both treaties be included in the framework?
- Should both be excluded?
- Should one be included and the other excluded?
- If so which one?
- Why?

The decision should be justifiable with historic reasoning as to why the selected content was systemic changing.

Since the focus of the Coherency Storyline is the political foundation, formation, and transformation of the American system, the Louisiana Purchase of 1803 would be very appropriate, where as the Kellogg-Briand Pact of 1928 would not be nearly as appropriate as all major signators were at war with each other within a decade.

Consider the topic of events and treaties relating to the American Indian experience. There are so many treaties with all of the tribes spanning American history that selecting appropriate treaties is a real curriculum content challenge. Taking the line of reasoning from above and using Figure 1, which one should be included to support the primary storyline – the *Indian Removal Act of 1830* or the *Treaty of Dancing Rabbit Creek*? Many scholars would say that since the *Indian Removal Act* was the primary basis for all subsequent land cessions and removal treaties with the numerous American Indian nations that it was the signature transformative event in changing the American system for both whites and the American Indian nations. Based upon the use of the Coherency Storyline, the committee literally came to the conclusion as illustrated in Figure 2.

The Primary Coherency Storyline for the Oklahoma Academic Standards for the Social Studies

The Coherency Storyline, *The Foundation, Formation, and Transformation of the American System – Politically and Economically*, is THE storyline for the entire Social Studies framework as it operates as a plumb line that pulls the entire curriculum framework towards the goal of developing literate citizens. It provides unity of story for the entire framework and focuses on key ideas, events, people, groups, and concepts that laid the foundations for the 13 British colonies becoming the United States. This primary Coherency Storyline gives transcendency of the narrative across the grade levels and across the several social studies disciplines of History, Civics/Government, Geography, and Economics. This Coherency Storyline provides purpose, pattern, and unity of design to the entire *Oklahoma Academic Standards for the Social Studies* framework. The Coherency Storyline will be spun into a tighter "curriculum thread" by adding focused specificity through a bi-focus on the foundation, formation, and transformation of the American political and economic systems. This bi-focus does not preclude the strand of geography as historic geography is a presumed part of the historic narrative. The bi-focus on the political and economic systems does not ignore the social development of the 13 original British colonies, the beginning American nation, and country as it grew and changed over the past 400 plus years. In fact, political events, developments, and decisions had social implications and impact. The same is true in the economic realm.

Figure 1

Figure 2

Pre-Kindergarten SOCIAL STUDIES *Our America*

In Pre-Kindergarten, students begin to understand the foundations of the social studies strands; history, geography, civics, citizenship, and economics. Students begin their introduction to the United States through the study of American symbols and holidays. Civics provides students with an introduction to rules, traits, and responsibilities of citizenship. Basic economic concepts and their underlying principles as seen in the community are also introduced. Basic concepts of cultural and physical geography are presented.

The Social Studies Process and Literacy Skills (PALS) are to be integrated throughout the Pre-Kindergarten content standards and methods of instructional delivery.

PROCESS AND LITERACY SKILLS (PALS) FOR LEARNING

Process and Literacy Skills Standard 1: The student will develop and demonstrate Common Core informational text reading literacy skills.

A. Key Ideas and Details

1. With prompting and support, ask and answer questions about key details in a text.
2. With prompting and support, identify the main topic and retell key details of a text.
3. With prompting and support, describe the connection between two individuals, events, ideas, or pieces of information in a text.

B. Craft and Structure

4. With prompting and support, ask and answer questions about unknown words in a text.

C. Integration of Knowledge and Ideas

7. With prompting and support, describe the relationship between illustrations and the text in which they appear (e.g., what person, place, thing, or idea in the text an illustration depicts).
9. With prompting and support, identify basic similarities in and differences between two texts on the same topic (e.g., in illustrations, descriptions, or procedures).

Process and Literacy Skills Standard 2: The student will develop and demonstrate Common Core writing literacy skills.

A. Text Types and Purposes

1. Use a combination of drawing, dictating, and writing to compose opinion pieces in which they tell a reader the topic or the name of the book they are writing about and state an opinion or preference about the topic or book (e.g., "My favorite American symbol or holiday is . . .").
2. Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic.
3. Use a combination of drawing, dictating, and writing to narrate a single event or several loosely linked events, tell about the events in the order in which they occurred, and provide a reaction to what happened.

B. Production and Distribution of Writing

6. With guidance and support from adults, explore a variety of digital tools to produce and publish writing, including in collaboration with peers.

C. Research to Build and Present Knowledge

8. With guidance and support from adults recall information from experiences or gather information from provided sources to answer a question.

Process and Literacy Skills Standard 3: The student will develop and demonstrate Common Core speaking and listening skills.

A. Comprehension and Collaboration

1. Participate in collaborative conversations with diverse partners about Pre-Kindergarten Our America topics and texts with peers and adults in small and larger groups.
2. Confirm understanding of a social studies text read aloud or information presented orally or through other media by asking and answering questions about key details and requesting clarification if something is not understood.

B. Presentation of Knowledge and Ideas

4. Describe familiar people, places, things, and events and, with prompting and support, provide additional detail.
5. Add social studies focused drawings or other visual displays to descriptions as desired to provide additional detail.

SOCIAL STUDIES CONTENT SKILLS

Citizenship Literacy
Content Standard 1: The student will exhibit traits of good citizenship.

1. Recognize the importance of rules and responsibilities as a member of the family, class, and school.
2. Identify the United States Flag as a symbol of the country including the learning of *The Pledge of Allegiance* and practicing appropriate flag etiquette.

Economic Literacy
Content Standard 2: The student will identify basic economic concepts.

1. Explain how various community people including police officers, firefighters, soldiers, school personnel, business professionals, and medical personnel impact his/her life.
2. Explain the relationship between work and earning money.
3. Describe the basic needs of food, clothing, and shelter that are common to all people.

Geography Literacy
Content Standard 3: The student will demonstrate knowledge of basic physical and human geographic concepts.

1. Explain that a map is a drawing of a place and the globe is a model of Earth.
2. Locate the United States on a world map and a globe.
3. Identify the state of Oklahoma on a map of the United States.
4. Describe family customs and traditions as basic elements of culture.

History Literacy
Content Standard 4: The student will understand that history relates to events and people of other times and places.

1. Recognize that commemorative holidays honor people and events of the past including Columbus Day, Veterans Day, Thanksgiving Day, Washington's Birthday, and Independence Day.
2. Identify important American symbols and explain their meanings including United States Flag, the Bald Eagle, the Statue of Liberty, and the Liberty Bell.
3. Use words and phrases related to chronology and time to explain how things change including before/after and today/tomorrow/yesterday.

Kindergarten
SOCIAL STUDIES
Symbols of America

In Kindergarten, students continue their understanding of the foundations of the social studies strands: history, geography, civics, citizenship, and economics. Students continue their examination of American symbols and holidays. Concepts of cultural and physical geography are developed. Civics provides students with a continued study of the traits of citizenship. Basic economic concepts are also introduced.

The Social Studies Process and Literacy Skills (PALS) are to be integrated throughout the Kindergarten content standards and methods of instructional delivery.

PROCESS AND LITERACY SKILLS (PALS) FOR LEARNING

Process and Literacy Skills Standard 1: The student will develop and demonstrate Common Core informational text reading literacy skills.

A. Key Ideas and Details

1. With prompting and support, ask and answer questions about key details in a text.
2. With prompting and support, identify the main topic and retell key details of a text.
3. With prompting and support, describe the connection between two individuals, events, ideas, or pieces of information in a text.

B. Craft and Structure

4. With prompting and support, ask and answer questions about unknown words in a text.

C. Integration of Knowledge and Ideas

7. With prompting and support, describe the relationship between illustrations and the text in which they appear (e.g., what person, place, thing, or idea in the text an illustration depicts).
9. With prompting and support, identify basic similarities in and differences between two texts on the same topic (e.g., in illustrations, descriptions, or procedures).

Process and Literacy Skills Standard 2: The student will develop and demonstrate Common Core writing literacy skills.

A. Text Types and Purposes

1. Use a combination of drawing, dictating, and writing to compose opinion pieces in which they tell a reader the topic or the name of the book they are writing about and state an opinion or preference about the topic or book (e.g., "My favorite American symbol or holiday is . . .").
2. Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic.
3. Use a combination of drawing, dictating, and writing to narrate a single event or several loosely linked events, tell about the events in the order in which they occurred, and provide a reaction to what happened.

B. Production and Distribution of Writing

6. With guidance and support from adults, explore a variety of digital tools to produce and publish writing, including in collaboration with peers.

C. Research to Build and Present Knowledge

8. With guidance and support from adults recall information from experiences or gather information from provided sources to answer a question.

Process and Literacy Skills Standard 3: The student will develop and demonstrate Common Core speaking and listening skills.

A. Comprehension and Collaboration

1. Participate in collaborative conversations with diverse partners about Kindergarten Symbols of America topics and texts with peers and adults in small and larger groups.
2. Confirm understanding of a social studies text read aloud or information presented orally or through other media by asking and answering questions about key details and requesting clarification if something is not understood.

B. Presentation of Knowledge and Ideas

4. Describe familiar people, places, things, and events and, with prompting and support, provide additional detail.
5. Add social studies focused drawings or other visual displays to descriptions as desired to provide additional detail.

PRE K KINDERGARTEN 1-3 4-5 6-8 9-12

SOCIAL STUDIES CONTENT SKILLS

Civics Citizenship Literacy
Content Standard 1: The student will exhibit traits of good citizenship.

1. Recognize the importance of rules and responsibilities as a member of the family, class, and school.
2. Identify the United States Flag as a symbol of the country including learning *The Pledge of Allegiance* and practicing appropriate flag etiquette.

Economics Literacy
Content Standard 2: The student will identify basic economic concepts.

1. Explain how various community people including police officers, firefighters, soldiers, school personnel, business professionals, and medical personnel impact his/her life.
2. Explain the relationship between work and earning money.
3. Describe the basic needs of food, clothing, and shelter that are common to all people.

Geography Literacy
Content Standard 3: The student will demonstrate knowledge of basic physical and human geographic concepts.

1. Explain that a map is a drawing of a place and the globe is a model of Earth.
2. Locate the United States on a world map and a globe.
3. Identify the state of Oklahoma on a map of the United States.
4. Describe family customs and traditions as basic elements of culture.

History Literacy
Content Standard 4: The student will understand that history relates to events and people of other times and places.

1. Recognize that commemorative holidays honor people and events of the past including Columbus Day, Veterans Day, Thanksgiving Day, Martin Luther King, Jr. Day, Washington's Birthday, Flag Day, and Independence Day.
2. Identify important American symbols and explain their meanings including United States Flag, the Bald Eagle, the Statue of Liberty, and the Liberty Bell.
3. Use words and phrases related to chronology and time to explain how things change including before/after, past/present/future, and today/tomorrow/yesterday.

Grade 1
SOCIAL STUDIES
American Heroes

In First grade, students continue their study of the United States history through the contributions of notable historic figures. In the civics strand the student will learn characteristics and responsibilities of good citizenship. In the geography strand students explore basic geographic concepts. The economic strand continues the development of understanding basic economic concepts.

The Social Studies Process and Literacy Skills (PALS) are to be integrated throughout the Grade 1 content standards and methods of instructional delivery.

PROCESS AND LITERACY SKILLS (PALS) FOR LEARNING

Process and Literacy Skills Standard 1: The student will develop and demonstrate Common Core informational text reading literacy skills.

A. Ideas and Details
1. Ask and answer questions about key details in a text.
2. Identify the main topic and retell key details of a text.
3. Describe the connection between two individuals, events, ideas, or pieces of information in a text.

B. Text and Structure
4. Ask and answer questions to help determine or clarify the meaning of words and phrases in a text.
5. Know and use various text features (e.g., headings, tables of contents, glossaries, electronic menus, icons) to locate key facts or information in a text.
6. Distinguish between information provided by pictures or other illustrations and information provided by the words in a text.

C. Integration of Knowledge and Ideas
7. Use the illustrations and details in a text to describe its key ideas.
9. Identify basic similarities in and differences between two texts on the same topic (e.g., in illustrations, descriptions, or procedures).

Process and Literacy Skills Standard 2: The student will develop and demonstrate Common Core writing literacy skills.

A. Text Types and Purposes
1. Write opinion pieces in which they introduce the topic they are writing about, state an opinion, supply a reason for the opinion, and provide some sense of closure.
2. Write informative/explanatory texts in which they name a topic, supply some facts about the topic, and provide some sense of closure.
3. Write narratives in which they recount two or more appropriately sequenced events, include some details regarding what happened, use temporal words to signal event order, and provide some sense of closure.

B. Production and Distribution of Writing
6. With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers.

C. Research to Build and Present Knowledge
7. Participate in shared research and writing projects (e.g., write a short step by step sequence of instructions for proper flag etiquette and/or proper behavior during the national anthem).
8. With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.

Process and Literacy Skills Standard 3: The student will develop and demonstrate Common Core speaking and listening skills.

A. Comprehension and Collaboration
1. Participate in collaborative conversations with diverse partners about Grade 1 American Heroes topics and texts with peers and adults in small and larger groups.
2. Ask and answer questions about key details in a social studies text read aloud or information presented orally or through other media.

B. Presentation of Knowledge and Ideas
4. Describe social studies related people, places, things, and events with relevant details, expressing ideas clearly.
5. Add social studies focused drawings or other visual displays to descriptions when appropriate to clarify ideas, thoughts, and feelings.

SOCIAL STUDIES CONTENT SKILLS

Citizenship Literacy
Content Standard 1: The student will analyze his/her role as a citizen in a community.

1. Identify the main purpose of government, its rules and laws including the concept of consequences for one's actions when a law or rule is violated. (CCRIT 2)
2. Participate in patriotic traditions including the recitation of *The Pledge of Allegiance*, the singing of *My Country 'Tis of Thee*, and demonstration of appropriate flag etiquette and proper behavior during the playing of the national anthem.
3. Identify important American symbols and explain their meanings including United States Flag, the Bald Eagle, the Statue of Liberty, and the Liberty Bell.
4. Describe how historic figures display character traits of fairness, respect for others, stewardship of natural resources, courage, equality, hard work, self-discipline, and commitment to the common good.
5. Describe relationships between people and events of the past which are commemorated on Columbus Day, Veterans Day, Thanksgiving Day, Martin Luther King, Jr. Day, Washington's Birthday, Lincoln's Birthday, Flag Day, and Independence Day. (CCRIT 3)

Economics Literacy
Content Standard 2: The student will describe the characteristics of the American economic system.

1. Summarize the need for money, how money is earned, and how money and credit are used in order to meet needs and wants including the costs and benefits of spending and saving. (CCRIT 2)
2. Define and explain the roles of consumers and producers in the American economy.
3. Summarize how historic inventors and entrepreneurs contributed to the prosperity of the nation including Samuel F. B. Morse, John Deere, Alexander Graham Bell, Orville and Wilbur Wright, and Thomas Edison. (CCRIT 2)

Geography Literacy
Content Standard 3: The student will demonstrate knowledge of basic geographic concepts.

1. Define and compare the physical features of urban and rural communities.
2. Construct maps and identify cardinal directions of north, south, east, and west, and identify locations on the map of their community, Oklahoma, and the United States.
3. Locate on a map and globe the United States, the seven continents, and five oceans.

History Literacy
Content Standard 4: The student will examine important events and historic figures in the nation's past.

1. Understand chronological sequencing of events by creating basic timelines. (CCRIT 5)
2. Participate in shared research using biographies and informational text the contributions of historic figures in American history including Squanto, the Pilgrims, George Washington, Benjamin Franklin, Paul Revere, Thomas Jefferson, Meriwether Lewis, William Clark, Sacagawea, Daniel Boone, Abraham Lincoln, and George Washington Carver. (CCW 7)
3. Identify the significance of historic places and monuments and describe their connection to real events of the past including the Plimoth Plantation, Mount Vernon, Washington Monument, Lincoln Memorial. (CCRIT 3)
4. Commemorate the contributions to the American nation of significant groups including National Hispanic History Month, Native American Heritage Month, and Black History Month.

Grade 2
SOCIAL STUDIES
Our Democratic Heritage

Second grade students conclude their introduction to the United States in the citizenship strand through the study of the foundation of the American republic. The historic strand introduces selected Americans who have been important in securing and ensuring their rights. The geography strand develops the students' understanding of the nation's physical and political features. The economic strand continues a more advanced understanding of economic concepts.

The Social Studies Process and Literacy Skills (PALS) are to be integrated throughout the Grade 2 content standards and methods of instructional delivery.

PROCESS AND LITERACY SKILLS (PALS) FOR LEARNING

Process and Literacy Skills Standard 1: The student will develop and demonstrate Common Core informational text reading literacy skills.

A. Key Ideas and Details

1. Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text.
2. Identify the main topic of a multi-paragraph text (e.g., primary or secondary sources) as well as the focus of specific paragraphs within the text.
3. Describe the connection between a series of historic events or social studies concepts.

B. Craft and Structure

4. Determine the meaning of words and phrases in a social studies text.
5. Know and use various text features (e.g., maps, graphs, charts captions, bold print, subheadings, glossaries, indexes, electronic menus, and icons) to locate key facts or information in a text efficiently.
6. Identify the main purpose of a text, including what the author wants to answer, explain, or describe in primary and secondary informational texts.

C. Integration of Knowledge and Ideas

7. Explain how specific images (e.g., a diagram, landforms, satellite photos, maps, and charts) contribute to and clarify a text.
9. Compare and contrast the most important points presented by two texts on the same topic.

Process and Literacy Skills Standard 2: The student will develop and demonstrate Common Core writing literacy skills.

A. Text Types and Purposes

1. Write opinion pieces in which they introduce the topic they are writing about, state an opinion, supply reasons that support the opinion, use linking words to connect opinion and reasons, and provide a concluding statement or section.
2. Write informative/explanatory texts in which they introduce a topic, use facts and definitions to develop points, and provide a concluding statement or section.
3. Write narratives in which they recount a sequence of events, include details to describe actions, thoughts, and feelings, use temporal words to signal event order (e.g., cause and effect relationships), and provide a sense of closure.

B. Production and Distribution of Writing

6. With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers.

C. Research to Build and Present Knowledge

7. Participate in shared research and writing projects (e.g., primary and secondary sources on a single topic).
8. Recall information from experiences or gather information from provided sources to answer a question.

Process and Literacy Skills Standard 3: The student will develop and demonstrate Common Core speaking and listening skills.

A. Comprehension and Collaboration

1. Participate in collaborative conversations with diverse partners about Grade 2 Our Democratic Heritage topics and texts with peers and adults in small and larger groups.
2. Recount or describe key ideas or details from a social studies text read aloud or information presented orally or through other media.
3. Ask and answer questions about what a speaker says in order to clarify comprehension, gather additional information, or deepen understanding of a social studies topic or issue.

B. Presentation of Knowledge and Ideas

4. Tell a social studies related story with appropriate facts and relevant, descriptive details, and speaking audibly in coherent sentences.

5. Create audio recordings of social studies stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings.

CONTENT SKILLS

Citizenship Literacy
Content Standard 1: The student will explain the importance of the basic principles that provide the foundation of the American system of government.

1. Summarize the five key individual rights and liberties protected by the *First Amendment* to the *United States Constitution*. (CCRIT 2)
2. Identify the basic roles of national leaders including the President of the United States and the members of the United States Congress.
3. Identify important American symbols and explain their meanings including United States Flag, the Bald Eagle, the Statue of Liberty, Lady Justice, and the Liberty Bell.
4. Participate in patriotic traditions including the recitation of *The Pledge of Allegiance* and singing of *The Star Spangled Banner*, and demonstrate proper flag etiquette and appropriate behavior during both.
5. Describe relationships between people and events of the past which are commemorated on Columbus Day, Veterans Day, Thanksgiving Day, Martin Luther King, Jr. Day, Washington's Birthday, Lincoln's Birthday, Flag Day, and Independence Day. (CCRIT 3)

Economics Literacy
Content Standard 2: The student will understand basic economic concepts in the American economy.

1. Describes ways people are paid for their labor and how goods and services are purchased through means like check, cash, and credit cards, and provide examples of interdependence through trade/barter and purchase.
2. Describe the connection between taxes and community services including schools, sanitation and water, fire and police protection, libraries, and roads. (CCRIT 3)

Geography Literacy
Content Standard 3: The student will examine how humans modify their environment.

1. Construct basic maps using legends, scale, and intermediate directions including the introduction of latitude and longitude and the division of the Earth into four hemispheres.
2. Identify basic natural landforms and bodies of water and man-made environments including examples found in the community and the United States: plains, mountains, peninsulas, and islands; rivers, lakes, oceans, seas, gulfs, bays, and harbors; and highways, cities, airports, and railroads.
3. Locate on a physical map of the United States the major natural features including the Mississippi River, Colorado River, Rio Grande, Great Lakes, Rocky and Appalachian Mountain Ranges, the Great Plains, the Atlantic and Pacific Oceans, and the Gulf of Mexico.
4. Locate on a political map of the United States the state of Oklahoma and the six bordering states, and the major cities of Washington, D.C., New York City, Los Angeles, and Chicago.

History Literacy
Content Standard 4: The student will examine the lives of notable Americans who expanded peoples' rights and freedoms in the American system of government.

1. Participate in shared and individual research using biographies and informational text historic examples of honesty, courage, patriotism, self-sacrifice, and other admirable character traits seen in citizens and leaders including Abigail Adams, Francis Scott Key, Harriet Tubman, Abraham Lincoln, Chief Joseph, Eleanor Roosevelt, Fred Korematsu, Jackie Robinson, Dr. Martin Luther King, Jr., Rosa Parks, César Chávez, and Senator Daniel Inouye. (CCW 7)
2. Analyze the significance of historic places including the White House, the United States Capitol, the United States Supreme Court, the Washington Monument, and the Lincoln Memorial.
3. Commemorate months designated to the contributions the American nation of significant groups to the history of including National Hispanic History Month, Native American Heritage Month, Black History Month, Women's History Month, and Asian-Pacific American Heritage Month.
4. Understand chronological sequencing and the connection between historic events and individuals through the creation of basic timelines. (CCRIT 3)

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Grade 3
SOCIAL STUDIES
Oklahoma Studies

In the third grade, students begin a focused study of the state of Oklahoma. The historic strand introduces selected Oklahomans who have been important in the development of the state and creates an appreciation for the many peoples who have settled in Oklahoma. In the geography strand students explore the physical and political features of the state including its natural resources. In civics students examine the structure of local governments and the state government. In the economic strand students explore how Oklahomans have used their natural resources to create a prosperous and growing economy.

The Social Studies Process and Literacy Skills (PALS) are to be integrated throughout the Grade 3 content standards and methods of instructional delivery.

PROCESS AND LITERACY SKILLS (PALS) FOR LEARNING

Process and Literacy Skills Standard 1: The student will develop and demonstrate Common Core informational text reading literacy skills.

A. Key Ideas and Details
1. Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.
2. Determine the main idea of a text; recount the key details and explain how they support the main idea.
3. Describe the relationship between a series of historic events or social studies concepts, using language that pertains to time, sequence, and cause/effect.

B. Craft and Structure
4. Determine the meaning of general academic and social studies domain-specific words and phrases in a text relevant to Grade 3 Oklahoma Studies.
5. Use text features and search tools (e.g., timelines, maps, charts, graphs, images, artwork, photographs, key words, sidebars, hyperlinks) to locate information relevant to a given topic.
6. Distinguish their own point of view from that of the author of a primary or secondary text.

C. Integration of Knowledge and Ideas
7. Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur).
8. Describe the logical connection between particular sentences and paragraphs in a text (e.g., comparison, cause/effect, first/second/third in a sequence).
9. Compare and contrast the most important points and key details presented in two texts on the same topic.

Process and Literacy Skills Standard 2: The student will develop and demonstrate Common Core writing literacy skills.

A. Text Types and Purposes
1. Write opinion pieces on topics or texts, supporting a point of view with reasons.
2. Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
3. Write narratives based on historic Oklahomans and/or events using descriptive details and clear event sequences.

B. Production and Distribution of Writing
6. With guidance and support from adults, use technology to produce and publish writing (using keyboarding skills) as well as to interact and collaborate with others.

C. Research to Build and Present Knowledge
7. Conduct short research projects that build knowledge about a topic related to Oklahoma.
8. Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.

D. Range of Writing
10. Write routinely over extended time frames and shorter time frames for a range of social studies tasks, purposes, and audiences.

Process and Literacy
Skills Standard 3: The student will develop and demonstrate Common Core speaking and listening skills.

A. Comprehension and Collaboration

1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on Grade 3 Oklahoma Studies topics and texts, building on others' ideas and expressing their own clearly.
2. Determine the main ideas and supporting details of a social studies text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally.
3. Ask and answer questions about social studies information from a speaker, offering appropriate elaboration and detail.

B. Presentation of Knowledge and Ideas

4. Report on a social studies topic or text or tell a social studies related story with appropriate facts and relevant, descriptive details, and speaking clearly at an understandable pace.
5. Create engaging audio recordings of social studies stories or poems that demonstrate fluid reading at an understandable pace; add visual displays when appropriate to emphasize or enhance certain facts or details.

CONTENT SKILLS

Citizenship Literacy
Content Standard 1: The student will analyze the traits of good citizens.

1. Commemorate Celebrate Freedom Week by recognizing the sacrifices and contributions to American freedom by veterans and by reciting the social contract selection from the *Declaration of Independence*:

   > We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness. – That to secure these rights, Governments are instituted among Men, deriving their just powers from the consent of the governed.

2. Examine and determine the main purposes of Oklahoma's state government and identify representative leaders of the state of Oklahoma and the three branches of government. (CCRIT 2)
3. Describe the connection between the historic significance of past events and people and the symbols of Oklahoma's history including the Oklahoma State Seal and the Oklahoma Flag. (CCRIT 3)
4. Describe relationships between people and events of the past which are commemorated on Columbus Day, Veterans Day, Thanksgiving Day, Martin Luther King, Jr. Day, Washington's Birthday, Lincoln's Birthday, Flag Day, and Independence Day. (CCRIT 3)

Economics Literacy
Content Standard 2: The student will identify and describe basic economic activities creating prosperity in the state of Oklahoma.

1. Summarize how scarcity and surplus require people to make choices about producing and consuming goods and services. (CCRIT 2)
2. Compare differences among human, natural, and capital resources used to produce goods and services.
3. Examine how the development of Oklahoma's major economic activities have contributed to the growth of the state including the oil and natural gas industry, agriculture and livestock, aviation, tourism, and military installations.

Geography Literacy
Content Standard 3: The student will examine Oklahoma's geography and how people of Oklahoma interact with their environment.

1. The student will examine Oklahoma's political and physical features using text features and search tools. (CCRIT 5)
   A. Distinguish among map symbols and identify relative location, direction, scale, size and shape using physical and political maps of Oklahoma including the use of latitude and longitude.
   B. Interpret thematic maps of Oklahoma with the essential map elements of title, legend, scale, and directional indicators.
   C. Identify Oklahoma's major landforms and bodies of water on a physical map including Arbuckle Mountains, Ozark Plateau, Wichita Mountains, Kiamichi Mountains, Black Mesa, Red River, Canadian River, Arkansas River, Lake Texoma, Lake Eufaula, and Lake Tenkiller, Grand Lake of the Cherokees, and the Great Salt Plains.
   D. Identify Oklahoma's major metropolitan centers and cities on a political map including Oklahoma City, Tulsa, Lawton, Stillwater, Norman, Muskogee, Woodward, McAlester, and Ponca City.

E. Describe the climate and various natural vegetation zones found in Oklahoma including the Great Plains and the Cross Timbers.

2. The student will examine through short research projects the interaction of the environment and the peoples of Oklahoma. (CCW 7)
   A. Describe how early Native Americans used Oklahoma's natural resources to survive including the use of the bison, fur trading, and farming.
   B. Describe how pioneers to Oklahoma adapted to and modified their environment including sod houses, wind mills, and crops.
   C. Summarize how contemporary Oklahomans affect and change their environments including the McClellan-Kerr Arkansas River Navigation System, creation of recreational lakes by the construction of dams, irrigation of croplands, and the establishment of wildlife refuges. (CCRIT 2)

History Literacy
Content Standard 4: The student will analyze the significant events and historic personalities contributing to the development of the state Oklahoma.

1. Understand and describe the relationship between historic events and chronology through the creation of basic timelines. (CCRIT 3)
2. Read and interpret primary sources related to key events in Oklahoma's past to demonstrate understanding of a text including Catlin's artwork, Sequoyah's syllabary, news accounts and photographs of the land openings, and the Dust Bowl, as well as the musical lyrics of *This Land is Your Land* and the state song, *Oklahoma*. (CCRIT 1)
3. Describe the many Native American cultures that have inhabited present-day Oklahoma including the Spiro Mound Builders, the Five Tribes, and the Plains Indians.
4. Describe early expeditions in Oklahoma including those of Coronado, Washington Irving, and George Catlin.
5. Describe the migrations and settlements by Native Americans including the Trail of Tears.
6. Describe cowboy life and cattle drives as typified by experiences along the Chisholm Trail.
7. Explain the opening of the Unassigned Lands and distinguish between the points of view of both Native Americans and settlers. (CCRIT 6)
8. Commemorate Statehood Day as the joining of Indian and Oklahoma Territories.
9. Summarize how the weather and the environment have impacted the economy of Oklahoma in events like the Dust Bowl. (CCRIT 2)
10. Conduct short research projects and examine notable historic and present-day Oklahomans utilizing biographies and informational texts to describe their significant contributions including Sequoyah, Bill Pickett, Jim Thorpe, the Kiowa Six (formerly the Kiowa Five), Will Rogers, Wiley Post, Woody Guthrie, Clara Luper, Wilma Mankiller, Gordon Cooper, Shannon Lucid, Mickey Mantle, Carl Albert, and the Five Ballerinas. (CCW 7)
11. Develop an understanding and appreciation of the historic and contemporary racial, ethnic, and cultural groups of Oklahoma.
12. Identify and describe the historic significance of state and local landmarks including the Buffalo Soldiers' Old Post at Fort Sill, the Nellie Johnstone Number 1, the Oklahoma Capitol, Route 66, and the Oklahoma City National Memorial.

Grade 4
UNITED STATES STUDIES
Regional Geography and History

In Grade 4, students will examine the physical, cultural, political, economic, and the historic development of the United States including early European contact with Native Americans. Students will use geographic tools to analyze the influence of the environment on the growth and development of all major regions of the United States.

The Social Studies Process and Literacy Skills (PALS) are to be integrated throughout the Grade 4 content standards and methods of instructional delivery.

PROCESS AND LITERACY SKILLS (PALS) FOR LEARNING

Process and Literacy Skills Standard 1: The student will develop and demonstrate Common Core informational text reading literacy skills.

A. Key Ideas and Details
1. Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.
2. Determine the main idea of a text and explain how it is supported by key details; summarize the text.
3. Explain events, ideas, or historic and geographic concepts based on specific information in the text.

B. Craft and Structure
4. Determine the meaning of social studies-specific words or phrases in a text relevant to United States geography and history.
5. Describe the overall structure (e.g., comparison, cause/effect, geographic/historic problem/solution) of events, ideas, concepts, or information in a text.
6. Compare and contrast a firsthand (primary source) and secondhand account (secondary source) of the same event or topic.

C. Integration of Knowledge and Ideas
7. Interpret qualitative and quantitative information and explain how the information contributes to an understanding of the text.

Process and Literacy Skills Standard 2: The student will develop and demonstrate Common Core writing literacy skills.

A. Text Types and Purposes
1. Write opinion pieces on United States Regional and History topics or texts, supporting a point of view with reasons and information.
2. Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
3. Write narratives to develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences.

B. Production and Distribution of Writing
4. Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience.
6. With some guidance and support from adults, use technology, including the Internet, to produce and publish writing as well as to interact and collaborate with others.
7. Conduct short research projects that build knowledge through investigation of different aspects of United States regional geography and history.
8. Recall and gather relevant information from experiences or print and digital sources; take notes and categorize information, and provide a list of sources.
9. Draw evidence from literary or informational social studies texts to support analysis, reflection, and research.

C. Range of Writing
10. Write routinely over extended time frames and shorter time frames for a range of social studies tasks, purposes, and audiences.

Process and Literacy Skills Standard 3: The student will develop and demonstrate Common Core speaking and listening skills.

A. Comprehension and Collaboration
1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on Grade 4 United States Regional Geography and History topics and texts, building on others' ideas and expressing their own clearly.
2. Paraphrase portions of a social studies text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally.

3. Identify the reasons and evidence a speaker provides to support particular points regarding a social studies topic.

B. Presentation of Knowledge and Ideas

4. Report on a social studies topic or text, tell a social studies related story in an organized manner, using appropriate facts and relevant, descriptive details to support main ideas or themes; and speak clearly at an understandable pace.
5. Add audio recordings and visual displays to social studies presentations when appropriate to enhance the development of main ideas or themes.

CONTENT SKILLS

Content Standard 1: The student will analyze the physical, cultural, political, economic, and the historic features and places of the regions of the United States.

1. The student will identify and locate both relative and absolute location (latitude and longitude), the physical features of the regions of the United States including bodies of water, major rivers and drainage systems, mountain ranges, and unique, natural geographic features.
   A. Locate landforms and bodies of water on a map of North America: the United States, the Atlantic and Pacific Oceans, and the Gulf of Mexico; the major river drainage systems including the Mississippi, Ohio, Missouri, Arkansas, Colorado, Columbia, and Rio Grande Rivers; the Great Lakes, the Great Salt Lake, and the Chesapeake Bay; the Great Plains and the Continental Divide; and the Appalachian, Rocky, Sierra Nevada, Cascade, and Brooks Mountain Ranges.
   B. Identify, locate, and describe unique, natural geographic features of the United States including Niagara Falls, the Everglades, Death Valley, the Petrified Forest, the Painted Desert, the Grand Canyon, the Great Salt Lake, the Great Basin, the Mojave Desert, the Redwood Forest, the Badlands in South Dakota, Yellowstone and Grand Teton National Parks, Yosemite National Park, and Hawaii Volcanoes National Park.
2. The student will identify and analyze the cultural and historic features of the United States.
   A. Locate the current boundaries of the United States including Alaska and Hawaii.
   B. Identify the states, state capitals, and major cities in each region.
   C. Identify the historic significance of major national monuments, historic sites, and landmarks including the Jefferson, Lincoln, and Washington Monuments, the White House, the United States Capitol, the United States Supreme Court, Mount Vernon, Monticello, Colonial Williamsburg, Jamestown Historic Site, Dr. Martin Luther King, Jr. National Historic Site in Atlanta, Ellis Island, the Statue of Liberty, the 9/11 memorials, Independence Hall, the Jefferson National Expansion Memorial/Gateway Arch in St. Louis, the Oklahoma City National Memorial, Mount Rushmore, Little Bighorn National Monument, the Golden Gate Bridge, and Pearl Harbor National Park.
   D. Describe the diverse but unified nature of the American people by identifying the distinctive contributions to American culture of Native Americans, African Americans, major European groups, major Spanish-speaking groups, and Asian Americans.
   E. Describe the purpose of local, state, tribal, and national governments in meeting the needs of American citizens including the basic structure of the national government centered in Washington, D.C.
   F. Commemorate Celebrate Freedom Week by recognizing the sacrifices and contributions to American freedom by veterans and by reciting the social contract selection from the *Declaration of Independence*:

      > We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness. – That to secure these rights, Governments are instituted among Men, deriving their just powers from the consent of the governed.
3. Compare and contrast the regional vegetation, climate, and spatial distribution and use of natural resources.
4. Analyze natural resources and how they impacted the economy of each region including fishing, farming, ranching, mining, manufacturing, tourism, and oil and gas, and their connections to global trade.
5. Summarize how people interact with their environment to resolve geographic challenges including housing, industry, transportation, communication, bridges, dams, tunnels, canals, freshwater supply, irrigation systems, and landfills. (CCRIT 2)

Standard 2: The student will examine Native American groups and European explorations and settlements impacting the development of the major regions of the United States.

1. Identify the major Native American groups and their ways of life in each region including traditional housing and economic activities, customs and storytelling, viewpoints on land usage and ownership, and their contributions to American culture and history.
2. Examine and summarize the reasons for the key expeditions of Spain, France, and England and their impact on the development of each region including the explorers Columbus, Ponce de León, Desoto, Coronado, Marquette and Jolliet, LaSalle, Cabot, Hudson, Drake, and Raleigh. (CCRIT 2)
3. Summarize how France, Spain, England, Russia, and the Netherlands culturally influenced different regions of the United States in which they settled including regional place names, architectural features, customs, and language. (CCRIT 2)
4. Identify and evaluate instances of both cooperation and conflict between Native American groups and European settlers arising from the Columbian Exchange including agriculture, trade, cultural exchanges, military alliances, wars, and control of territory.

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Grade 5
UNITED STATES STUDIES
Creating the United States: The Foundation, Formation, and Transformation of the American Nation, 1607-1806

In the Grade 5 curriculum section of The Foundation, Formation, and Transformation of United States History, students will examine the inheritance of the British system and the practices of constitutionalism, self-government, individual rights, representative government, and separation of powers. The United States Studies will begin with the British settlement of Virginia at James Towne in 1607 and will conclude with the explorations of the Louisiana Purchase by Lewis and Clark.

The Social Studies Process and Literacy Skills (PALS) are to be integrated throughout the Grade 5 content standards and methods of instructional delivery.

ASSESSMENT NOTE: For the Grade 5 Criterion-Referenced Test (CRT) in Social Studies, the time frame is James Towne, 1607 through the ratification of the *United States Constitution* and the adoption of the *Bill of Rights* on December 15, 1791.

The Process and Literacy Standards 1-3 should be integrated throughout the content standards and used in teaching and assessing the course content at the classroom and district level. At the state level, the Process and Literacy Standards 1-3 will be measured and reported within each of the content standards 1, 2, 3, and 4 as appropriate. Only Content Standard 5 will not be assessed on the Grade 5 CRT. The Process and Literacy Skills (PALS) assessment items will be content-based and reported under each of the content standards. For assessment purposes, each Content Standard 1- 4 will have items using primary and secondary source documents, timelines, maps, charts, graphs, pictures, photographs, and/or political cartoons. There will be a balance of graphic and textual stimulus materials within the various United States History test forms. At least 50 percent of the assessment items will have appropriate pictorial and graphical representations.

An asterisk (*) has been used to identify Content Standard 5 and the following objectives that must be assessed by the local school district. All other skills may be assessed by the Oklahoma School Testing Program (OSTP).

PROCESS AND LITERACY SKILLS (PALS) FOR LEARNING

Process and Literacy Skills Standard 1: The student will develop and demonstrate Common Core informational text reading literacy skills.

A. Key Ideas and Details
1. Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.
2. Determine two or more main ideas of a text and explain how they are supported by key details; summarize the text.
3. Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in United States history primary and/or secondary sources based on specific information in the texts.

B. Craft and Structure
4. Determine the meaning of social studies-specific words and phrases in a text relevant to United States history and government.
5. Compare and contrast the overall structure (e.g., chronology, comparison, cause/effect, historic problem/solution) of events, ideas, concepts, or information in two or more texts.
6. Analyze multiple accounts of the same event or topic, noting important similarities and differences in the point of view they represent.

C. Integration of Knowledge and Ideas
7. Draw on information from multiple print or digital sources (e.g., timelines, maps, graphs, charts, political cartoons, images, artwork), demonstrating the ability to locate an answer to a question or to solve an historic problem.
8. Identify and explain how an author uses reasons and evidence to support particular points in a text.
9. Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably.

Process and Literacy Skills Standard 2: The student will develop and demonstrate Common Core writing literacy skills.

A. Text Types and Purposes
1. Write opinion pieces on topics in United States history and government, supporting a point of view with reasons and information.
2. Write informative/explanatory texts to examine a topic in United States history and government.
3. Write historically-based narratives to develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences.

B. Production and Distribution of Writing
4. Produce clear and coherent writing in which the development and organization are appropriate to the task, purpose, and audience.
6. With some guidance and support from adults, use technology, including the Internet, to produce and publish writing as well as to interact and collaborate with others.

C. Research to Build and Present Knowledge
7. Conduct short research projects that use several primary and secondary sources to build knowledge through investigation of different aspects of United States history and government.
8. Gather and recall relevant information from experiences, print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources.
9. Draw evidence from literary or informational texts to support analysis, reflection, and research.

D. Range of Writing
10. Write routinely over extended time frames and shorter time frames for a range of United States history and government tasks, purposes, and audiences.

Process and Literacy Skills Standard 3: The student will develop and demonstrate Common Core speaking and listening skills.

A. Comprehension and Collaboration
1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on Grade 5 United States History topics and texts, building on others' ideas and expressing their own clearly.
2. Summarize a social studies text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally.
3. Summarize the points a speaker makes and explain how each claim is supported by reasons and evidence.

B. Presentation of Knowledge and Ideas
4. Report on a United States History topic or text or present an opinion, sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; and speak clearly at an understandable pace.
5. Include multimedia components (e.g., graphics, sound) and visual displays in United States History presentations when appropriate to enhance the development of main ideas or themes.

CONTENT SKILLS

Content Standard 1: The student will examine James Towne Settlement and Plimoth Plantation as the foundations of American culture and society. (CCRIT 3 and 8)

1. Examine the economic and political reasons and motivations for English exploration and settlement in Virginia as evidenced through the competition for resources and the gaining of national wealth and prestige at Roanoke and James Towne. (CCRIT 8)
2. Analyze the economic, political, and religious reasons and motivations of free immigrants and indentured servants from the British Isles who came to Virginia. (CCRIT 8)
3. Explain the contributions, relationships, and interactions of John Smith, Powhatan, and John Rolfe to the establishment and survival of the James Towne settlement including the Starving Times and the development of tobacco as Virginia's cash crop. (CCRIT 3)
4. Identify and explain the reasons for the English commitment to the permanent settlement of James Towne as evidenced through the foundational events of 1619 including the introduction of
   A. representative government with the meeting of the House of Burgesses,
   B. private ownership of land, and
   C. Africans as laborers; initially as indentured servants and later lifetime slavery. (CCRIT 8)

5. Use specific textual evidence from primary and secondary sources to summarize the successes and challenges the settlement of Plimoth Plantation experienced in regards to their approach to
   A. Religious motivations for migration,
   B. Governing institutions as established by the *Mayflower Compact*,
   C. Relationship with Native Americans, and
   D. The contributions of the Pilgrims, William Bradford, Chief Massasoit, and Squanto. (CCRIT 1 and 3)

Content Standard 2: The student will compare and contrast the developments of the New England Colonies, the Middle Colonies, and the Southern Colonies based on economic opportunities, natural resources, settlement patterns, culture, and institutions of self-government. (CCRIT 5, 6 and 7; CCW 9)

1. Compare and contrast the three colonial regions in regards to natural resources, agriculture, exports, and economic growth including the different uses of the labor systems use of indentured servants and slaves. (CCRIT 5 and CCRIT 6)
2. Analyze the similarities and differences of self-government in the three colonial regions including the role of religion in the establishment of some colonies, the House of Burgesses in Virginia, and town hall meetings in New England. (CCRIT 6)
3. Explain the international economic and cultural interactions occurring because of the triangular trade routes including the forced migration of Africans in the Middle Passage to the British colonies. (CCRIT 3)
4. Analyze and explain the relationships and interactions of ongoing encounters and conflicts between Native Americans and the British colonists involving territorial claims including King Phillip's War. (CCRIT 3)
5. Draw specific evidence using informational texts and analyze the contributions of important individuals and groups to the foundation of the American system including Roger Williams, the Puritans, William Penn and the Quakers, Lord Baltimore, and James Oglethorpe. (CCRIT 7 and CCW 9)
6. Analyze and compare the daily life in the colonies as experienced by different social classes including large landowners, craftsmen and artisans, farmers, women, enslaved and freed African Americans, indentured servants, merchants, and Native Americans, noting important similarities and differences in the points of view they represent. (CCRIT 6)

Content Standard 3: The student will examine the foundations of the American nation laid during the Revolutionary Era through the contributions of historic individuals and groups, the spreading of the ideals found within the *Declaration of Independence*, and the significant military and diplomatic events of the Revolutionary War that resulted in an independent United States. (CCRIT 1, 3, 5, 6, and CCW 7, 9)

1. Research and examine the causes and effects of significant events leading to armed conflict between the colonies and Great Britain drawing evidence from informational texts about the following events including (CCRIT 3, 5, 6 and CCW 7, 9)
   A. The *Proclamation of 1763* by King George III in restricting the perceived rights of the colonists to Native American lands which they believed they had earned by fighting during the French and Indian War,
   B. The *Sugar* and *Stamp Acts* as the first direct taxes levied by Parliament on the American colonists,
   C. The boycotts of British goods and the efforts of the Committees of Correspondence as economic means of protesting British policies the colonists thought were violating their rights to govern themselves including the right of self-taxation in hopes of getting the acts repealed,
   D. The *Quartering Act* as a way for the British government to share the costs of defending the colonies and of controlling the growing colonial discontent,
   E. The Boston Massacre as a sign the colonists were beginning to change protest tactics from peaceful means to direct, physical confrontation,
   F. Colonial arguments that there should be no taxation without representation in Parliament,
   G. The Boston Tea Party and issuance of the *Coercive Acts* (the Intolerable Acts) as punishment for destroying private property,
   H. The British raids on Lexington and Concord, which provoked colonial armed resistance resulting in the siege of the British in Boston, and
   I. The publication of Thomas Paine's pamphlet, *Common Sense*, which made a rational argument for colonial independence.

2. Draw evidence from the *Declaration of Independence* to identify and explain the colonial grievances which motivated the Second Continental Congress to make arguments for and to declare independence from Great Britain and establish the ideals in American society of equality, inalienable rights, and the consent of the governed. (CCRIT 8 and CCW 9)
3. Commemorate Celebrate Freedom Week by recognizing the sacrifices and contributions to American freedom by veterans and by reciting the social contract selection from the *Declaration of Independence*:

    > We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness. – That to secure these rights, Governments are instituted among Men, deriving their just powers from the consent of the governed.

4. Draw specific evidence from informational texts and analyze the formation, benefits, and weaknesses of the first American national system of government under the *Articles of Confederation* including conducting and winning the Revolutionary War and management of the western territories. (CCRIT 7 and CCW 9)
5. Analyze and explain the relationships of significant military and diplomatic events of the Revolutionary War including the leadership of General George Washington, the experiences at Valley Forge, the impact of the battles at Trenton, Saratoga, and Yorktown, as well as the recognition of an independent United States by Great Britain through the *Treaty of Paris*. (CCRIT 3)
6. Identify and explain the contributions and points of view of key individuals and groups involved in the American Revolution including Patrick Henry, Samuel Adams, John Adams, Abigail Adams, Paul Revere, Benjamin Franklin, Thomas Jefferson, Mercy Otis Warren, Phillis Wheatley, the Sons and Daughters of Liberty, patriots, and loyalists by drawing information from multiple sources. (CCRIT 7, 8 and CCW 7, 9)

Content Standard 4: The student will examine the formation of the American system of government following the American Revolution.

1. Draw specific evidence from informational texts and examine the issues and events encountered by the young nation that led to the Constitutional Convention in Philadelphia in 1787 including a weak national government, the *Northwest Ordinance*, and civil unrest as typified in Shays' Rebellion. (CCRIT 3 and CCW9)
2. Examine the contributions and leadership of George Washington, James Madison, George Mason, and Gouverneur Morris as evidenced in the great issues, debates, and compromises of the Constitutional Convention including the *Virginia Plan* and the *New Jersey Plan*, slavery, the Three-fifths Compromise, and the Great Compromise. (CCRIT 2)
3. Determine the main purposes of the United States government as expressed in the *Preamble* and as evidenced in the *United States Constitution* including the principles reflected in the separation of powers, checks and balances, and shared powers between the federal and state governments, and the basic responsibilities of the three branches of government. (CCRIT 2)
4. Explain the process of ratification of the *United States Constitution* as well as compare and contrast the viewpoints of the Federalists and Anti-Federalists over the addition of a bill of rights. (CCRIT 5)
5. Examine the *Bill of Rights* and summarize the liberties protected in all 10 amendments. (CCRIT 2)

***Content Standard 5: The student will compare and contrast the continued formation of the new nation under the leadership of Presidents Washington, Adams, and Jefferson. (CCRIT 5)**

1. Analyze the formation of the new government and the presidential leadership qualities of George Washington including the precedent set by his decision not to seek a third term and the impact of his *Farewell Address*.
2. Explain the impact of the presidential election of 1800 regarding the peaceful transfer of political power from one party to another.
3. Examine the transformative impact of the *Louisiana Purchase* in 1803 upon the American system in regards to the explorations by Lewis and Clark and the concept of Manifest Destiny as America expanded westward.

An asterisk (*) has been used to identify Content Standard 5 and the following objectives that must be assessed by the local school district. All other skills may be assessed by the Oklahoma School Testing Program (OSTP).

Grade 6
WORLD GEOGRAPHY
Western Hemisphere: The Why of Where – Places, Patterns of Settlement, and Global Interactions

Geography is the study of spatial patterns of the human and physical characteristics of the world and its peoples. Students will use geographic knowledge as a tool for understanding the concepts of economics and the impact of recent history on contemporary events. Students will explore how spatial patterns form, change over time, and relate to one another through a two-year examination of the regions of the world with the Western Hemisphere being studied in Grade 6 followed by the Eastern Hemisphere in Grade 7. For practical uses the traditional designations of Eastern and Western Hemispheres have been followed. The Western Hemisphere is treated as the areas of North America, South America, and the Caribbean.

The Common Core History/Social Studies Reading and Writing Literacy Skills are to be integrated across all of the content standards and used for instructional delivery of the content.

PROCESS AND LITERACY SKILLS

Literacy Skills Standard 1: The student will develop and demonstrate Common Core Social Studies reading literacy skills.

A. Key Ideas and Details
1. Cite specific textual evidence to support analysis of primary and secondary sources.
2. Determine the central ideas or information of a primary or secondary source; provide an accurate summary of the source distinct from prior knowledge or opinions.
3. Identify key steps in a text's description of a process related to history/social studies (e.g., how a bill becomes law, how interest rates are raised or lowered).

B. Craft and Structure
4. Determine the meaning of words and phrases as they are used in a text, including vocabulary specific to domains related to history/social studies.
5. Describe how a text presents information (e.g., sequentially, comparatively, causally).
6. Identify aspects of a text that reveal an author's point of view or purpose (e.g., loaded language, inclusion or avoidance of particular facts).

C. Integration of Knowledge and Ideas
7. Integrate visual information (e.g., in charts, graphs, photographs, videos, or maps) with other information in print and digital texts.
8. Distinguish among fact, opinion, and reasoned judgment in a text.
9. Analyze the relationship between a primary and secondary source on the same topic.

D. Range of Reading and Level of Text Complexity
10. By the end of grade 8, read and comprehend history/social studies texts in the grades 6–8 text complexity band independently and proficiently.

Literacy Skills Standard 2: The student will develop and demonstrate Common Core Social Studies writing literacy skills.

A. Text Types and Purposes
1. Write arguments focused on discipline-specific content.
   a. Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.
   b. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.
   c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.
   d. Establish and maintain a formal style.
   e. Provide a concluding statement or section that follows from and supports the argument presented.
2. Write informative/explanatory texts, including the narration of historic events, scientific procedures/experiments, or technical processes.
   a. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.
   b. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.
   c. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.
   d. Use precise language and domain-specific vocabulary to inform about or explain the topic.

e. Establish and maintain a formal style and objective tone.
f. Provide a concluding statement or section that follows from and supports the information or explanation presented.
3. (See note; not applicable as a separate requirement)

B. Production and Distribution of Writing
4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
5. With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.
6. Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.
7. Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
8. Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
9. Draw evidence from informational texts to support analysis reflection, and research.

C. Range of Writing
10. Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Note: Students' narrative skills continue to grow in these grades. The Standards require that students be able to incorporate narrative elements effectively into arguments and informative/explanatory texts. In history/social studies, students must be able to incorporate narrative accounts into their analyses of individuals or events of historic import.

CONTENT SKILLS

Content Standard 1: The student will analyze data from a geographic perspective using the skills and tools of geography.

1. Cite specific geographic information to support analysis from primary and secondary sources located in texts, documents, newspapers, magazines, journals, political cartoons, and online news sources.
2. Integrate visual information, draw conclusions, and make predictions from geographic data and analyze spatial distribution and patterns by interpreting that data as displayed on globes, graphs, charts, satellite and other forms of visual imagery including data from bar and line graphs, pie charts, thematic maps, population pyramids, climagraphs, cartagrams, contour/relief maps, GIS systems, and diagrams.
3. Describe basic types of map projections and compare how they display information including Mercator, Peters, and Robinson, and apply the concepts of scale, distance, direction, relative location, absolute location, and latitude and longitude.
4. Integrate visual information and apply the skill of mental mapping of the political and physical features of Earth's surface and to organize information about people, places, and environments.
5. Conduct short research projects by investigating contemporary events and issues from political, economic, social, and geographic perspectives.
6. Commemorate Celebrate Freedom Week by recognizing the sacrifices and contributions to American freedom by veterans and by reciting the social contract selection from the *Declaration of Independence*:

> We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness. – That to secure these rights, Governments are instituted among Men, deriving their just powers from the consent of the governed.

Content Standard 2: The student will examine the cultural and physical characteristics of the major regions of the Western Hemisphere.

1. Define the concept of region and identify major political, physical, and economic regions of the Western Hemisphere including
   A. The political regions of North America, Central America, South America, and the Caribbean,

B. The physical regions including the Amazon rainforest and the North American Great Plains, and
C. The economic regions including commercial agriculture in North America and subsistence agriculture of Amazonian communities.

2. Describe specific political regions of the Western Hemisphere and identify on a political map the major urban centers and countries including
   A. All nations of North America, Central America, South America, and the Caribbean, and
   B. Major metropolitan areas including New York City, Los Angeles, Chicago, Houston, Washington, DC, Miami, Toronto, Montreal, Vancouver, Mexico City, Panama City, San Jose, Rio de Janeiro, Buenos Aires, Santiago, Caracas, Bogota, Sao Paulo, San Juan, and Havana.
3. Describe the characteristics and relative location of major cultural regions of the Western Hemisphere including
   A. the Maya civilization of Mesoamerica,
   B. the Inca civilization of Latin America,
   C. the Inuit indigenous peoples of the Arctic,
   D. Hispanic communities of the United States and indigenous peoples of North and South America, and
   E. French-speaking Quebec.
4. Explain and summarize how common characteristics can link as well as divide regions including
   A. The question of sovereignty for French-speaking Canadians,
   B. The free trade relationships established by NAFTA, and
   C. The establishment of *maquiladoras* on the United States-Mexican border.
5. Cite specific textual and visual evidence in order to analyze reasons for conflict and cooperation among groups, societies, countries, and regions of the Western Hemisphere including
   A. The bi-national construction of the St. Lawrence Seaway,
   B. Disputes between South American nations over fishing rights off the Pacific Coast,
   C. The strain on international relations caused by immigration, and
   D. Relief efforts of the United Nations following natural disasters.

Content Standard 3: The student will examine the interactions of physical systems that shape the patterns of Earth's surface.

1. Integrate visual information in order to identify on a physical map and describe the major landforms and bodies of water of the Western Hemisphere including
   A. Bodies of Water – Mississippi, Colorado, MacKenzie, Rio Grande, and Amazon Rivers, Gulf of Mexico, Hudson Bay, Straits of Magellan and the Bering Strait, Atlantic, Pacific, Arctic and Southern Oceans, the Great Lakes, and the concept of drainage systems and the Continental Divide.
   B. Landforms – the Appalachian, Rocky, Andes, and Cascade Mountain Ranges, the Atacama and Sonoran Deserts, the Hawaiian and Greater Antilles archipelagos, the Pampas and Great Plains, the Canadian Shield, the Yucatan Peninsula, the Isthmus of Panama, and the Great Basin.
2. Describe how the processes and factors of latitude, elevation, Earth-Sun relationship, prevailing winds, and proximity to bodies of water influence climate and how humans respond to regional climate patterns and events including drought and *El Niño*.
3. Analyze the impact of natural disasters on human populations including forced migration, scarcity of consumer goods, and loss of employment.

Content Standard 4: The student will analyze the human systems of the Western Hemisphere in the context of the world's peoples and cultures.

1. Identify and describe cultural traits of language, ethnic heritage, social systems, religion, and traditions including how cultural diffusion impacts societies.
2. Describe and compare examples of the market and command economic systems including how governments affect economic activities in such systems.
3. Describe the major political systems of representative governments (democracy, republic, constitutional monarchy) and authoritarian systems (dictatorship) including the role of the citizen in the selection of government officials, lawmaking, and the liberties guaranteed under different forms of government.
4. Cite specific textual and visual evidence to explain patterns of global economic interdependence and world trade including the concepts of balance of trade, supply and demand, and measures of economic growth including Gross Domestic Product (GDP).

5. Analyze the impact of geography on population location, growth, and change, applying geographic concepts of population density, the availability of resources, settlement patterns, and migrational push and pull factors including the twentieth century Asian and Caribbean refugee migration to North America or the pattern of Hispanic workers migrating to the United States.

Content Standard 5: The student will analyze the interactions of humans and their environment in the western hemisphere.

1. Integrate and compare visual information of the common characteristics of developed and developing countries including access to human and economic capital, the impact of education and technology; and analyze data used by geographers including literacy rate, life expectancy, and per capita income.
2. Summarize the impact of the distribution of major renewable and nonrenewable resources and evaluate how the three levels of economic activities (primary, secondary, and tertiary) contribute to the development of a country or region including
   A. The United States' and Canada's access to fossil fuels, water, iron, and arable soil,
   B. Agricultural development dependent on the natural aquifers of the Great Plains,
   C. The nationalized oil production in Venezuela and Mexico, and
   D. North America's access to iron and coal enabling a productive steel industry.
3. Evaluate the effects of human modification of and adaptation to the natural environment including
   A. Terraced farmland of the Andes,
   B. Construction of the Panama Canal,
   C. Clear-cutting of the boreal forests of North America, and
   D. Diversion of the Colorado River for irrigation and municipal water.
4. Analyze regional problems of the western hemisphere having spatial dimensions including
   A. Oil spills in the Gulf of Mexico,
   B. Deforestation of Amazonia,
   C. Air pollution and urban sprawl of Mexico City, and
   D. Water pollution from industrial run-off into the Great Lakes.
5. Summarize the role of citizens as responsible stewards of natural resources and the environment including
   A. Careful use of fertilizer and pesticides to avoid polluting the land and the water supply,
   B. Participation in recycling and anti-littering activities,
   C. Conservation of natural resources, and
   D. Support of alternative and sustainable energy sources.

Grade 7
WORLD GEOGRAPHY
Eastern Hemisphere
The Why of Where – Places, Patterns of Settlement, and Global Interactions

Geography is composed of the interrelated components of skills and content knowledge, both of which are necessary to being a geographically informed citizen. Students will use geographic knowledge as a tool for understanding the concepts of economics and the impact of recent history on contemporary events. Students will focus on spatial patterns of human and physical characteristics of the world and its peoples, and will explore how these patterns form, change over time, and relate to one another in the Eastern Hemisphere. This is the second half of the middle level geographic studies program. The Western Hemisphere was the focus of the Grade 6 portion. For practical uses the traditional designations of Eastern and Western Hemispheres have been followed. The Eastern Hemisphere is treated as the areas of Africa, Asia, Europe, Australia, and Oceania.

The Common Core History/Social Studies Reading and Writing Literacy Skills are to be integrated throughout all of the content standards and used for instructional delivery of the content.

ASSESSMENT NOTE: Standard 1 and 2 Social Studies Process and Literacy Skills should be integrated throughout the content standards and used in teaching and assessing the student's understanding of the course skills and content at the classroom and district level. At the state level, the Social Studies Process and Literacy Standards 1 and 2 will be measured and reported within each of the content standards. Process and Literacy Skills assessment items will be content-based and reported under each of the content standards. For assessment purposes, each standard will have items using maps, charts, graphs, pictures, and photographs. There will be a balance of graphic and textual stimulus materials within the various World Geography Eastern Hemisphere test forms. At least 50 percent of the assessment will have appropriate pictorial and graphical representations.

PROCESS AND LITERACY SKILLS
Literacy Skills Standard 1: The student will develop and demonstrate Common Core Social Studies reading literacy skills.

A. Key Ideas and Details
1. Cite specific textual evidence to support analysis of primary and secondary sources.
2. Determine the central ideas or information of a primary or secondary source; provide an accurate summary of the source distinct from prior knowledge or opinions.
3. Identify key steps in a text's description of a process related to history/social studies (e.g., how a bill becomes law, how interest rates are raised or lowered).

B. Craft and Structure
4. Determine the meaning of words and phrases as they are used in a text, including vocabulary specific to domains related to history/social studies.
5. Describe how a text presents information (e.g., sequentially, comparatively, causally).
6. Identify aspects of a text that reveal an author's point of view or purpose (e.g., loaded language, inclusion or avoidance of particular facts).

C. Integration of Knowledge and Ideas
7. Integrate visual information (e.g., in charts, graphs, photographs, videos, or maps) with other information in print and digital texts.
8. Distinguish among fact, opinion, and reasoned judgment in a text.
9. Analyze the relationship between a primary and secondary source on the same topic.

D. Range of Reading and Level of Text Complexity
10. By the end of grade 8, read and comprehend history/social studies texts in the grades 6–8 text complexity band independently and proficiently.

Literacy Skills Standard 2: The student will develop and demonstrate Common Core Social Studies writing literacy skills.

A. Text Types and Purposes
1. Write arguments focused on discipline-specific content.
   a. Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.
   b. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.
   c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.
   d. Establish and maintain a formal style.

e. Provide a concluding statement or section that follows from and supports the argument presented.

2. Write informative/explanatory texts, including the narration of historic events, scientific procedures/experiments, or technical processes.
   a. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.
   b. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.
   c. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.
   d. Use precise language and domain-specific vocabulary to inform about or explain the topic.
   e. Establish and maintain a formal style and objective tone.
   f. Provide a concluding statement or section that follows from and supports the information or explanation presented.
3. (See note; not applicable as a separate requirement)

B. Production and Distribution of Writing

4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
5. With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.
6. Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.
7. Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
8. Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
9. Draw evidence from informational texts to support analysis reflection, and research.

C. Range of Writing

10. Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Note: Students' narrative skills continue to grow in these grades. The Standards require that students be able to incorporate narrative elements effectively into arguments and informative/explanatory texts. In history/social studies, students must be able to incorporate narrative accounts into their analyses of individuals or events of historic import.

CONTENT SKILLS

Content Standard 1: The student will analyze data from a geographic perspective using the skills and tools of geography.

1. Cite specific geographic information to support analysis from primary and secondary sources located in texts, documents, newspapers, magazines, journals, political cartoons, and online news sources.
2. Integrate visual information, draw conclusions, and make predictions from geographic data and analyze spatial distribution and patterns by interpreting that data as displayed on globes, graphs, charts, satellite and other forms of visual imagery including data from bar and line graphs, pie charts, thematic maps, population pyramids, climagraphs, cartagrams, contour/relief maps, GIS systems, and diagrams.
3. Apply the concepts of scale, distance, direction, relative location, absolute location, and latitude and longitude.
4. Integrate visual information and apply the skill of mental mapping of the political and physical features of Earth's surface and to organize information about people, places, and environments.
5. Conduct short research projects by investigating contemporary events and issues from political, economic, social, and geographic perspectives.
6. Commemorate Celebrate Freedom Week by recognizing the sacrifices and contributions to American freedom by veterans and by reciting the social contract selection from the *Declaration of Independence*:

   > We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness. – That to secure these rights, Governments are instituted among Men, deriving their just powers from the consent of the governed.

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Content Standard 2: The student will examine the human and physical characteristics of the major regions of the Eastern Hemisphere.

1. Integrate visual information in order to describe specific political regions of the Eastern Hemisphere, and identify on a political map the major urban areas and countries including
   A. Europe – London/United Kingdom, Paris/France, Rome/Italy, Berlin/Germany, and Moscow/Russia,
   B. Southwest Asia – Mecca/Saudi Arabia, Jerusalem/Israel, Tehran/Iran, Beirut/Lebanon, and Bagdad/Iraq,
   C. South Asia – Mumbai/India, Pakistan, Afghanistan,
   D. East and Southeast Asia – Beijing/China, Seoul/South Korea, Tokyo/Japan, Indonesia, Vietnam, and Malaysia,
   E. Africa – Cairo/Egypt, Nairobi/Kenya, South Africa, Libya, Sudan, and Nigeria, and
   F. Oceania – Australia and New Zealand.
2. Integrate visual information in order to describe the characteristics and relative location of physical and cultural regions of the Eastern Hemisphere including
   A. Physical Regions –
      1) Sub-Saharan savannas and rainforests,
      2) Pacific Ring of Fire,
      3) Rhine-Danube industrial corridor, and
      4) The Himalayan Mountain Range.
   B. Cultural Regions –
      1) The Sahel's and Sahara's nomadic peoples,
      2) Jerusalem's religious significance to Judaism, Christianity, and Islam, and
      3) The cultural hearths of the Nile, Indus, Ganges, Hwang He River Valleys, and Mesopotamia.
3. Explain and summarize how common physical or human characteristics can link as well as divide regions including
   A. Extensive inland waterway systems of natural rivers and manmade canals that link European trading centers,
   B. Ural Mountains that physically divide Europe from Asia,
   C. Sahara Desert that physically and culturally divides North Africa from Sub-Sahara Africa,
   D. Multiple languages, religion, and the legacy of the caste system in India that present barriers to cultural unity, and
   E. Cultural differences resulting in civil war and genocide in Darfur and Rwanda.
4. Cite specific textual and visual evidence to analyze reasons for conflict and cooperation among groups, societies, countries, and regions of the Eastern Hemisphere and the involvement of multinational organizations of the United Nations and the North Atlantic Treaty Organization including
   A. Multinational peace-keeping efforts to stabilize Arab-Israeli relations,
   B. Roots of disputes between India and Pakistan resulting in the threat of conventional war and nuclear war,
   C. Impact of multiple ethnic groups on Nigerian political stability,
   D. Coordination of currency and free trade zones created by the European Union,
   E. Humanitarian relief efforts by the United Nations to address hunger in Africa, and
   F. The struggle for and achievement of civil liberties and economic opportunities in South Africa's post-apartheid era.
5. Explain and summarize how and why regions change over time through physical and human processes which operate to modify Earth's surface including the
   A. Cultural diffusion brought about by North Africa's location central to trade across multiple continents,
   B. Impact of overgrazing and drought leading to desertification in the Sahel,
   C. Results of the Green Revolution in Central Asia, and
   D. Effects of abundant oil supplies in the Persian Gulf region.

Content Standard 3: The student will examine the interactions of physical systems that shape the patterns of Earth's surface in the Eastern Hemisphere.

1. Integrate visual information to identify on a physical map and describe the major landforms and bodies of water including
   A. Landforms – the Iberian, Scandinavian, and Indochina Peninsulas; the Urals, Pyrenees, Alps, and Himalayan Mountain Ranges; the Sahara, Kalahari, and Gobi Deserts; and the Great Rift Valley.
   B. Bodies of water – Danube, Volga, Nile, Congo, Niger, Tigris, Euphrates, Indus, Ganges, and Yangtze Rivers; Mediterranean, Arabian and North Seas; Persian Gulf; Bay of Bengal; Strait of Gibraltar; Atlantic, Arctic, Indian, Pacific, and the Southern Oceans.
2. Analyze from multiple perspectives the impact of natural disasters on human populations resulting in forced migration, scarcity of consumer goods, and loss of employment including
   A. The impact of plate tectonics resulting in earthquakes, tsunamis, and volcanic eruptions on human and physical systems bordering the Pacific Ring of Fire,
   B. Frequent drought of northern Africa and Southwest Asia that creates stress on humans and wildlife,
   C. The impact of monsoon patterns and typhoon activity on agriculture and loss of life in South Asia, and
   D. Regular flooding of China's rivers resulting in the accumulation of loess.

Content Standard 4: The student will analyze the world's peoples and cultures in the context of the human systems in the Eastern Hemisphere.

1. Compare and contrast the common cultural traits including language, ethnic heritage, social systems, religions, and traditions and how cultural diffusion impacts societies.
2. Describe the world's major religions including Buddhism, Christianity, Daoism, Hinduism, Islam, and Judaism including the geographic origins, major beliefs, and customs of the six major world religions and the significance of religion in contemporary societies.
3. Integrate visual information to analyze data used by geographers to measure the human characteristics used to define developed versus developing countries including literacy rates, life expectancy, infant mortality rate, Gross National Product (GNP), and per capita income.
4. Compare and contrast the market and command economic systems and how governments affect economic activities in such systems including
   A. Economic reforms in China that are moving China from a command system toward a market system,
   B. The economic advantages and disadvantages of Sweden's mixed market system,
   C. The economic prosperity generated by Japan's market system, and
   D. The economic development limitations of North Korea's command economic system.
5. Compare and contrast the major political systems of representative governments (democracy, republic, and constitutional monarchy) and authoritarian systems (dictatorship and absolute monarchy) including the role of the citizen in the selection of government officials, lawmaking, and the liberties guaranteed under different forms of government.
   A. The symbolic role of the British crown in comparison to the absolute authority of the monarchy of Saudi Arabia.
   B. The transformation of the former Soviet Union from an authoritarian system to the limited representative democracy of Russia.
6. Integrate visual information to explain patterns of global economic interdependence and world trade focusing on the concepts of imports and exports, supply and demand, Gross Domestic Product (GDP), and balance of trade including
   A. The European Union's single currency and open single market that link economies and governments,
   B. The relative isolation of Japan and the United Kingdom that require extensive trade patterns for natural resources and markets,
   C. Outsourcing of technological and manufacturing jobs to developing regions of Asia, and
   D. Control over production and supply of global oil reserves as exercised by the Organization of the Petroleum Exporting Countries (OPEC).
7. Evaluate and summarize the impact of geography on population location, growth, change and density and on the availability of resources, settlement patterns, and migration including the
   A. Impact of push and pull factors on the rural migration to overcrowded urban centers in India,
   B. Challenges of under-population on the labor market in developed nations of Europe,
   C. Changing face of European cultures as a result of recent patterns of immigration, and
   D. Impact of China's one-child policy on population growth and culture.

Content Standard 5: The student will analyze the interactions of humans and their environment in the Eastern Hemisphere.

1. Cite specific textual and visual evidence to describe the relationship between the distribution of major renewable and nonrenewable resources and evaluate how the three levels of economic activities (primary, secondary, and tertiary) contribute to the development of a country or region including the
   A. Abundant energy resources driving China's rapid development,
   B. Reserves of valuable minerals responsible for South Africa's economic growth,
   C. Accessibility of coal and iron reserves contributing to steel industries of western Europe and Russia, and
   D. Value of North Sea petroleum reserves to developed nations' economies.
2. Evaluate the effects of human modification of and adaptation to the natural environment including the
   A. Deforestation of Indonesia's rainforests,
   B. Creation of living space through the drainage of seawater and the system of dikes in the Netherlands,
   C. Transformation of arid lands of the Arabian Peninsula through introduction of western irrigation methods,
   D. Use of terrace farming and double-cropping as solutions to food needs of East Asia, and
   E. Benefits and dangers of nuclear power generation as exemplified by the environmental disaster at Chernobyl.
3. Integrate visual information to analyze regional problems and policies having spatial dimensions in the Eastern Hemisphere including the
   A. Management of the Aral Sea's water resources,
   B. Impact of economic development on Russia's Arctic regions, and
   C. Transformation of the environment and population centers caused by the construction of the Three Gorges Dam in China.

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Grade 8
UNITED STATES HISTORY
Creating the United States: The Foundation, Formation, and Transformation of the American Nation, 1754-1877

The focus of the course in United States History for Grade 8 is the American Revolution through the Civil War and Reconstruction Eras (1754-1877).

The student will describe and analyze the major causes, key events, and important personalities of the American Revolution. The student will examine in greater depth the factors, events, documents, significant individuals, and political ideas that led to the formation of the United States of America. These will be pursued through a chronological study of the early national period, westward expansion, and the Civil War and Reconstruction Eras. Citizenship skills will focus upon the historic development and understanding of constitutional government in the United States. The student will continue to develop and put to use a variety of Social Studies Process and Literacy Skills.

The Common Core History/Social Studies Reading and Writing Literacy Skills are to be integrated throughout all of the content standards and used for instructional delivery of the content.

ASSESSMENT NOTE: However, for the Grade 8 Criterion-Referenced Test over the History, Constitution and Government of the United States, the time frame is 1754-1865, or from approximately the *Albany Plan of Union* to the assassination of President Abraham Lincoln.

Standard 1 and 2 Social Studies Process and Literacy Skills should be integrated throughout the content standards and used in teaching and assessing the student's understanding of the course skills and content at the classroom and district level. At the state level, the Social Studies Process and Literacy Standards 1 and 2 will be measured and reported within each of the content standards 1, 2, 3, 4, and 5. Content Standard 6 is to be taught and assessed at the local district and classroom levels. Process and Literacy Skills assessment items will be content-based and reported under each of the content standards. For assessment purposes, each standard will have items using primary and secondary source documents, timelines, maps, charts, graphs, pictures, photographs, and/or political cartoons. There will be a balance of graphic and textual stimulus materials within the various United States History test forms. At least 50 percent of the assessment will have appropriate pictorial and graphical representations.

An asterisk (*) has been used to identify Content Standard 6 and the following objectives that must be assessed by the local school district. All other skills may be assessed by the Oklahoma School Testing Program (OSTP).

PROCESS AND LITERACY SKILLS

Literacy Skills Standard 1: The student will develop and demonstrate Common Core Social Studies reading literacy skills.

A. Key Ideas and Details
1. Cite specific textual evidence to support analysis of primary and secondary sources.
2. Determine the central ideas or information of a primary or secondary source; provide an accurate summary of the source distinct from prior knowledge or opinions.
3. Identify key steps in a text's description of a process related to history/social studies (e.g., how a bill becomes law, how interest rates are raised or lowered).

B. Craft and Structure
4. Determine the meaning of words and phrases as they are used in a text, including vocabulary specific to domains related to history/social studies.
5. Describe how a text presents information (e.g., sequentially, comparatively, causally).
6. Identify aspects of a text that reveal an author's point of view or purpose (e.g., loaded language, inclusion or avoidance of particular facts).

C. Integration of Knowledge and Ideas
7. Integrate visual information (e.g., in charts, graphs, photographs, videos, or maps) with other information in print and digital texts.
8. Distinguish among fact, opinion, and reasoned judgment in a text.
9. Analyze the relationship between a primary and secondary source on the same topic.

D. Range of Reading and Level of Text Complexity
10. By the end of grade 8, read and comprehend history/social studies texts in the grades 6–8 text complexity band independently and proficiently.

Literacy Skills Standard 2: The student will develop and demonstrate Common Core Social Studies writing literacy skills.

A. Text Types and Purposes

1. Write arguments focused on discipline-specific content.
    a. Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.
    b. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.
    c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.
    d. Establish and maintain a formal style.
    e. Provide a concluding statement or section that follows from and supports the argument presented.
2. Write informative/explanatory texts, including the narration of historic events, scientific procedures/experiments, or technical processes.
    a. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.
    b. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.
    c. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.
    d. Use precise language and domain-specific vocabulary to inform about or explain the topic.
    e. Establish and maintain a formal style and objective tone.
    f. Provide a concluding statement or section that follows from and supports the information or explanation presented.
3. (See note; not applicable as a separate requirement)

B. Production and Distribution of Writing

4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
5. With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.
6. Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.
7. Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
8. Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
9. Draw evidence from informational texts to support analysis reflection, and research.

C. Range of Writing

10. Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Note: Students' narrative skills continue to grow in these grades. The Standards require that students be able to incorporate narrative elements effectively into arguments and informative/explanatory texts. In history/social studies, students must be able to incorporate narrative accounts into their analyses of individuals or events of historic import.

CONTENT SKILLS

Content Standard 1: The student will analyze the foundations of the United States by examining the causes, events, and ideologies which led to the American Revolution.

1. Summarize the political and economic consequences of the French and Indian War on the 13 colonies including the imperial policies of requiring the colonies to pay a share of the costs of defending the British Empire and the precedent of the *Albany Plan of Union* as an early attempt to unify the colonies.
2. Cite specific textual and visual evidence to summarize the significance of British attempts to regulate colonial rights, as well as the colonial responses to these measures including
    A. The restriction of colonial rights as British subjects including colonial opposition and protests against taxation without representation, the boycotts of British goods, Patrick Henry's *Stamp Act Resolves,* the Committees of Correspondence, and the Boston Massacre,

B. The *Coercive Acts of 1774* (the Intolerable Acts) as British punishment for the Boston Tea Party and the convening of the First Continental Congress as a colonial response,
C. The Battles of Lexington and Concord as a rallying point of armed colonial resistance, and
D. Patrick Henry's *Give Me Liberty or Give Me Death* speech and Thomas Paine's pamphlet *Common Sense* advocating the defense of colonial rights and independence.

3. Cite specific textual and visual evidence to analyze the ideological and propaganda war between Great Britain and her North American colonies including the
   A. Points of views of the Patriots and the Loyalists about independence,
   B. Writings of Mercy Otis Warren and Phillis Wheatley,
   C. Use of Paul Revere's engraving of the Boston Massacre,
   D. Rejection of the *Olive Branch Petition* by King George III, and
   E. Grievances which motivated the Second Continental Congress to make arguments for and to declare independence from Great Britain thus creating the United States of America.
4. Determine the central ideas and grievances expressed in the *Declaration of Independence* and their intellectual origin including
   A. John Locke's theory of natural rights,
   B. The concept of the social contract,
   C. The ideals established in the American society of equality, inalienable rights, and the consent of the governed; and
   D. Evaluate the contributions of Thomas Jefferson and the Committee of Five in drafting the *Declaration of Independence*.
5. Commemorate Celebrate Freedom Week by recognizing the sacrifices and contributions to American freedom by veterans and by reciting the social contract selection from the *Declaration of Independence*:

   > We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness. – That to secure these rights, Governments are instituted among Men, deriving their just powers from the consent of the governed.

Content Standard 2: The student will examine the foundations of the American nation laid during the Revolutionary Era through the contributions of significant individuals and groups involved in the key military and diplomatic events of the Revolutionary War that resulted in an independent nation.

1. Analyze the formation of the first American national system of government under the *Articles of Confederation* including the success of conducting and winning the Revolutionary War.
2. Compare and contrast the different motivations and choices that various colonial populations had regarding the War for Independence including
   A. Whether to fight for independence, remain loyal to the king, or to be neutral,
   B. The choices that free and enslaved African Americans had of escaping to freedom, or joining the British or Colonial forces, or remaining enslaved,
   C. The decisions Native Americans had as to which side to support in hopes of protecting their traditional cultures and native territories, and
3. Cite specific textual and visual evidence to summarize the impact of key military and diplomatic events including the
   A. Military leadership of General George Washington,
   B. Victories at Boston, Trenton, and Saratoga,
   C. French Alliance,
   D. Publication of Thomas Paine's *The Crisis*,
   E. Valley Forge Encampment, and
   F. Defeat of Lord Cornwallis's army at the Siege of Yorktown.

Content Standard 3: The student will examine the formation of the American system of government following the Revolutionary War that led to the creation of the *United States Constitution*.

1. Examine and summarize the issues encountered by the young nation that led to the Constitutional Convention in Philadelphia in 1787 including the
   A. Strengths and weaknesses of the *Articles of Confederation*,
   B. Lack of a common national currency,
   C. Lack of a common defense,
   D. Management of the war debts,
   E. Disputes over the western territories as resolved by the *Northwest Ordinance*, and
   F. Civil unrest as typified in Shays' Rebellion.
2. Analyze the significance of the Constitutional Convention, its major debates and compromises including the *Virginia Plan*, the *New Jersey Plan*, the Great Compromise, the Three-fifths Compromise, and the key contributions of George Washington, James Madison, George Mason, and Gouverneur Morris.

3. Cite specific textual and visual evidence to examine the arguments for and against the ratification of the *United States Constitution* as expressed in the *Federalist Papers Number 10 and Number 51*, as well as Anti-Federalist concerns over a strong central government and the omission of a bill of rights.
4. Explain the constitutional principles of popular sovereignty, consent of the governed, separation of powers, checks and balances, federalism, and judicial review.
5. Cite specific textual and visual evidence and summarize the rights and responsibilities all Americans possess under the *United States Constitution* as guaranteed in the *Bill of Rights* including the freedoms of religion, speech, press, assembly, petition, and the rights to due process and trial by jury.

Content Standard 4: The student will examine the political, economic, social, and geographic transformation of the United States during the early to mid-1800s.

1. Analyze the impact and consequences of major events and issues facing early presidential administrations including
   A. The suppression of the Whiskey Rebellion and establishment of the government's right to tax,
   B. President George Washington's advice for the new nation in his *Farewell Address*,
   C. The restriction of individual rights in the *Alien and Sedition Acts* and the responses of the Republican-Democrats in the *Virginia* and *Kentucky Resolutions,*
   D. The impact of the presidential election of 1800 and the peaceful transfer of political power from one party to another,
   E. The acquisition of territory through the *Louisiana Purchase* and the contributions of the explorations of the Lewis and Clark Corps of Discovery Expedition,
   F. How the Marshall Court's precedent-setting decisions in *Marbury v. Madison* and *McCulloch v. Maryland* interpreted the *United States Constitution* and established the Supreme Court as an independent and equal branch of the federal government.
   G. The War of 1812 which confirmed American independence and fueled a spirit of nationalism,
   H. The increased sectional tensions as the nation dealt with the expansion of slavery and attempts to limit it through the *Missouri Compromise*, and
   I. The *Monroe Doctrine* as an attempt to protect American interests and territory in the western hemisphere.
2. Summarize the significance and impact of the Jacksonian Era including the
   A. Election of Andrew Jackson as a victory for the common man,
   B. Nullification Crisis and the development of the states' rights debates as typified by the arguments put forth by Senator Daniel Webster and Senator John C. Calhoun, and
   C. Impact of government policies, non-adherence to treaties, and territorial expansion on Native American lands including the resistance and removal of the Five Tribes.
3. Cite specific textual and visual evidence to compare the sectional economic transformations including the concentration of population, manufacturing, shipping, and the development of the railroad system in the North as contrasted to the plantation system, the increased demand for cotton brought about by the invention of the cotton gin, and the reliance on a slave labor system in the South.
4. Analyze points of view from specific textual evidence to describe the variety of African American experiences, both slave and free, including Nat Turner's Rebellion, legal restrictions in the South, and efforts to escape via the Underground Railroad network including Harriet Tubman.
5. Analyze and summarize the significance of the Abolitionist and Women's Suffrage Movements including the influence of the Second Great Awakening and the *Declaration of Sentiments*, and the leadership of Frederick Douglass, William Lloyd Garrison, Sojourner Truth, Susan B. Anthony, and Elizabeth Cady Stanton to the respective movements.
6. Examine the concept of Manifest Destiny as a motivation and justification for westward expansion, including the
   A. Territorial growth resulting from the annexation of Texas, the *Mexican Cession*, and the *Gadsden Purchase*,
   B. Causes of the rapid settlement of Oregon and California,
   C. Impact upon Native American culture and tribal lands, and
   D. Growing sectional tensions regarding the expansion of slavery.

Content Standard 5: The student will analyze the social and political transformation of the United States as a result of the causes, course, and consequences of the American Civil War during the period of 1850 to 1865.

1. Cite specific textual and visual evidence to summarize the importance of slavery as a principal cause of increased sectional polarization as seen in the following significant events including the
   - A. *Compromise of 1850* as a last attempt to reach a compromise regarding slavery,
   - B. Publication of *Uncle Tom's Cabin* as fuel for anti-slavery sentiments,
   - C. *Kansas-Nebraska Act* as it established the principle of popular sovereignty in new territories, repealed the *Missouri Compromise*, and led to factional feuds in Bleeding Kansas, and
   - D. *Dred Scott v. Sanford* case which declared slaves as property and motivated John Brown's Raid on the federal arsenal at Harper's Ferry.
2. Cite specific textual and visual evidence to analyze the significance and results of the presidential election of 1860 including the
   - A. Secession of South Carolina as expressed in the *Ordinance of Secession*,
   - B. Goal of President Abraham Lincoln to preserve the Union,
   - C. Formation of the Confederate States of America,
   - D. Opening attack on Fort Sumter, and
   - E. Rising tensions over the strategic Border States.
3. Compare the advantages and disadvantages of the Union and the Confederacy upon the eve of the war including the political/military leadership of President Lincoln to Confederate President Jefferson Davis and the military leadership of Union General Ulysses S. Grant to Confederate General Robert E. Lee.
4. Identify and summarize the consequences of the major turning points of the war including the
   - A. Anaconda Plan and Total War Strategy,
   - B. Battle of Antietam as a catalyst for the issuance of the *Emancipation Proclamation* and its role in expanding the goals of the war to include the ending of slavery,
   - C. Battle of Gettysburg as inspiration for the *Gettysburg Address* and how Lincoln's speech clarified the Union's motivations for winning the war,
   - D. Capture of Vicksburg in securing the Union's control of the Mississippi River,
   - E. Excerpts from Lincoln's *Second Inaugural Address* of President Lincoln, calling for national reconciliation,
   - F. Generosity of the North in terms of surrender demands as offered to General Lee at Appomattox Courthouse, and
   - G. Impact of Lincoln's assassination and loss of his leadership on plans for reconstruction.

***Content Standard 6: The student will analyze the transformation of politics and society during the Reconstruction Era, 1865 to 1877.**

1. Compare and contrast the various policies and plans for the reconstruction of the Confederacy including those proposed by President Lincoln, President Andrew Johnson, and the Radical Republicans.
2. Cite specific textual and visual evidence to analyze the impact of the *13th, 14th, and 15th Amendments*, the Black Codes, the Freedmen's Bureau, and Jim Crow laws.
3. Identify points of view regarding the social changes following the Civil War including the role of carpetbaggers and scalawags, the rise of the Ku Klux Klan, elected Black officials, and sharecroppers.
4. Evaluate the impact of the *Homestead Act of 1862* and the resulting movement westward to free land including the impact of continued displacement of Native Americans.
5. Assess the impact of the presidential election of 1876 as an end to the reconstruction of the South.

An asterisk (*) has been used to identify Content Standard 6 and the following objectives that must be assessed by the local school district. All other skills may be assessed by the Oklahoma School Testing Program (OSTP).

High School ECONOMICS

In high school Economics, the student will learn and apply basic economic reasoning skills, concepts, and skills. The student will apply a variety of economic decision-making models to real-life economic situations. The student will examine the American free-market system as contrasted with other economic systems. The roles of economic systems, money, entrepreneurs, the United States Government, and the Federal Reserve will be examined as well.

The Common Core History/Social Studies Reading and Writing Literacy Skills are to be integrated throughout all of the content standards and used for instructional delivery of the content.

COMMON CORE STATE STANDARDS READING AND WRITING LITERACY IN HISTORY/SOCIAL STUDIES

The Common Core State Standards Reading and Writing Literacy Standards for Literacy in History/Social Studies in the high school contain two grade bands, 9-10 and 11-12. Since school districts have the option of scheduling high school social studies courses at any grade level 9-12, only the CCSS for Reading and Writing for Grades 9-10 have been included in each high school Social Studies course. If a course is taught at the 11th or 12th grade level, then the CCSS for Reading and Writing Grades 11-12 must be used for social studies literacy instruction. A copy of the CCSS for Reading and Writing Grades 11-12 are found in Appendix C.

Celebrate Freedom Week

In order to educate Oklahoma students about the sacrifices made for freedom on behalf of the country and the values on which this country was founded, November 11 has been designated "Veterans Day," and the week in which November 11 falls has been designated "Celebrate Freedom Week" for the public schools of Oklahoma. As part of a social studies class, during Celebrate Freedom Week or during another full school week as determined by the local board of education, appropriate instruction concerning the intent, meaning, and importance of the *Declaration of Independence* and the *United States Constitution*, including the *Bill of Rights*, in their historic contexts shall occur.

The study of the *Declaration of Independence* is to include the study and the relationship of ideas expressed in that document to subsequent American history.

Students in Grades 3-12 shall study and recite the following from the "social contract" selection of the *Declaration of Independence*:

> We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness. – That to secure these rights, Governments are instituted among Men, deriving their just powers from the consent of the governed.

The board of education of each public school district shall ensure that each school in its district will on Veterans Day conduct and observe an appropriate Veterans Day Assembly program of at least one class period that remembers and honors American veterans.

PROCESS AND LITERACY SKILLS

Process and Literacy Standard 1: Reading Skills. The student will develop and demonstrate social studies Common Core reading literacy skills.

A. Key Ideas and Details

1. Cite specific textual evidence to support analysis of primary and secondary sources, attending to such features as the date and origin of the information.
2. Determine the central ideas or information of a primary or secondary source; provide an accurate summary of how key events or ideas develop over the course of the text.
3. Analyze in detail a series of events described in a text; determine whether earlier events caused later ones or simply preceded them.

B. Craft and Structure

4. Determine the meaning of words and phrases as they are used in a text, including vocabulary describing political, social, or economic aspects of history/social science.
5. Analyze how a text uses structure to emphasize key points or advance an explanation or analysis.
6. Compare the point of view of two or more authors for how they treat the same or similar topics, including which details they include and emphasize in their respective accounts.

C. Integration of Knowledge and Ideas

7. Integrate quantitative or technical analysis (e.g., charts, research data) with qualitative analysis in print or digital text.
8. Assess the extent to which the reasoning and evidence in a text support the author's claims.
9. Compare and contrast treatments of the same topic in several primary and secondary sources.

D. Range of Reading and Level of Text Complexity

10. By the end of grade 10, read and comprehend history/social studies texts in the grades 9–10 text complexity band independently and proficiently.

Process and Literacy Standard 2: Writing Skills. The student will develop and demonstrate Common Core social studies writing literacy skills.

A. Text Types and Purposes

1. Write arguments focused on discipline-specific content.
   a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.
   b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns.
   c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
   d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
   e. Provide a concluding statement or section that follows from or supports the argument presented.
2. Write informative/explanatory texts, including the narration of historic events, scientific procedures/experiments, or technical processes.
   a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
   b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
   c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.
   d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.
   e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
   f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).
3. (See note; not applicable as a separate requirement)

B. Production and Distribution of Writing

4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

C. Research to Build and Present Knowledge

7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
9. Draw evidence from informational texts to support analysis, reflection, and research.

D. Range of Writing

10. Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Note: Students' narrative skills continue to grow in these grades. The Standards require that students be able to incorporate narrative elements effectively into arguments and informative/explanatory texts. In history/social studies, students must be able to incorporate narrative accounts into their analyses of individuals or events of historic import.

CONTENT SKILLS

Content Standard 1: The student will develop and apply economic reasoning and decision-making skills.

1. Define and apply basic economic concepts of scarcity, surplus, choice, opportunity cost, cost/benefit analysis, risk/reward relationship, incentive, disincentive, and trade-off to a variety of economic situations.
2. Determine appropriate courses of economic actions using a variety of economic reasoning and decision-making models including the PACED Decision-Making Model by using the five step process of
   P = Stating the PROBLEM,
   A = Listing the ALTERNATIVES,
   C = Identifying the CRITERIA,
   E = EVALUATING the options, based on the criteria, and
   D = Making a DECISION.

Content Standard 2: The student will evaluate how societies answer the three basic economic questions: what goods and services to produce, how to produce them, and for whom are they produced.

1. Compare the world's basic economic systems of market (free enterprise), command, and mixed market economies identifying countries that have adopted each and comparing and contrasting the results those economic systems have produced in those countries as measured by GDP, national prosperity, and individual income and wealth.
2. Describe the role of the factors of production, land, labor, capital, entrepreneurship, and technology in economic systems.

Content Standard 3: The student will explain how prices are set in a market economy using supply and demand graphs and will determine how price provides incentives to buyers and sellers.

1. Analyze how price and non-price factors affect the demand and supply of goods and services available in the marketplace.
2. Explain what causes shortages and surpluses including government imposed price floors, price ceilings, and other government regulations and the impact they have on prices and people's decisions to buy or sell.

Content Standard 4: The student will evaluate how changes in the level of competition in different markets affect prices.

1. Explain how competition impacts the free market including the concepts that competition among sellers lowers costs and prices while encouraging increased production and competition among buyers increases prices and the allocation of goods and services to consumers willing and able to pay higher prices.
2. Explain how people's own self-interest, incentives and disincentives influence market decisions.

Content Standard 5: The student will describe the role of economic institutions including banks, labor unions, corporations, governments, and not-for-profits in a market economy.

1. Evaluate the impact of government ensuring the protection of private property rights and the rule of law in a market economy.
2. Describe how banks match savers with borrowers and allow people to pool their incomes and provide future income through investing in stocks.
3. Identify how labor unions, corporations, and not-for-profits influence a market economy.

Content Standard 6: The student will analyze how money makes it easier to trade, borrow, save, invest, and compare the value of goods and services.

1. Explain how individuals, businesses and the overall economy benefit from using and saving money.
2. Identify the components of the money supply, the different functions of money, and give examples of each.
3. Explain how the value of money is determined by the goods and services it can buy.

Content Standard 7: The student will evaluate how interest rates impact decisions in the market economy.

1. Analyze the relationship between interest rates and inflation rates.
2. Determine how changes in real interest rates impact people's decisions to borrow money and purchase goods in a market economy.

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Content Standard 8: The student will analyze the role of entrepreneurs in a market economy.

1. Analyze the potential risks and potential gains of entrepreneurs opening new businesses or inventing a new product, and determine the financial and nonfinancial incentives that motivate them.
2. Identify an entrepreneur and describe how his/her decisions affect job opportunities for others.

Content Standard 9: The student will evaluate the economic role of government in a market economy.

1. Explain the role that government has in dealing with issues such as poverty, pollution, and medical research.
2. Describe the costs and benefits of government assistance programs, education, and other government funded services and projects.

Content Standard 10: The student will examine current economic conditions in the United States.

1. Determine how interest rates, unemployment, Consumer Price Index (CPI), individual savings and debt, government debt, labor supply, and inflation impact current economic conditions in the United States.
2. Explain how these conditions have an impact on consumers, producers, and government policymakers.

Content Standard 11: The student will identify Gross Domestic Product (GDP) and Gross National Product (GNP) as basic measures of a nation's economic output and income.

1. Explain GDP and GNP and how they are used to describe economic output over time and compare the GDP of various countries representing free-market, command, and mixed economies.
2. Describe the impact on the economy when GDP and GNP are growing or declining.

Content Standard 12: The student will explain the role of inflation and unemployment in an economic system.

1. Define inflation and determine how it is measured and the impact it has on different sectors of the United States economy.
2. Define the different types of unemployment and determine how it is measured and the impact it has on different sectors of the United States economy.

Content Standard 13: The student will identify the potential economic impact of policy changes by the Federal Reserve and the federal government.

1. Compare and contrast fiscal and monetary policy and their impact on the economy.
2. Evaluate the conditions under which the federal government and the Federal Reserve implement expansionary or contractionary policies.

High School
OKLAHOMA HISTORY AND GOVERNMENT: *The Foundation, Formation, and Transformation of Oklahoma*

In Oklahoma History and Government, the student will examine the people and events that have formed and transformed the landscape and cultures of the place and peoples that have become Oklahoma. The student will examine important political and ideological movements, as well as economic, cultural, and political accomplishments of state, national, and world significance. The learning of Oklahoma History and Government should lead students to link Oklahoma's history to local, national, and global contexts.

The Common Core History/Social Studies Reading and Writing Literacy Skills are to be integrated throughout all of the content standards and used for instructional delivery of the content.

COMMON CORE STATE STANDARDS READING AND WRITING LITERACY IN HISTORY/SOCIAL STUDIES

The Common Core State Standards Reading and Writing Literacy Standards for Literacy in History/Social Studies in the high school contain two grade bands, 9-10 and 11-12. Since school districts have the option of scheduling high school social studies courses at any grade level 9-12, only the CCSS for Reading and Writing for Grades 9-10 have been included in each high school Social Studies course. If a course is taught at the 11th or 12th grade level, then the CCSS for Reading and Writing Grades 11-12 must be used for social studies literacy instruction. A copy of the CCSS for Reading and Writing Grades 11-12 are found in Appendix C.

Celebrate Freedom Week

In order to educate Oklahoma students about the sacrifices made for freedom on behalf of the country and the values on which this country was founded, November 11 has been designated "Veterans Day," and the week in which November 11 falls has been designated "Celebrate Freedom Week" for the public schools of Oklahoma. As part of a social studies class, during Celebrate Freedom Week or during another full school week as determined by the local board of education, appropriate instruction concerning the intent, meaning, and importance of the *Declaration of Independence* and the *United States Constitution*, including the *Bill of Rights*, in their historic contexts shall occur.

The study of the *Declaration of Independence* is to include the study and the relationship of ideas expressed in that document to subsequent American history

Students in Grades 3-12 shall study and recite the following from the "social contract" selection of the *Declaration of Independence*:

> We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness. – That to secure these rights, Governments are instituted among Men, deriving their just powers from the consent of the governed.

The board of education of each public school district shall ensure that each school in its district will on Veterans Day conduct and observe an appropriate Veterans Day Assembly program of at least one class period that remembers and honors American veterans.

PROCESS AND LITERACY SKILLS

Process and Literacy Standard 1: Reading Skills. The student will develop and demonstrate social studies Common Core reading literacy skills.

A. Key Ideas and Details

1. Cite specific textual evidence to support analysis of primary and secondary sources, attending to such features as the date and origin of the information.
2. Determine the central ideas or information of a primary or secondary source; provide an accurate summary of how key events or ideas develop over the course of the text.
3. Analyze in detail a series of events described in a text; determine whether earlier events caused later ones or simply preceded them.

B. Craft and Structure

4. Determine the meaning of words and phrases as they are used in a text, including vocabulary describing political, social, or economic aspects of history/social science.
5. Analyze how a text uses structure to emphasize key points or advance an explanation or analysis.
6. Compare the point of view of two or more authors for how they treat the same or similar topics, including which details they include and emphasize in their respective accounts.

PRE K
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1-3
4-5
6-8
9-12

C. Integration of Knowledge and Ideas

7. Integrate quantitative or technical analysis (e.g., charts, research data) with qualitative analysis in print or digital text.
8. Assess the extent to which the reasoning and evidence in a text support the author's claims.
9. Compare and contrast treatments of the same topic in several primary and secondary sources.

D. Range of Reading and Level of Text Complexity

10. By the end of grade 10, read and comprehend history/social studies texts in the grades 9–10 text complexity band independently and proficiently.

Process and Literacy Standard 2: Writing Skills. The student will develop and demonstrate Common Core social studies writing literacy skills.

A. Text Types and Purposes

1. Write arguments focused on discipline-specific content.
    a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.
    b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns.
    c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
    d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
    e. Provide a concluding statement or section that follows from or supports the argument presented.
2. Write informative/explanatory texts, including the narration of historic events, scientific procedures/experiments, or technical processes.
    a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
    b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
    c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.
    d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.
    e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
    f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).
3. (See note; not applicable as a separate requirement)

B. Production and Distribution of Writing

4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

C. Research to Build and Present Knowledge

7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
9. Draw evidence from informational texts to support analysis, reflection, and research.

D. Range of Writing

10. Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Note: Students' narrative skills continue to grow in these grades. The Standards require that students be able to incorporate narrative elements effectively into arguments and informative/explanatory texts. In history/social studies, students must be able to incorporate narrative accounts into their analyses of individuals or events of historic import.

CONTENT SKILLS

Content Standard 1: The student will describe the state's geography and the historic foundations laid by Native American, European, and American cultures.

1. Integrate visual information to identify and describe the significant physical and human features including major trails, railway lines, waterways, cities, ecological regions, natural resources, highways, and landforms.
2. Summarize the accomplishments of prehistoric cultures including the Spiro Mound Builders.
3. Compare and contrast the goals and significance of early Spanish, French, and American expeditions including the impact of disease, interactions with Native Americans, and the arrival of the horse and new technologies.
4. Compare and contrast cultural perspectives of Native Americans and European Americans regarding land ownership and trading practices.

Content Standard 2: The student will evaluate the major political and economic events that transformed the land and its people prior to statehood.

1. Summarize and analyze the role of river transportation to early trade and mercantile settlements including Chouteau's Trading Post at Three Forks.
2. Describe the major trading and peacekeeping goals of early military posts including Fort Gibson.
3. Integrate visual and textual evidence to explain the reasons for and trace the migrations of Native American peoples including the Five Tribes into present-day Oklahoma, the *Indian Removal Act of 1830*, and tribal resistance to the forced relocations.
4. Summarize the impact of the Civil War and Reconstruction Treaties on Native American peoples, territories, and tribal sovereignty including the
   A. Required enrollment of the Freedmen,
   B. Second Indian Removal and the role of the Buffalo Soldiers,
   C. Significance of the Massacre at the Washita,
   D. Reasons for the reservation system, and
   E. Establishment of the western military posts of Fort Sill, Fort Supply, and Fort Reno.
5. Cite specific visual and textual evidence to assess the impact of the cattle and coal mining industries on the location of railroad lines, transportation routes, and the development of communities.
6. Analyze the influence of the idea of Manifest Destiny on the Boomer Movement including the official closing of the frontier in 1890.
7. Compare and contrast multiple points of view to evaluate the impact of the *Dawes Act* which resulted in the loss of tribal communal lands and the redistribution of lands by various means including land runs as typified by the Unassigned Lands and the Cherokee Outlet, lotteries, and tribal allotments.

Content Standard 3: The student will analyze the formation and development of constitutional government in Oklahoma.

1. Compare and contrast the development of governments among the Native American tribes, the movement for the state of Sequoyah, the proposal for an all-Black state, and the impact of the *Enabling Act* on single statehood.
2. Describe and summarize attempts to create a state constitution joining Indian and Oklahoma Territories including the impact of the Progressive and Labor Movements resulting in statehood on November 16, 1907.
3. Compare and contrast Oklahoma's state government to the United States' national system of government including the branches of government, their functions, and powers.
4. Describe the division, function, and sharing of powers among levels of government including city, county, tribal, and state.
5. Identify major sources of local and state revenues and the services provided including education, infrastructure, courts, and public safety.
6. Describe state constitutional provisions including the direct primary, initiative petition, referendum, and recall.

Content Standard 4: The student will examine the transformation of Oklahoma during times of boom and bust of the 1920s through the 1940s.

1. Compare and contrast the successes and failures of the United States policy of assimilation of the Native Americans in Oklahoma including the passage of the *Indian Citizenship Act of 1924* and the effects of the Indian boarding schools (1880s-1940s) upon Native Americans' identity, culture, traditions, and tribal government and sovereignty.

2. Examine multiple points of view regarding the historic evolution of race relations in Oklahoma including *Senate Bill 1* establishing Jim Crow laws, the growth of all-Black towns, the Tulsa Race Riot, and the resurgence of the Ku Klux Klan.
3. Summarize the impact of the national Socialist movement and organized labor on various segments of Oklahoma society including agriculture, mining, and state politics.
4. Examine how the economic cycles of boom and bust of the oil industry affected major sectors of employment, mining, and the subsequent development of communities, as well as the role of entrepreneurs including J.J. McAlester, Frank Phillips, E.W. Marland, and Robert S. Kerr.
5. Cite specific textual and visual evidence to evaluate the impact of the boom and bust cycle of Oklahoma's agricultural production as a response to the needs of World War I, and its effect as a precursor of the Great Depression.
6. Cite specific textual and visual evidence of the environmental conditions and the impact of human mismanagement of resources resulting in the Dust Bowl including the migration of the Okies, the national perceptions of Oklahomans as shaped by *The Grapes of Wrath*, and the New Deal policies regarding conservation of natural resources.
7. Describe the contributions of Oklahomans in 1920s and 1930s including Deep Deuce and African-American jazz musicians, Will Rogers's and Woody Guthrie's political and social commentaries, Wiley Post's aviation milestones, and the artwork of the Kiowa Six (formerly the Kiowa Five).
8. Summarize and analyze the impact of mobilization for World War II including the establishment of military bases and prisoner of war installations and the contributions of Oklahomans to the war effort including the Native American code talkers and the 45th Infantry Division.

Content Standard 5: The student will investigate how post-war social, political, and economic events continued to transform the state of Oklahoma during the 1950s through the present.

1. Cite specific textual and visual evidence to evaluate the progress of race relations and actions of civil disobedience in the state including the
   A. Judicial interpretation of the equal protection clause of the *14th Amendment* which ultimately resulted in the desegregation of public facilities, and public schools and universities,
   B. Landmark Supreme Court cases of *Sipuel v. Board of Regents of the University of Oklahoma* (1948) and *McLaurin v. Oklahoma Board of Regents for Higher Education* (1950),
   C. Lunch counter sit-ins organized by Clara Luper and the NAACP, and
   D. Leadership of Governor Gary in the peaceful integration of the public common and higher education systems.
2. Analyze the impact of economic growth in various sectors including the
   A. Impact of rural to urban migration,
   B. Development of water and timber resources,
   C. Emergence of the tourism as an industry,
   D. Discovery of new fossil fuel resources, Tulsa's designation as Oil Capital of the World, and the opening of the Anadarko Basin, and
   E. Improvement of the state's transportation infrastructures and the McClellan-Kerr Arkansas River Navigation System.
3. Cite specific textual and visual evidence to describe the artistic contributions of Oklahomans in the fields of music, art, literature, theater and dance including Ralph Ellison and the Five Indian Ballerinas as well as the perceptions of Oklahoma by the rest of the nation because of the musical *Oklahoma*.
4. Summarize the impact of Oklahoma's leadership on state and national politics including the rise of viable two party elections, Governor Henry Bellmon, and United States Representative Carl Albert.
5. Analyze the evolving relationship between state and tribal governments impacting tribal self-determination and control over Native American lands and resources including issues of joint jurisdiction, taxation, and gaming.
6. Cite specific textual and visual evidence to analyze the oil and gas boom of the 1970s and the subsequent bust of the energy industry during the 1980s including the impact of the Penn Square Bank Collapse on the state's economy, employment, and banking.
7. Describe the contemporary role the state's agriculture plays in feeding the nation and the world including the wheat, corn, cattle, pork, and chicken industries.
8. Explain the leadership of Oklahoma and its people in the field of aeronautics including the Federal Aviation Administration, NASA space program, and the influence of weather research on national disaster preparedness.
9. Examine major cultural and ethnic groups' contributions to the social and economic transformation of the modern state of Oklahoma.
10. Cite specific textual and visual evidence to analyze the causes and effects of the domestic terrorist attack on the Murrah Federal Building in Oklahoma City including the responses of Oklahomans to the event, the concept of the "Oklahoma Standard" and the creation of the Oklahoma City National Memorial and Museum.

High School PSYCHOLOGY *Foundations and Formations of Human Development*

Psychology is the study of human social behavior from an individual perspective including the foundations of psychology as an empirical social science, the structure and functions of the brain, human development, and how individuals adapt to their environment. Students will examine principles of motivation, how a person's culture and society influence the individual, psychological disorders, and the promotion of mental health.

The Common Core History/Social Studies Reading and Writing Literacy Skills are to be integrated throughout all of the content standards and used for instructional delivery of the content.

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Celebrate Freedom Week

In order to educate Oklahoma students about the sacrifices made for freedom on behalf of the country and the values on which this country was founded, November 11 has been designated "Veterans Day," and the week in which November 11 falls has been designated "Celebrate Freedom Week" for the public schools of Oklahoma. As part of a social studies class, during Celebrate Freedom Week or during another full school week as determined by the local board of education, appropriate instruction concerning the intent, meaning, and importance of the *Declaration of Independence* and the *United States Constitution*, including the *Bill of Rights*, in their historic contexts shall occur.

The study of the *Declaration of Independence* is to include the study and the relationship of ideas expressed in that document to subsequent American history

Students in Grades 3-12 shall study and recite the following from the "social contract" selection of the *Declaration of Independence*:

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The board of education of each public school district shall ensure that each school in its district will on Veterans Day conduct and observe an appropriate Veterans Day Assembly program of at least one class period that remembers and honors American veterans.

PROCESS AND LITERACY SKILLS

Process and Literacy Standard 1: Reading Skills. The student will develop and demonstrate social studies Common Core reading literacy skills.

A. Key Ideas and Details
1. Cite specific textual evidence to support analysis of primary and secondary sources, attending to such features as the date and origin of the information.
2. Determine the central ideas or information of a primary or secondary source; provide an accurate summary of how key events or ideas develop over the course of the text.
3. Analyze in detail a series of events described in a text; determine whether earlier events caused later ones or simply preceded them.

B. Craft and Structure
4. Determine the meaning of words and phrases as they are used in a text, including vocabulary describing political, social, or economic aspects of history/social science.
5. Analyze how a text uses structure to emphasize key points or advance an explanation or analysis.
6. Compare the point of view of two or more authors for how they treat the same or similar topics, including which details they include and emphasize in their respective accounts.

C. Integration of Knowledge and Ideas
7. Integrate quantitative or technical analysis (e.g., charts, research data) with qualitative analysis in print or digital text.
8. Assess the extent to which the reasoning and evidence in a text support the author's claims.
9. Compare and contrast treatments of the same topic in several primary and secondary sources.

D. Range of Reading and Level of Text Complexity
10. By the end of grade 10, read and comprehend history/social studies texts in the grades 9–10 text complexity band independently and proficiently.

PRE K KINDERGARTEN 1-3 4-5 6-8 9-12

Process and Literacy Standard 2: Writing Skills. The student will develop and demonstrate Common Core social studies writing literacy skills.

A. Text Types and Purposes

1. Write arguments focused on discipline-specific content.
   a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.
   b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns.
   c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
   d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
   e. Provide a concluding statement or section that follows from or supports the argument presented.
2. Write informative/explanatory texts, including the narration of historic events, scientific procedures/ experiments, or technical processes.
   a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
   b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
   c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.
   d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.
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3. (See note; not applicable as a separate requirement)

B. Production and Distribution of Writing

4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
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C. Research to Build and Present Knowledge

7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
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D. Range of Writing

10. Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Note: Students' narrative skills continue to grow in these grades. The Standards require that students be able to incorporate narrative elements effectively into arguments and informative/ explanatory texts. In history/social studies, students must be able to incorporate narrative accounts into their analyses of individuals or events of historic import.

CONTENT SKILLS

Content Standard 1: The student will examine the foundations of psychology and its origins as a separate social science discipline.

1. Analyze the definition of psychology in the context of psychology as an empirical science and the major approaches to psychology including behavioral, psychoanalytical, cognitive, and humanistic.
2. Evaluate the origins of psychology based on significant historic figures including Wilhelm Wundt, William James, John B. Watson, and Karen Horney.
3. Classify the various subfields in psychology including vocational applications such as counseling, industrial, clinical, experimental, and educational psychology.

Content Standard 2: The student will examine the development of psychology as an empirical science by describing the scientific method, explaining research strategies and identifying ethical issues.

1. Describe the scientific method as the framework for research and apply the principles of research design to an appropriate experiment.
2. Compare and contrast quantitative and qualitative research strategies including experiments, surveys, focus groups, and narratives as the foundation of research in psychology.
3. Identify ethical standards psychologists must address regarding research with human and non-human participants.
4. Explore the various modes of psychological testing including personality, intelligence, and projective while assessing the reliability of each.

Content Standard 3: The student will investigate the structure, biochemistry and circuitry of the brain and the nervous system to understand their roles in affecting behavior.

1. Identify and describe the structure and function of the brain including the hypothalamus, prefrontal lobe, corpus callosum, hemispheres, and amygdala.
2. Examine the structure and function of the nervous and endocrine system and how they affect behavior.
3. Identify the parts of a neuron and explain neurotransmission including the role and impact of various neurotransmitters.
4. Explain the processes of sensation and perception, as well as the capabilities and limitations of sensory processes including the visual, auditory, kinesthetic, olfactory, and gustatory sensory systems.
5. Describe the interaction of a person and the environment in determining perception including Gestalt principles and how one's experiences and expectations influence perception.
6. Identify various states of consciousness including sleep and dreams, hypnosis, meditation, and psychoactive drugs.

Content Standard 4: The student will analyze physical, social, emotional, moral, and cognitive development from conception through the latter stages of adulthood.

1. Explain the interaction of environmental and biological factors in human development including the role of the brain in all aspects of development.
2. Compare the theories of Jean Piaget, Sigmund Freud, Lawrence Kohlberg, Carl Jung, and Erik Erikson regarding human development.

Content Standard 5: The student will understand how organisms adapt to their environment through learning and cognition.

1. Identify and explain the major theories of learning including Ivan Pavlov's classical conditioning, B.F. Skinner's, and Albert Bandura's Operant conditioning, and Bandura's observational learning.
2. Describe the process, organization, and factors that influence memory and recall.
3. Analyze strategies and impediments involved in problem solving and decision making and how this knowledge could be applied to daily life.

Content Standard 6: The student will understand the principles of motivation and emotion.

1. Compare the predominant theories of motivation and emotion including the biological, social-cognitive, humanistic, and cultural theories.
2. Analyze the biological and environmental influences on positive and negative emotion.

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Content Standard 7: The student will understand how society and culture influence a person's behavior and mental processes.

1. Evaluate the factors that lead to conformity, obedience, and nonconformity as demonstrated in experiments including the Stanford Prison Experiment, Milgram Experiment, or Solomon Asch's studies.
2. Explain how bias, discrimination, and use of stereotypes influence behavior with regard to gender, race, sexual orientation, and ethnicity as demonstrated in the studies of the Brown Eyed/Blue Eyed Experiment and the Clark Doll Experiment.
3. Examine influences on aggression and conflict including the factors associated with the bystander effect as demonstrated in such cases as the Kitty Genovese murder.

Content Standard 8: The student will examine how psychological disorders are diagnosed, classified and treated.

1. Analyze the methods of determining abnormal behavior and the tools used to diagnose and classify disorders.
2. Describe symptoms and causes of major categories of psychological disorders including schizophrenic, mood, anxiety, personality, somatoform, and dissociative disorders.
3. Compare available treatment options and how they evolved through history and among different cultures.

Content Standard 9: The student will evaluate the many factors that promote mental health.

1. Identify and explain potential sources of stress, effects of stress, and various coping strategies for dealing with stress.
2. Describe the characteristics of and factors that promote resilience and optimism.
3. Analyze the relationship between psychological health and physiological health.

High School SOCIOLOGY *Formations and Patterns of Group Behavior*

Sociology is the study of human social behavior from a group perspective including recurring patterns of attitudes, actions and reactions, and how these patterns vary in social groups, among cultures, and across time. Students will examine diverse societies, group behavior and social structures, as well as the impact of cultural change on society and using scientific method of sociological thought. As in other social science disciplines, sociology guides students to continue to develop skills in thinking, inquiry and research, and participation in a culturally diverse, democratic society in an interdependent world.

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A. Key Ideas and Details

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B. Craft and Structure

4. Determine the meaning of words and phrases as they are used in a text, including vocabulary describing political, social, or economic aspects of history/social science.
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D. Range of Reading and Level of Text Complexity

10. By the end of grade 10, read and comprehend history/social studies texts in the grades 9–10 text complexity band independently and proficiently.

Process and Literacy Standard 2: Writing Skills. The student will develop and demonstrate Common Core social studies writing literacy skills.

A. Text Types and Purposes

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   b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns.
   c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
   d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
   e. Provide a concluding statement or section that follows from or supports the argument presented.
2. Write informative/explanatory texts, including the narration of historic events, scientific procedures/experiments, or technical processes.
   a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
   b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
   c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.
   d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.
   e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
   f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).
3. (See note; not applicable as a separate requirement)

B. Production and Distribution of Writing

4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

C. Research to Build and Present Knowledge

7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
9. Draw evidence from informational texts to support analysis, reflection, and research.

D. Range of Writing

10. Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Note: Students' narrative skills continue to grow in these grades. The Standards require that students be able to incorporate narrative elements effectively into arguments and informative/explanatory texts. In history/social studies, students must be able to incorporate narrative accounts into their analyses of individuals or events of historic import

CONTENT SKILLS

Content Standard 1: The student will recognize sociology as a social science, identify methods and strategies of research, and examine the contributions of sociology to the understanding of social issues.

1. Describe the development of the field of sociology as a social science.
2. Identify the contributions of leading theorists within sociology including Auguste Comte, Emile Durkheim, Harriet Martineau, Herbert Spencer, Max Weber, C. Wright Mills, Karl Marx, and W.E.B. Dubois.
3. Evaluate different sociological research methods including participant observation, natural observation, library research, questionnaires, experiments, interviews, and case studies.
4. Conduct research on an issue using the scientific method of inquiry including developing a hypothesis, gathering and interpreting data, and drawing conclusions.

Content Standard 2: The student will examine the influence of culture and the way cultural transmission is accomplished.

1. Examine how relationships, structures, patterns, and processes influence culture.
2. Recognize the key components of a culture including knowledge, language and communication, customs, values, and physical artifacts.
3. Explain the differences between a culture and a society.
4. Analyze the influences of genetic inheritance and culture on human behavior including the debate over nature versus nurture.
5. Compare and contrast various subcultures including counter culture, pop culture, ethnic cultures, and religious cultures.
6. Describe factors that have led to cultural diversity within the United States.

Content Standard 3: The student will identify how social status influences individual and group behaviors.

1. Describe how social status affects social order including upper class, middle class, lower class, white-collar professionals, blue-collar workers, and the unemployed.
2. Recognize how role expectations can lead to conflict including gender, age, racial groups, and ethnic groups within different societies.

Content Standard 4: The student will examine how social groups are composed of people who share common characteristics including interests, beliefs, behaviors, and feelings.

1. Examine why individuals become members of or associate with different social groups.
2. Compare and contrast various types of norms including folkways, mores, laws, and taboos, and explain why rules of behavior are considered important to society.
3. Evaluate the characteristics of primary groups including small size, intimate settings, and enduring relationships and how members' behaviors are influenced by the primary groups.
4. Evaluate the characteristics of secondary groups including less permanence, less personal, and having a special purpose, and how members' behaviors are influenced by the secondary groups.
5. Investigate stereotypes of different groups including gangs, baby boomers, immigrants, and the homeless.

Content Standard 5: The student will identify the effects of social institutions on individual and group behavior, and how these institutions influence the development of the individual.

1. Analyze the impact of social institutions on individuals, groups, and organizations within society, and how these institutions transmit the values of society including familial, religious, educational, economic, and political.
2. Examine rites of passage within various social institutions including religious ceremonies, school proms, quinceañeros, graduation, marriage, and retirement.
3. Define ethnocentrism and xenophobia, and analyze how they can be beneficial or destructive to a culture.

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Content Standard 6: The student will examine social change over time and the various factors that lead to these changes.

1. Examine environmental, political, economic, scientific and technological influences upon immediate and long-term social change.
2. Describe how collective behavior can influence and change society including sit-ins, organized demonstrations, and the use of social media.

Content Standard 7: The student will analyze social problems that affect large numbers of people or result from imbalances within a social system.

1. Distinguish between characteristics of a social problem as compared to an individual problem.
2. Analyze patterns of behavior found within social problems and their implications for society including juvenile crime, drug addiction, and long-term unemployment.
3. Examine individual and group response and potential resolutions to social problems as well as the consequences of such solutions.

Content Standard 8: The student will explore both individual and collective behavior.

1. Describe the traditions, roles and expectations necessary for a society to continue and flourish.
2. Examine factors that can lead to the breakdown and disruption of a society.
3. Differentiate the impact of individual leaders of different social and political movements including Mohandas K. Gandhi, Adolf Hitler, Dr. Martin Luther King, Jr., Osama Bin Laden, and Susan B. Anthony.
4. Interpret how social behavior is influenced by propaganda, the news media, and advertising.
5. Investigate the impact of rumor, gossip, and other inaccurate communications upon group behavior.

High School
UNITED STATES GOVERNMENT
Freedom for All: Securing Rights and Defining Responsibilities

Students of American government will examine the philosophical foundations of the American republican system, the formation of governmental institutions and practices, and their transformations since the founding era as a basis of preparing students to become informed, responsible, engaged, and literate citizens who are committed to the ideas and values of democracy and use them in their daily lives, as well as make informed decisions about how their government should protect individual liberties and address the common good.

The Common Core History/Social Studies Reading and Writing Literacy Skills are to be integrated throughout all of the content standards and used for instructional delivery of the content.

COMMON CORE STATE STANDARDS READING AND WRITING LITERACY IN HISTORY/SOCIAL STUDIES

The Common Core State Standards Reading and Writing Literacy Standards for Literacy in History/Social Studies in the high school contain two grade bands, 9-10 and 11-12. Since school districts have the option of scheduling high school social studies courses at any grade level 9-12, only the CCSS for Reading and Writing for Grades 9-10 have been included in each high school Social Studies course. If a course is taught at the 11th or 12th grade level, then the CCSS for Reading and Writing Grades 11-12 must be used for social studies literacy instruction. A copy of the CCSS for Reading and Writing Grades 11-12 are found in Appendix C.

Celebrate Freedom Week

In order to educate Oklahoma students about the sacrifices made for freedom on behalf of the country and the values on which this country was founded, November 11 has been designated "Veterans Day," and the week in which November 11 falls has been designated "Celebrate Freedom Week" for the public schools of Oklahoma. As part of a social studies class, during Celebrate Freedom Week or during another full school week as determined by the local board of education, appropriate instruction concerning the intent, meaning, and importance of the *Declaration of Independence* and the *United States Constitution* including the *Bill of Rights*, in their historic contexts shall occur.

The study of the *Declaration of Independence* is to include the study and the relationship of ideas expressed in that document to subsequent American history

Students in Grades 3-12 shall study and recite the following from the "social contract" selection of the *Declaration of Independence*:

> We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness. – That to secure these rights, Governments are instituted among Men, deriving their just powers from the consent of the governed.

The board of education of each public school district shall ensure that each school in its district will on Veterans Day conduct and observe an appropriate Veterans Day Assembly program of at least one class period that remembers and honors American veterans.

PROCESS AND LITERACY SKILLS

Process and Literacy Standard 1: Reading Skills. The student will develop and demonstrate social studies Common Core reading literacy skills.

A. Key Ideas and Details

1. Cite specific textual evidence to support analysis of primary and secondary sources, attending to such features as the date and origin of the information.
2. Determine the central ideas or information of a primary or secondary source; provide an accurate summary of how key events or ideas develop over the course of the text.
3. Analyze in detail a series of events described in a text; determine whether earlier events caused later ones or simply preceded them.

B. Craft and Structure

4. Determine the meaning of words and phrases as they are used in a text, including vocabulary describing political, social, or economic aspects of history/social science.
5. Analyze how a text uses structure to emphasize key points or advance an explanation or analysis.
6. Compare the point of view of two or more authors for how they treat the same or similar topics, including which details they include and emphasize in their respective accounts.

C. Integration of Knowledge and Ideas

7. Integrate quantitative or technical analysis (e.g., charts, research data) with qualitative analysis in print or digital text.
8. Assess the extent to which the reasoning and evidence in a text support the author's claims.

9. Compare and contrast treatments of the same topic in several primary and secondary sources.

D. Range of Reading and Level of Text Complexity

10. By the end of grade 10, read and comprehend history/social studies texts in the grades 9–10 text complexity band independently and proficiently.

Process and Literacy Standard 2: Writing Skills. The student will develop and demonstrate Common Core social studies writing literacy skills.

A. Text Types and Purposes

1. Write arguments focused on discipline-specific content.
   a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.
   b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns.
   c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
   d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
   e. Provide a concluding statement or section that follows from or supports the argument presented.
2. Write informative/explanatory texts, including the narration of historic events, scientific procedures/experiments, or technical processes.
   a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
   b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
   c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.
   d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.
   e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
   f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).
3. (See note; not applicable as a separate requirement)

B. Production and Distribution of Writing

4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

C. Research to Build and Present Knowledge

7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
9. Draw evidence from informational texts to support analysis, reflection, and research.

D. Range of Writing

10. Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Note: Students' narrative skills continue to grow in these grades. The Standards require that students be able to incorporate narrative elements effectively into arguments and informative/explanatory texts. In history/social studies, students must be able to incorporate narrative accounts into their analyses of individuals or events of historic import.

CONTENT SKILLS

Content Standard 1: The student will compare the formation of contemporary governments in terms of access, use, and justification of power.

1. Contrast the essential characteristics of limited versus unlimited governments with an understanding that the United States' constitutional system establishes legal restraints on governmental power.
2. Cite specific textual and visual evidence to compare and contrast historic and contemporary examples of unlimited governments, known as authoritarian or totalitarian systems including dictatorships, theocracies, and absolute monarchies to examples of limited systems including direct democracies, representative democracies, constitutional monarchies, and republics.
3. Summarize and explain how the American system is a representative republic in which the citizenry is sovereign.
4. Compare the advantages and disadvantages of the major ways governmental power is distributed, shared, and structured in unitary, federal, and confederal systems in terms of effectiveness, prevention of abuse of power, and responsiveness to the popular will.
5. Compare and contrast the property and due process rights in the United States free-market economy which are protected by the *United States Constitution* to the restricted property and due process rights existing/non-existing under command economic systems.

Content Standard 2: The student will describe the historic and philosophical foundations of the United States republican system of government.

1. Cite specific textual and visual evidence and compare points of view to examine the philosophical contributions of the Enlightenment including the writings of Montesquieu, Locke, and Thomas Jefferson; the early experiences of colonial self-government; and the influence of religious texts including *The Bible* to the foundation of American political thought.
2. Cite specific textual and visual evidence and summarize the impact of major historic events of the Revolutionary Era and major documents contributing to the formation of constitutional government in the United States including the *Mayflower Compact* (1620), the *Fundamental Orders of Connecticut* (1639), the *English Bill of Rights* (1689), the *Albany Plan of Union* (1754), the *Virginia Declaration of Rights* (1776), the *Articles of Confederation* (1781), and the colonial/revolutionary writings of Patrick Henry, Thomas Paine, and James Otis.
3. Determine the central ideas and importance of the concept of inalienable rights, the social contract or compact, the 27 grievances as stated in the *Declaration of Independence*, and the discussions of enumerated versus implied powers; and cite specific textual and visual evidence to explain how the protection of these rights were incorporated in the *United States Constitution* and the federal *Bill of Rights* as a fundamental purpose of the government.
4. Evaluate the necessity for a written constitution to set forth the organization of government and to distribute powers among the three different branches of government and the states, or the people.
5. Analyze the events and major conflicts, beliefs, and arguments which led to the addition of the *Bill of Rights* to the *United States Constitution*; and compare the points of view as expressed in *Federalist Papers Number 10 and Number 51* and the writings of the Anti-Federalists including Patrick Henry and George Mason.
6. Analyze the steps of the constitutional amendment process including examples of recent attempts to amend the *United States Constitution* as exemplified in the issues of the *Equal Rights Amendment* and flag desecration.

Content Standard 3: The student will analyze the fundamental principles of the American system of government.

1. Explain the concept of popular sovereignty as exercised by the nation's people who possess the ultimate source of authority.
2. Examine the American system of federalism and evaluate the changes that have occurred in the relationship between the states and the national government over time.
3. Analyze the enumerated powers delegated to the federal government by the states in the *United States Constitution*, the limits placed on the powers of the national government, and the powers of the states including the reserved and concurrent powers.
4. Summarize and explain the relationships and the responsibilities between national and state governments including tribal and local governments.
5. Cite specific textual and visual evidence and summarize how power is separated as well as shared under the American system including the separation of powers and checks and balance, which is designed to prevent abuse of power by any government body at the local, state, tribal, and federal levels.
6. Evaluate the importance of the rule of law and on the sources, purposes, and functions of government, and explain how the rule of law provides for the protection of individual liberties, public order, management of conflict, and assurance of domestic and national security.

7. Analyze the United States government's responsibility to protect minority rights while legitimizing majority rule including the rights of due process and equality under the law.
8. Cite specific textual and visual evidence and compare points of view regarding the shared values and ideals of American political culture as set forth in basic documents and speeches including the *Declaration of Sentiments*, Abraham Lincoln's *Gettysburg Address*, Franklin Roosevelt's *Four Freedoms* speech, and Dr. Martin Luther King, Jr.'s *Letter From Birmingham Jail*.

Content Standard 4: The student will examine the *United States Constitution* by comparing the legislative, executive, and judicial branches of government as they form and transform American society.

1. Cite specific textual and visual evidence to explain the purposes expressed in the *Preamble* and how the *United States Constitution* preserves those core principles of American society.
2. Examine the makeup, organization, functions, and authority exercised by the executive, legislative, and judicial branches of government.
   A. Identify constitutional qualifications for holding public office, the terms of office, and the expressed powers delegated to each branch of the national government including the numbers of members comprising the United States Congress and United States Supreme Court.
   B. Evaluate the extent to which each branch of government reflects the people's sovereignty including current issues concerning representation such as term limitations and legislative redistricting.
   C. Describe the process in which public policy is formulated into law including both the constitutional and operational procedures utilized in the modern legislative process.
   D. Explain why certain provisions of the *United States Constitution* result in tensions among the three branches, and evaluate how the functions of the national government have changed over time through executive actions and judicial interpretation of the necessary and proper clause.
   E. Compare and contrast the structure of the national branches of government to Oklahoma's state government.
   F. Apply the principles of limited government, federalism, checks and balances, and separation of powers to the workings of the three branches of government in real world situations including current issues and events.
   G. Identify the issues behind and explain the changes resulting from landmark United States Supreme Court decisions including *Marbury v. Madison* (1803), *McCulloch v. Maryland* (1819), *Plessy v. Ferguson* (1896), *Brown v. Board of Education of Topeka, Kansas* (1954), *Mapp v. Ohio* (1961), *Engel v. Vitale* (1962), *Miranda v. Arizona* (1966), *Furman v. Georgia* (1972), *Roe v. Wade* (1973), *United States v. Nixon* (1974), and *Bush v. Gore* (2000).
3. Analyze steps of the political process and its role in the United States' representative government.
   A. Evaluate the role of political parties, interest groups including organized labor and the media in influencing the public agenda, public opinion, and the actions of government.
   B. Describe the electoral process including the components of national campaigns, the nominative process, campaign funding, and the Electoral College.
4. Explain the role of the national government in formulating and carrying out domestic policy.
   A. Identify major sources of revenues for the federal government and how revenue is budgeted.
   B. Analyze significant policy issues and how they reflect the nation's interests and principles including entitlements and environmental concerns.
5. Investigate the role government plays in the growth and stability of the economy including the inseparable relationship between political and economic freedoms.
   A. Describe the steps of the budget process including examples of economic trade-offs that occur when addressing competing public needs.
   B. Determine how the government influences economic growth by using the tools of fiscal and monetary policy.
   C. Explain how legislation, executive departments, and regulatory agencies affect both economic sectors and individual citizens.
6. Summarize and explain the major responsibilities of the national government in formulating and carrying out foreign policy.
   A. Evaluate the effectiveness of cooperative efforts exercised through international alliances and organizations from the perspective of the United States including the United Nations, the North Atlantic Treaty Organization, and the *North American Free Trade Agreement*.
   B. Examine issues of national sovereignty and human rights on contemporary decisions of foreign policy.

Content Standard 5: Students will be able to evaluate the significance of civic participation in order to insure the preservation of constitutional government.

1. Distinguish between civic life and private life by defining civic virtue and explaining the individual's duty and responsibility to participate in civic life by voting, serving on juries, volunteering within the community, running for office, serving on a political campaign, paying taxes for governmental services, and respecting lawful authority.
2. Analyze how the structures of government provide citizens opportunities to monitor and influence the actions of the government and hold elected officials accountable.
3. Evaluate historic and contemporary examples of American citizens who have attempted to make the values and principles of the *United States Constitution* a reality.
   A. Analyze the rights and liberties guaranteed to all citizens in and protected by the *Bill of Rights*, how they are applied and protected within the states through the *14th Amendment*, and sustained through the actions of individual citizens.
   B. Explain the impact on American politics, both historically and presently, of the racial, religious, socioeconomic, and ethnic diversity of American society including the importance of adhering to constitutional values in managing conflicts over diversity.

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High School
UNITED STATES HISTORY
The United States: The American Nation in Transformation, 1878 to the Present

In United States History, the student will describe and analyze effects of the Reconstruction Era amendments to the *United States Constitution*, examine the impact of immigration and the settlement of the American West on American society, and evaluate the economic effects of the industrialization and the changing role of the United States in world affairs at the turn of the twentieth century. The student will also describe the social, cultural, and economic events between the World Wars, investigate and analyze the Great Depression, and the causes, events and effects of World War II, and assess the foreign and domestic policies of the United States since World War II. The student will also examine the 9/11 attacks on New York City and Washington, DC.

The Common Core History/Social Studies Reading and Writing Literacy Skills are to be integrated throughout all of the content standards and used for instructional delivery of the content.

ASSESSMENT NOTE: High schools students in United States History for Grades 9-12 will study the time frame of 1878 to the present. However, for the high school ACE United States History End-of-Instruction Examination (EOI), the time frame is approximately 1878-2002, or approximately from the Reconstruction amendments through the terrorist attacks of September 11, 2001 and the immediate effects of those events.

Standard 1 and 2 Social Studies Process and Literacy Skills should be integrated throughout and across the content standards, as well as being used in teaching and assessing the course content at the classroom and district level. At the state level, Standard 1 and 2 Social Studies Process and Literacy Skills be measured and reported within each of the Content Standards 1, 2, 3, 4, 5, and 6. Process skill assessment items will be content-based and reported under each of the content standards. For assessment purposes, each standard will have items using primary and secondary source documents, timelines, maps, charts, graphs, pictures, photographs, and/or political cartoons. There will be a balance of graphic and textual stimulus materials within the various United States History test forms. At least 50 percent of the assessment items will have appropriate pictorial and graphical representations.

An asterisk (*) has been used to identify Content Standard 7and the following objectives under that standard that must be assessed by the local school district. All other skills may be assessed by the Oklahoma School Testing Program (OSTP).

COMMON CORE STATE STANDARDS READING AND WRITING LITERACY IN HISTORY/SOCIAL STUDIES

The Common Core State Standards Reading and Writing Literacy Standards for Literacy in History/Social Studies in the high school contain two grade bands, 9-10 and 11-12. Since school districts have the option of scheduling high school social studies courses at any grade level 9-12, only the CCSS for Reading and Writing for Grades 9-10 have been included in each high school Social Studies course. If a course is taught at the 11th or 12th grade level, then the CCSS for Reading and Writing Grades 11-12 must be used for social studies literacy instruction. A copy of the CCSS for Reading and Writing Grades 11-12 are found in Appendix C.

Celebrate Freedom Week

In order to educate Oklahoma students about the sacrifices made for freedom on behalf of the country and the values on which this country was founded, November 11 has been designated "Veterans Day," and the week in which November 11 falls has been designated "Celebrate Freedom Week" for the public schools of Oklahoma. As part of a social studies class, during Celebrate Freedom Week or during another full school week as determined by the local board of education, appropriate instruction concerning the intent, meaning, and importance of the *Declaration of Independence* and the *United States Constitution* including the *Bill of Rights* in their historic contexts shall occur.

The study of the *Declaration of Independence* is to include the study and the relationship of ideas expressed in that document to subsequent American history

Students in Grades 3-12 shall study and recite the following from the "social contract" selection of the *Declaration of Independence*:

> We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness. – That to secure these rights, Governments are instituted among Men, deriving their just powers from the consent of the governed.

The board of education of each public school district shall ensure that each school in its district will on Veterans Day conduct and observe an appropriate Veterans Day Assembly program of at least one class period that remembers and honors American veterans.

PROCESS AND LITERACY SKILLS

Process and Literacy Standard 1: Reading Skills. The student will develop and demonstrate social studies Common Core reading literacy skills.

A. Key Ideas and Details

1. Cite specific textual evidence to support analysis of primary and secondary sources, attending to such features as the date and origin of the information.
2. Determine the central ideas or information of a primary or secondary source; provide an accurate summary of how key events or ideas develop over the course of the text.
3. Analyze in detail a series of events described in a text; determine whether earlier events caused later ones or simply preceded them.

B. Craft and Structure

4. Determine the meaning of words and phrases as they are used in a text, including vocabulary describing political, social, or economic aspects of history/social science.
5. Analyze how a text uses structure to emphasize key points or advance an explanation or analysis.
6. Compare the point of view of two or more authors for how they treat the same or similar topics, including which details they include and emphasize in their respective accounts.

C. Integration of Knowledge and Ideas

7. Integrate quantitative or technical analysis (e.g., charts, research data) with qualitative analysis in print or digital text.
8. Assess the extent to which the reasoning and evidence in a text support the author's claims.
9. Compare and contrast treatments of the same topic in several primary and secondary sources.

D. Range of Reading and Level of Text Complexity

10. By the end of grade 10, read and comprehend history/social studies texts in the grades 9–10 text complexity band independently and proficiently.

Process and Literacy Standard 2: Writing Skills. The student will develop and demonstrate Common Core social studies writing literacy skills.

A. Text Types and Purposes

1. Write arguments focused on discipline-specific content.
   a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.
   b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns.
   c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
   d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
   e. Provide a concluding statement or section that follows from or supports the argument presented.
2. Write informative/explanatory texts, including the narration of historic events, scientific procedures/experiments, or technical processes.
   a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
   b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
   c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.
   d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.
   e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
   f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).
3. (See note; not applicable as a separate requirement)

B. Production and Distribution of Writing

4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

C. Research to Build and Present Knowledge

7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
9. Draw evidence from informational texts to support analysis, reflection, and research.

D. Range of Writing

10. Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Note: Students' narrative skills continue to grow in these grades. The Standards require that students be able to incorporate narrative elements effectively into arguments and informative/ explanatory texts. In history/social studies, students must be able to incorporate narrative accounts into their analyses of individuals or events of historic import.

CONTENT SKILLS

Content Standard 1: The student will analyze the transformation of the United States through its civil rights struggles, immigrant experiences, settlement of the American West, and the industrialization of American society in the Post-Reconstruction through the Progressive Eras, 1865 to 1900.

1. Cite specific textual and visual evidence to analyze the post-Reconstruction civil rights struggles.
   A. Examine the purposes and effects of the *13th, 14th, and 15th Amendments*.
   B. Assess the impact of the Black Codes, Jim Crow laws, and the actions of the Ku Klux Klan.
2. Integrate specific textual and visual evidence to analyze the impact of Westward Movement and immigration on migration, settlement patterns in American society, economic growth, and Native Americans.
   A. Summarize the reasons for immigration, shifts in settlement patterns, and the immigrant experience including the *Chinese Exclusion Act*, the impact of Nativism, Americanization, and the immigrant experiences at Ellis Island.
   B. Examine the rationale behind federal policies toward Native Americans including the establishment of reservations, attempts at assimilation, the end of the Indian Wars at Wounded Knee, and the impact of the *Dawes Act* on tribal sovereignty and land ownership.
   C. Compare the contrasting view points of Native American leadership's resistance to United States Indian policies as evidenced by Red Cloud and his Cooper Union speech, Seattle, Quanah Parker, and Chief Joseph as expressed in his *I Will Fight No More Forever* speech.
3. Evaluate the impact of industrialization on the transformation of American society, economy, and politics.
   A. Analyze the impact of leading industrialists as "robber barons" and as "philanthropists" including John D. Rockefeller and Andrew Carnegie and his *Gospel of Wealth* essay on American society.
   B. Identify the impact of new inventions and industrial production methods including new technologies by Thomas Edison, Alexander G. Bell, and the Bessemer process.
   C. Evaluate the contributions of muckrakers including Ida Tarbell and Upton Sinclair that changed government policies regarding child labor, working conditions, and the *Sherman Antitrust Act*.
   D. Analyze major social reform movements including the Women's Suffrage and Temperance Movement and their significant leaders including Susan B. Anthony, Alice Paul, and Jane Addams.
   E. Evaluate the significance of the Labor Movement on the organization of workers including the impact of the Pullman strikes, the Haymarket Riot, and the leadership of Eugene V. Debs.
   F. Evaluate the rise and reforms of the Progressive Movement including the
      1. Direct primary, initiative petition, referendum, and recall,
      2. Impact of William Jennings Bryan and his *Cross of Gold* speech on the political landscape, and
      3. Conservation of the environment under the leadership of Theodore Roosevelt.

4. Analyze the series of events leading to and the effects of the *16th, 17th, 18th, 19th, and 21st Amendments* to the *United States Constitution*.

G. Assess and summarize changing race relations as exemplified in the *Plessy v. Ferguson* case.

H. Cite specific textual and visual evidence to compare and contrast early civil rights leadership including the viewpoints of Booker T. Washington, W.E.B. DuBois, and Marcus Garvey in response to rising racial tensions, and the use of poll taxes and literacy tests to disenfranchise blacks and poor whites.

Content Standard 2: The student will analyze the expanding role of the United States in international affairs as America was transformed into a world power in the late 19th and early 20th centuries, 1890 to 1920.

1. Cite specific textual and visual evidence to evaluate the impact of American imperialism on international relations and explain its impact on developing nations.
   A. Compare and contrast the economic, religious, social, and political rationales for American imperialism including the concept of "white man's burden," the annexation of Hawaii, the impact of Admiral Alfred T. Mahan, and the actions of the Anti-Imperialist League.
   B. Assess the role of yellow journalism in inciting American desire to go to war with Spain.
   C. Examine how the Spanish-American War resulted in the rise of the United States as a world power, and led to new territorial acquisitions and national insurrections in Cuba and the Philippines.
   D. Compare and contrast the foreign policies of Presidents Theodore Roosevelt, William Howard Taft, and Woodrow Wilson including Big Stick Diplomacy, Dollar Diplomacy, Missionary Diplomacy the *Roosevelt Corollary*, military interventionism, and the territorial acquisition and construction of the Panama Canal.
2. Analyze and summarize the 1912 presidential election including the key personalities of President William Howard Taft, Theodore Roosevelt, Woodrow Wilson and Eugene V. Debs; the key issues of dealing with the trusts, the right of women to vote, and trade tariffs; and the impact of the "Bull Moose Party" on the outcome of the election.
3. Evaluate the long-term impact of America's entry into World War I on national politics, the economy, and society.
   A. Summarize the transformation of the United States from a position of neutrality to engagement in World War I including the *Zimmerman Note* and the threats to international trade caused by unrestricted submarine warfare.
   B. Analyze the experiences of the war's homefront including the use of propaganda, women's increased role in industry, the marshaling of industrial production, the Great Migration, the institution of a draft, and the suppression of individual liberties resulting in the First Red Scare.
   C. Cite specific textual and visual evidence to examine Wilson's foreign policy as proposed in his *Fourteen Points* and the reasons for the nation's return to isolationism including the rejection of the League of Nations.

Content Standard 3: The student will analyze the cycles of boom and bust of the 1920s and 1930s on the transformation of American government, the economy, and society.

1. Examine the economic, political, and social transformations between the World Wars.
   A. Cite specific textual and visual evidence to describe modern forms of cultural expression including the Harlem Renaissance, the Jazz Age, and "talkies" (movies).
   B. Describe the rising racial tensions in American society including the resurgence of the Ku Klux Klan, increased lynchings, race riots as typified by the Tulsa Race Riot, and the use of poll taxes and literacy tests to disenfranchise blacks and poor whites.
   C. Examine growing labor unrest and industry's reactions including the use of sit-down strikes and court injunctions, and why socialism and communism appealed to labor.
   D. Describe the booming economy based upon access to and easy credit through installment buying of appliances and inventions of modern conveniences including the automobile.
   E. Assess the impact of the *Indian Citizenship Act of 1924* upon the various Native American tribes.
2. Cite specific textual and visual evidence to analyze the effects of the destabilization of the American economy.
   A. Identify causes contributing to an unstable economy including the overproduction of agriculture products, greater speculation and buying on margin in the Stock Market, and the government's laissez-faire policy.

B. Examine the role of the Stock Market Crash and bank failures in weakening both the agricultural and manufacturing sectors of the economy leading to the Great Depression.
C. Analyze how President Herbert Hoover's financial policies and massive unemployment as exemplified by the Bonus Army March and Hoovervilles impacted the presidential election of 1932.
D. Cite specific textual and visual evidence to compare points of view regarding the economic and social impact of the Great Depression on individuals, families, and the nation.

3. Analyze the impact of the New Deal in transforming the federal government's role in domestic economic policies.
   A. Assess changing viewpoints regarding the expanding role of government as expressed in President Franklin Roosevelt's *First Inaugural Address* and the *Four Freedoms* speech.
   B. Examine how national policies addressed the economic crisis including deficit spending, Roosevelt's court packing plan, and the new federal agencies of the Social Security Administration, Federal Deposit Insurance Corporation, Works Progress Administration, and Tennessee Valley Authority.
   C. Cite specific textual and visual evidence to summarize the causes and impact of the Dust Bowl including the government's responses.

Content Standard 4: The student will analyze the United States role in international affairs by examining the major causes, events, and effects of the nation's involvement in World War II, 1933 to 1946.

1. Cite specific textual and visual evidence to examine the transformations in American society and government policy as the nation mobilized for entry into World War II.
   A. Examine the roles of appeasement and isolationism in the United States' reluctance to respond to Fascist military aggression in Europe and Asia including the *Neutrality Acts* and the Lend-Lease program.
   B. Evaluate the mobilization for war as stated in President Roosevelt's *Day Which Will Live in Infamy* speech including the role of women and minorities in the war effort, rationing, the internment of Japanese-Americans and the *Korematsu v. United States* decision, and the internment of Americans of German and Italian descent.
2. Cite specific textual and visual evidence to analyze the series of events affecting the outcome of World War II including major battles, military turning points, and key strategic decisions in both the European and Pacific Theaters of operation including Pearl Harbor, the D-Day Invasion, development and use of the atomic bomb, the island-hopping strategy, the Allied conference at Yalta, and the contributions of Generals MacArthur and Eisenhower.
3. Summarize American reactions to the events of the Holocaust resulting in United States participation in the Nuremburg Trials, which held Nazi leaders accountable for war crimes.

Content Standard 5: The student will analyze foreign and domestic policies during the Cold War, 1945 to 1975.

1. Cite specific textual and visual evidence to analyze the origins of international alliances and efforts at containment of Communism following World War II.
   A. Identify the origins of Cold War confrontations between the Soviet Union and the United States including the leadership of President Harry Truman, the postwar division of Berlin, the Berlin Blockade and Airlift, the fall of the Iron Curtain, and the Marshall Plan.
   B. Describe the role of the United States in the formation of the United Nations, NATO and the resulting Warsaw Pact, and the dividing of the political world into the Western and Soviet spheres of influence.
   C. Assess the impact and successes of the *Truman Doctrine* including the American military response to the invasion of South Korea.
   D. Compare and contrast the domestic and international goals of President Kennedy's administration as expressed in his *Inaugural Address* to the subsequent building of the Berlin Wall, the Bay of Pigs Invasion, the Cuban Missile Crisis, and the establishment of the Peace Corps.
2. Cite specific textual and visual evidence to describe events which changed domestic policies during the Cold War and its aftermath.
   A. Summarize the reasons for the public fear of communist influence within the United States and how politicians capitalized on these threats including the leadership of President Dwight D. Eisenhower, the Army-McCarthy hearings, the Second Red Scare, and the Rosenbergs' spy trials.

B. Examine the impact of the proliferation of nuclear weapons and the resulting nuclear arms race, the concept of brinkmanship, the doctrine of mutually assured destruction (MAD), and the launching of *Sputnik* and the space race.

3. Cite specific textual and visual evidence to analyze the series of events and long term foreign and domestic consequences of the United States' military involvement in Vietnam including the Domino Theory, the *Gulf of Tonkin Resolution*, the Tet Offensive, the presidential election of 1968, university student protests, expanded television coverage of the war, the *War Powers Act,* and the *26th Amendment*.
4. Cite specific textual and visual evidence to analyze the major events, personalities, tactics, and effects of the Civil Rights Movement.
   A. Assess the effects of President Truman's decision to desegregate the United States armed forces, and the legal attacks on segregation by the NAACP and Thurgood Marshall, the United States Supreme Court decisions in the cases of Ada Lois Sipuel Fisher and George McLaurin, and the differences between *de jure* and *de facto* segregation.
   B. Compare and contrast segregation policies of "separate but equal," disenfranchisement of African Americans through poll taxes, literacy tests, and violence; and the sustained attempts to dismantle segregation including the *Brown v. Board of Education* decision, Rosa Parks and the Montgomery Bus Boycott, the desegregation of Little Rock Central High School, the Oklahoma City lunch counter sit-ins led by Clara Luper, the Freedom Rides, the March on Washington, the Birmingham church bombing, the adoption of the *24th Amendment*, the passage of the *Civil Rights Act of 1964* and the *Voting Rights Act of 1965*, the Selma to Montgomery marches, and the assassination of Dr. Martin Luther King, Jr.
   C. Compare and contrast the view points and the contributions of civil rights leaders and organizations linking them to events of the movement including Dr. Martin Luther King, Jr. and his *I Have a Dream* speech, Malcolm X, NAACP, SCLC, CORE, SNCC, and the tactics used at different times including civil disobedience, non-violent resistance, sit-ins, boycotts, marches, and voter registration drives.
   D. Evaluate the effects the Civil Rights Movement had on other contemporaneous social movements including the Women's Liberation Movement, the United Farm Workers and César Chávez, and the American Indian Movement.
5. Cite specific textual and visual evidence to analyze the ongoing social and political transformations within the United States.
   A. Summarize and examine the United States Supreme Court's use of the incorporation doctrine in applying the *Bill of Rights* to the states, thereby securing and further defining individual rights and civil liberties.
   B. Assess the lasting impact of President Lyndon Johnson's civil rights initiatives, the war on poverty, and the Great Society.
   C. Describe the goals and effectiveness of the Native American movement on tribal identity and sovereignty including the American Indian Movement (AIM), and the Siege at Wounded Knee.
   D. Cite specific textual and visual evidence to compare and contrast the changing roles of women from the Post-war Era through the 1970s including the goals of the Women's Liberation Movement, the National Organization of Women (NOW), the attempts to ratify the *Equal Rights Amendment* (ERA), and the United States Supreme Court's ruling in *Roe v. Wade*.
   E. Analyze the political and economic impact of President Nixon's foreign policies including *détente* and the opening of China.
   F. Evaluate the impact of the Watergate Scandal on executive powers including the role of the media, the *Pentagon Papers*, the first use of the *25th Amendment*, and President Ford's decision to pardon former President Nixon.

Content Standard 6: The student will analyze the foreign and domestic policies in the contemporary era, 1977 to the present.

1. Cite specific textual and visual evidence to evaluate President Carter's foreign policy in the Middle East including the *Camp David Accords*, the OPEC oil embargo, and the response to the 1979 Iranian hostage crisis.
2. Analyze the economic and political impact of President Reagan's domestic and foreign policies including Reaganomics, the Iran-Contra Scandal, and Reagan's *Tear Down This Wall* speech in West Berlin.
3. Summarize the series of events leading to the emergence of the United States as the sole superpower following the fall of the Berlin Wall, the reunification of Germany, and the collapse of the Soviet Empire.
4. Describe the goal of President H.W. Bush's foreign policy in forming an international coalition to counter Iraqi aggression in the Persian Gulf.

5. Describe and evaluate the continuing global influence of the United States under the leadership of President Bill Clinton including NAFTA and the NATO interventions to restore stability to the former Yugoslav republics.
6. Evaluate the rise of terrorism and its impact on the United States including the 1995 bombing of the Murrah Federal Building, the first attack on the World Trade Center Towers in 1993, the attacks on September 11, 2001, the *PATRIOT ACT*, and the creation of the Department of Homeland Security.

***Content Standard 7: The student will examine contemporary challenges and successes in meeting the needs of the American citizen and society, 2002 to the present.**

1. Cite specific textual and visual evidence to assess the causes, conduct, and consequences of the United States led wars in Afghanistan and Iraq including President George W. Bush's leadership, the efforts to counter and combat terrorism, and the impact of President Barack Obama's election on the course of the wars.
2. Examine the ongoing issues of immigration, employment, climate change, environmental pollution, globalization, population growth, race relations, women's issues, healthcare, civic engagement, education, and the rapid development of technology.

An asterisk (*) has been used to identify Content Standard 7 and the following objectives under that standard that must be assessed by the local school district. All other skills may be assessed by the Oklahoma School Testing Program (OSTP).

High School WORLD HISTORY: *Cultural Connections, Turning Points, and Transformation of the World into the Modern Era*

The student will examine the enduring philosophical and religious contributions from the ancient and classical eras to the modern world. The student will examine the impact of the European Renaissance and Reformation, various revolutionary movements, the Industrial Revolution, and the world that the World Wars helped create, the transformation of societies in the Post-World War Two Era, and recent contemporary events and issues.

COMMON CORE STATE STANDARDS READING AND WRITING LITERACY IN HISTORY/SOCIAL STUDIES

The Common Core State Standards Reading and Writing Literacy Standards for Literacy in History/Social Studies in the high school contain two grade bands, 9-10 and 11-12. Since school districts have the option of scheduling high school social studies courses at any grade level 9-12, only the CCSS for Reading and Writing for Grades 9-10 have been included in each high school Social Studies course. If a course is taught at the 11th or 12th grade level, then the CCSS for Reading and Writing Grades 11-12 must be used for social studies literacy instruction. A copy of the CCSS for Reading and Writing Grades 11-12 are found in Appendix C.

The Common Core History/Social Studies Reading and Writing Literacy Skills are to be integrated throughout all of the content standards and used for instructional delivery of the content.

Celebrate Freedom Week

In order to educate Oklahoma students about the sacrifices made for freedom on behalf of the country and the values on which this country was founded, November 11 has been designated "Veterans Day," and the week in which November 11 falls has been designated "Celebrate Freedom Week" for the public schools of Oklahoma. As part of a social studies class, during Celebrate Freedom Week or during another full school week as determined by the local board of education, appropriate instruction concerning the intent, meaning, and importance of the *Declaration of Independence* and the *United States Constitution*, including the *Bill of Rights*, in their historic contexts shall occur.

The study of the *Declaration of Independence* is to include the study and the relationship of ideas expressed in that document to subsequent American history

Students in Grades 3-12 shall study and recite the following from the "social contract" selection of the *Declaration of Independence*:

> We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness. – That to secure these rights, Governments are instituted among Men, deriving their just powers from the consent of the governed.

The board of education of each public school district shall ensure that each school in its district will on Veterans Day conduct and observe an appropriate Veterans Day Assembly program of at least one class period that remembers and honors American veterans.

PROCESS AND LITERACY SKILLS

Process and Literacy Standard 1: Reading Skills. The student will develop and demonstrate social studies Common Core reading literacy skills.

A. Key Ideas and Details

1. Cite specific textual evidence to support analysis of primary and secondary sources, attending to such features as the date and origin of the information.
2. Determine the central ideas or information of a primary or secondary source; provide an accurate summary of how key events or ideas develop over the course of the text.
3. Analyze in detail a series of events described in a text; determine whether earlier events caused later ones or simply preceded them.

B. Craft and Structure

4. Determine the meaning of words and phrases as they are used in a text, including vocabulary describing political, social, or economic aspects of history/social science.
5. Analyze how a text uses structure to emphasize key points or advance an explanation or analysis.
6. Compare the point of view of two or more authors for how they treat the same or similar topics, including which details they include and emphasize in their respective accounts.

C. Integration of Knowledge and Ideas

7. Integrate quantitative or technical analysis (e.g., charts, research data) with qualitative analysis in print or digital text.
8. Assess the extent to which the reasoning and evidence in a text support the author's claims.

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9. Compare and contrast treatments of the same topic in several primary and secondary sources.

D. Range of Reading and Level of Text Complexity

10. By the end of grade 10, read and comprehend history/ social studies texts in the grades 9–10 text complexity band independently and proficiently.

Process and Literacy Standard 2: Writing Skills. The student will develop and demonstrate Common Core social studies writing literacy skills.

A. Text Types and Purposes

1. Write arguments focused on discipline-specific content.
   a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.
   b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns.
   c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
   d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
   e. Provide a concluding statement or section that follows from or supports the argument presented.
2. Write informative/explanatory texts, including the narration of historic events, scientific procedures/ experiments, or technical processes.
   a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
   b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
   c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.
   d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.
   e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
   f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).
3. (See note; not applicable as a separate requirement)

B. Production and Distribution of Writing

4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

C. Research to Build and Present Knowledge

7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
9. Draw evidence from informational texts to support analysis, reflection, and research.

D. Range of Writing

10. Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Note: Students' narrative skills continue to grow in these grades. The Standards require that students be able to incorporate narrative elements effectively into arguments and informative/explanatory texts. In history/social studies, students must be able to incorporate narrative accounts into their analyses of individuals or events of historic import.

CONTENT SKILLS

Content Standard 1: The student will analyze and summarize the impact on the modern world of the major world religions and the philosophical political principles of ancient and classical societies.

1. Cite specific textual and visual evidence to evaluate the impact of geography and various trade networks connecting Asia, Europe, and Africa on the spread of religions, philosophies, and political beliefs.
2. Examine the origins, traditions, beliefs, and impact of Judaism on ancient and modern societies including the religious concept of monotheism and its influence into the modern eras.
3. Compare using specific textual evidence the contributions of Greek and Roman philosophers to political ideas using selections from Plato's *Republic*, Aristotle's *Politics*, Cicero's *On the Republic* and *On the Laws*, and their impact on later political thought in Western societies.
4. Examine the origins, traditions, and beliefs of Hinduism and Buddhism, and explain their influence on the civilizations of India, China, and Southeast Asia, and their influence into the modern eras.
5. Examine the origins, traditions, beliefs, and impact of Christianity including its spread under the Roman Empire; its preservation by the Roman Catholic Church; the Byzantines and the Orthodox churches; and its influence into the modern eras.
6. Examine the origins, traditions, beliefs, and impact of Confucianism and Daoism including how those ideas and beliefs influenced Asian civilizations into the modern eras.
7. Examine the origins, traditions, beliefs, and impact of Islam including the religious, political, and economic causes and effects of the Crusades on the spread of Islam, and the influence of Islam into the modern eras.

Content Standard 2: The student will analyze patterns of social, economic, political, and cultural changes of the Renaissance and Reformation.

1. Cite specific textual and visual evidence to assess the significance of the Renaissance on politics and artistic creativity as exemplified by Machiavelli, Michelangelo, and daVinci.
2. Summarize how the theological movements during the Reformation transformed society by comparing the impact of the ideas of Martin Luther and John Calvin.
3. Analyze migration, settlement patterns, and cultural diffusion caused by the competition for resources among European nations during the Age of Exploration including the impact of the Columbian Exchange and the Atlantic slave trade.

Content Standard 3: The student will evaluate modern revolutionary movements influenced by the European Age of Absolutism and the Enlightenment including political, economic, and social transformations.

1. Summarize the establishment and authority exercised by absolute monarchies including Louis XIV, Frederick the Great, and Peter the Great.
2. Compare how scientific theories and technological discoveries including those made by Newton, Copernicus, and Galileo brought about social and cultural changes.
3. Cite specific textual and visual evidence to analyze the impact of the Enlightenment including the theories of John Locke and Adam Smith on modern government and economic institutions.
4. Compare and contrast the causes and lasting impact of England's Glorious Revolution, the American Revolution, and the French Revolution on the decline of monarchy and on the rise of representative government including the impact of the Napoleonic Wars and the resulting Congress of Vienna.
5. Summarize the influence and global impact of emerging democratic ideals on the Latin American and Caribbean revolutions including Haiti, Mexico, and Bolivia.

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Content Standard 4: The student will evaluate the global transformation brought about by the Industrial Revolution and the World Wars.

1. Summarize the impact of massive social and economic changes as a result of industrialization including Marxist criticisms of capitalism.
2. Cite specific textual and visual evidence to explain the rationales and consequences of imperialism on Asia, Africa, and the Americas including colonization and the exploitation of natural resources and peoples.
3. Analyze socialism, communism, and the Bolshevik Revolution as responses to market economies.
4. Evaluate the forces of nationalism and militarism, as well as the systems of alliances as causes of World War I.
5. Examine the causes of World War II including the failure of the *Treaty of Versailles*, the impact of the Great Depression, and the rise of totalitarian regimes in the Soviet Union, Germany, Italy, and Japan.
6. Cite specific textual and visual evidence to analyze World War II including the leadership of Winston Churchill, Franklin Roosevelt, Josef Stalin, Adolf Hitler, Benito Mussolini, and Hideki Tōjō, the key strategic decisions, and the war's significant turning points.
7. Evaluate the effects of World War II including military and economic power shifts, purposes of the United Nations and NATO, and the origins and escalation of the Cold War.
8. Cite specific textual and visual evidence to examine the causes, course, and effects of the Holocaust; and compare and contrast eyewitness accounts of camp inmates, survivors, liberators, and perpetrators; and, summarize world responses resulting in the Nuremberg Trials and the move to establish a Jewish homeland in Palestine.

Content Standard 5: The student will evaluate post World War II regional events leading to the transformations of the modern world.

1. Cite specific textual and visual evidence to describe the creation of the modern state of Israel, the ongoing regional disputes with its Arab neighbors, the continuing hostilities between Iran and Iraq, and the impact of significant regional leaders including Golda Meir, Anwar Sadat, Yasser Arafat, Saddam Hussein, and the Ayatollah Khomeini.
2. Compare the Chinese Communist Revolution under the leadership of Mao Zedong, the effects of the Great Leap Forward and the Cultural Revolution to recent attempts toward economic and democratic reforms including the Tiananmen Square demonstrations, limited privatization, and foreign investments.
3. Cite specific textual and visual evidence to examine the origins of India as a modern world power by tracing the struggle for independence achieved through Mohandas K. Gandhi's non-violent civil disobedience movement, the development of India's industrial and service-oriented economy, and the ongoing threat of nuclear warfare between India and Pakistan.
4. Evaluate the effects of Poland's Solidarity Movement, Soviet President Mikhail Gorbachev's policies of the *perestroika* and *glasnost*, the fall of the Berlin Wall, the reunification of Germany, the collapse of Communism and the breakup of the Soviet Union that resulted in new independent countries.
5. Assess the impact of continuing African independence movements on human rights and the global expansion of democracy including the effects of Pan-Africanism on changing political boundaries, Kwame Nkrumah's struggle for self-government in Ghana, and South Africa dismantling its apartheid system under the leadership of Nelson Mandela and Desmond Tutu.
6. Compare and contrast multiple perspectives to examine the religious, ethnic and political origins, as well as the lasting impact of modern genocide and conflicts including Northern Ireland's Troubles, acts of genocide by the Khmer Rouge in Cambodia, ethnic-cleansing in the Balkans, Rwanda's mass murders, and the ethnic and religious crisis in Darfur.

Content Standard 6: The student will evaluate contemporary global issues and challenges.

1. Describe the ongoing impact of interdependence on the world's economies resulting in the creation and growth of multinational organizations including the challenges faced by the European Economic Community, the cooperative efforts of OPEC, the emergence of the Pacific Rim economy, and the roles of the World Bank and World Trade Organization.
2. Cite specific textual and visual evidence to examine the changing patterns of population growth, the cycle of disease and poverty, the impact of the Green Revolution on future food supplies, and the status of women in developing regions.
3. Cite specific textual and visual evidence to describe the impact of ongoing cultural diffusion as a result of the development of mass communication, social media, transportation systems, and global trade.
4. Describe the rise of international terrorism including the causes and effects of the attacks on the World Trade Center Towers in 1993, the attacks on 9/11 in 2001, and other acts of international terrorism including London, Madrid, and Mumbai, and analyze the policies and actions of world powers to counter and combat terrorism including the wars in Afghanistan and Iraq.

High School
WORLD HUMAN GEOGRAPHY
The Why of Where: Places, Patterns of Settlement, and Global Interactions

Human Geography is the study of spatial patterns of the human and physical dimensions of the world. Students will explore, describe, analyze, and seek to understand the spatial arrangement of objects and people on Earth's surface. Students will use the skills and tools of geography to examine the world and its inhabitants from a spatial perspective, solve problems of geographic dimensions and make informed decisions based upon solid research.

COMMON CORE STATE STANDARDS READING AND WRITING LITERACY IN HISTORY/SOCIAL STUDIES

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The Common Core History/Social Studies Reading and Writing Literacy Skills are to be integrated throughout all of the content standards and used for instructional delivery of the content.

Celebrate Freedom Week
In order to educate Oklahoma students about the sacrifices made for freedom on behalf of the country and the values on which this country was founded, November 11 has been designated "Veterans Day," and the week in which November 11 falls has been designated "Celebrate Freedom Week" for the public schools of Oklahoma. As part of a social studies class, during Celebrate Freedom Week or during another full school week as determined by the local board of education, appropriate instruction concerning the intent, meaning, and importance of the *Declaration of Independence* and the *United States Constitution*, including the *Bill of Rights*, in their historic contexts shall occur.

The study of the *Declaration of Independence* is to include the study and the relationship of ideas expressed in that document to subsequent American history.

Students in Grades 3-12 shall study and recite the following from the "social contract" selection of the *Declaration of Independence*:

> We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness. – That to secure these rights, Governments are instituted among Men, deriving their just powers from the consent of the governed.

The board of education of each public school district shall ensure that each school in its district will on Veterans Day conduct and observe an appropriate Veterans Day Assembly program of at least one class period that remembers and honors American veterans.

PROCESS AND LITERACY SKILLS

Process and Literacy Standard 1: Reading Skills. The student will develop and demonstrate social studies Common Core reading literacy skills.

A. Key Ideas and Details
1. Cite specific textual evidence to support analysis of primary and secondary sources, attending to such features as the date and origin of the information.
2. Determine the central ideas or information of a primary or secondary source; provide an accurate summary of how key events or ideas develop over the course of the text.
3. Analyze in detail a series of events described in a text; determine whether earlier events caused later ones or simply preceded them.

B. Craft and Structure
4. Determine the meaning of words and phrases as they are used in a text, including vocabulary describing political, social, or economic aspects of history/social science.
5. Analyze how a text uses structure to emphasize key points or advance an explanation or analysis.
6. Compare the point of view of two or more authors for how they treat the same or similar topics, including which details they include and emphasize in their respective accounts.

C. Integration of Knowledge and Ideas
7. Integrate quantitative or technical analysis (e.g., charts, research data) with qualitative analysis in print or digital text.
8. Assess the extent to which the reasoning and evidence in a text support the author's claims.

9. Compare and contrast treatments of the same topic in several primary and secondary sources.

D. Range of Reading and Level of Text Complexity

10. By the end of grade 10, read and comprehend history/ social studies texts in the grades 9–10 text complexity band independently and proficiently.

Process and Literacy Standard 2: Writing Skills. The student will develop and demonstrate Common Core social studies writing literacy skills.

A. Text Types and Purposes

1. Write arguments focused on discipline-specific content.
   a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.
   b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns.
   c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
   d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
   e. Provide a concluding statement or section that follows from or supports the argument presented.
2. Write informative/explanatory texts, including the narration of historic events, scientific procedures/ experiments, or technical processes.
   a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
   b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
   c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.
   d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.
   e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
   f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).
3. (See note; not applicable as a separate requirement)

B. Production and Distribution of Writing

4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

C. Research to Build and Present Knowledge

7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
9. Draw evidence from informational texts to support analysis, reflection, and research.

D. Range of Writing

10. Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Note: Students' narrative skills continue to grow in these grades. The Standards require that students be able to incorporate narrative elements effectively into arguments and informative/explanatory texts. In history/social studies, students must be able to incorporate narrative accounts into their analyses of individuals or events of historic import.

CONTENT SKILLS

Content Standard 1: The student will cite textual and visual evidence including maps and other geographic representations, tools and technologies to acquire, research, process, and solve problems from a spatial perspective.

1. Analyze key concepts underlying the geographical perspectives of location, space, place, scale, pattern, regionalization, and globalization.
2. Utilize geographic skills to understand and analyze the spatial organization of people, places, and environments on the Earth's surface.
3. Define regions and evaluate the regionalization process to characterize and analyze changing interconnections among places.
4. Utilize geographic technologies of GIS, remote sensing, and GPS sources of geographical data including census data, population pyramids, climagraphs, cartagrams, and satellite imagery.

Content Standard 2: The student will evaluate specific textual and visual evidence to analyze how human population is organized geographically in order to understand the cultural, political, and economic systems of the world.

1. Analyze geographic data measuring population including density; distribution; patterns of composition: age, sex, race, and ethnicity; and population trends and projections.
2. Describe and summarize the push and pull theory of migration and its impact on human capital and demographic transitions including the research of major voluntary and involuntary migrations.
3. Compare and contrast the impact of population policies on the patterns of fertility, mortality, and health.

Content Standard 3: The student will evaluate textual and visual evidence to analyze the components and regional variations of cultural patterns and processes.

1. Assess the spatial dimensions of culture as defined by language, religion, race, ethnicity, and gender.
2. Analyze and summarize the role the environment plays in determining a region's culture.
3. Explain the processes of cultural diffusion, acculturation, assimilation, and globalization regarding their impact on defining a region.
4. Compare and contrast the world's major cultural landscapes to analyze cultural differences, cultural identity, social mores and sets of beliefs which determine a sense of place.
5. Summarize the impact of the world's major religions of Buddhism, Christianity, Daoism, Hinduism, Islam, and Judaism on modern societies.

Content Standard 4: The student will evaluate specific textual and visual evidence to explain the political organization of space.

1. Describe and summarize the different forces that shape the evolution of the contemporary world's political map including the rise of nation-states.
2. Analyze the concept of territoriality, the nature and meaning of boundaries, and their influence on identity, interaction, and exchange.
3. Compare and contrast the world's political patterns of organization including federal and unitary states.
4. Examine changes and challenges to political/territorial arrangements, the changing nature of sovereignty, and evolution of contemporary political patterns.
5. Evaluate how the forces of cooperation and conflict among people influence the division and control of territory and resources.

Content Standard 5: The student will evaluate specific textual and visual evidence to analyze agricultural and rural land use.

1. Examine the origin and diffusion of agriculture including the Neolithic Revolution and the Green Revolution.
2. Describe and summarize the characteristics of modern commercial agriculture including major production regions, variations within major zones, and effects of markets.
3. Analyze settlement patterns associated with major agricultural regions and linkages among regions of food production and consumption.
4. Research and describe the impact of agricultural practices including irrigation, conservation, desertification, deforestation, organic farming, pesticides and herbicides, and genetic modification on the environment and the quality of life.
5. Examine common characteristics of rural communities including the impact of the environment on location; the political, economic, and cultural functions of rural communities; the types of transportation, communication, and trade linkages among rural areas; and the impact of modern migration to urban centers.

Content Standard 6: The student will evaluate specific textual and visual evidence to analyze the impact of industrialization on economic development.

1. Examine the changing roles of natural resources, energy, and technology that resulted in the Industrial Revolution.
2. Evaluate the impact of industrialization and government policies of both market and command economic systems on the availability and use of natural resources, environmental concerns, and sustainable development.
3. Compare and contrast contemporary patterns of industrialization and development in selected regions of the world including the Pacific Rim, Central Asia, and the Middle East.
4. Analyze why some economies achieve rapid growth while other economies with similar resources struggle to reach developed status.
5. Summarize common characteristics of developed nations including variations in levels of development, modern patterns of deindustrialization and economic restructuring, globalization, and international division of labor.

Content Standard 7: The student will evaluate specific textual and visual evidence to analyze cities and urban land use.

1. Examine the origin, development, and character of cities including the impact of the environment on location; the political, economic, and cultural functions of cities; historical distribution of cities; and the types of transportation, communication, and trade linkages among cities.
2. Analyze contemporary patterns of rural migration upon urban development including the concept of suburbanization, edge cities, megacities, and global cities.
3. Describe the factors that impact cities over time including uneven development, changing economic and demographic structures, transportation and infrastructure, housing, and urban planning.

SOCIAL STUDIES

OKLAHOMA
ACADEMIC
STANDARDS

OKLAHOMA
STATE DEPARTMENT of EDUCATION
JOY HOFMEISTER
STATE SUPERINTENDENT of PUBLIC INSTRUCTION

OKLAHOMA

STATE DEPARTMENT *of* EDUCATION

JOY HOFMEISTER

STATE SUPERINTENDENT *of* PUBLIC INSTRUCTION

APPENDIX B—COMMITTEE MEMBERSHIP

•OKLAHOMA TECHNICAL ADVISORY COMMITTEE

The Oklahoma Technical Advisory Committee is comprised of five leading, national experts in the fields of large scale assessment and educational research. Each member provides Oklahoma with sound input to assure validity and reliability of all technical and policy procedures throughout development and implementation of the Oklahoma School Testing Program assessments. The committee provides additional oversight of testing contractors and input to the State Board of Education on state-of-the-art technical/statistical information on assessment and accountability issues and trends.

John M. Keene (Committee Member since March 2003)

Dr. Keene is the owner of *Assessment and Evaluation Services* which provide assessment and evaluation services and consultation to states and large school districts. His work is primarily with large scale testing programs. Dr. Keene has also served as the Vice President, Director of Measurement and Development for the *Riverside Publishing* Company, Director, Test Development for *Science Research Associates*, and Director, Psychometric and Applied Research Group with the *Psychological Corporation*. Dr. Keene received a Ph.D. in Educational Psychology from Indiana Universit}'.

Robert A. Terry (Committee Member since March 2003)

Dr. Terry is a professor of psychology at the University of Oklahoma. He has served as an active member of the American Educational Research Association review panel. Dr. Terry is currently researching measurement and methodological issues in sociometry as well as longitudinal data analysis. He has written and edited several published articles pertaining to statistics and testing, developmental psychology, and applied psychological measurement. Dr. Terry received a Ph.D. in Quantitative Psychology from the University of North Carolina at Chapel Hill.

H. Gary Cook (Committee Member since January 2013)

Dr. H. Gary Cook directs research for the WIDA Consortium and is a research scientist attached to the Wisconsin Center for Education Research. Dr. Cook received his Ph.D. in Measurement and Quantitative Methods from Michigan State University. He has a Masters in Teaching English as a Second Language and a Bachelor's in linguistics from the University of Hawai'i at Manoa. He has served in educational leadership or research positions in private industry, in an urban public school district, in a state department of education, and at the university level. He is an experienced Federal Peer Reviewer for *NCLB* and serves on several state and national technical advisory committees. His recent research and publication interests have focused on the relationship between English language proficiency and content assessments, standards alignment, policy issues associated with Title Ill accountability, and applying growth modeling techniques to address key educational questions for English language learners.

John F.Olson (Committee Member since January 2013)

Dr. John F. Olson is the chair of the committee. Dr. Olson is President of the consulting business he founded in 2006, Olson Educational Measurement & Assessment Services (OEMAS), which provides technical assistance and support to states, school districts, the U.S. Department of Education, Ministries of Education in other countries, CCSSO, Caveon Test Security, testing companies, researchers, and others. He has more than 30 years of experience providing consulting on a variety of measurement and statistical issues for international, national, state, and local assessment programs. Dr. Olson also currently serves as senior partner for the Assessment Solutions Group (ASG), which he co-founded in 2008. The mission of ASG is to help states and local districts maximize value throughout the assessment procurement and implementation process via service offerings in RFP preparation, bid analysis and proposal evaluation, cost analysis, price negotiations, and ongoing program and contract management. Previously, he has served as Vice President for Psychometrics and Research Services at Harcourt Assessment, Director of Assessment for CCSSO and the SCASS projects, Deputy Director of the Center for Education Assessment at American Institutes for Research (AIR), Senior Research Scientist with the Education Statistics Services Institute (ESSI), and in a number of leadership roles for NAEP at the Educational Testing Service (ETS). Olson holds a Ph.D.in educational statistics and measurement from the University of Nebraska - Lincoln.

Marianne Perie (Committee Member since January 2013)

Dr. Marianne Perie is the Director of the Center for Assessment and Accountability Research and Design (CAARD), formed in 2016 at the University of Kansas. This Center is evaluating the use of learning maps to build formative tools for teachers, researching the comparability of various devices used in computer-based testing, and designing accountability systems under the Every Student Succeeds Act. Previously, Dr. Perie served as the Director for Center for Educational Testing and Evaluation (CETE) for three years. In that role she oversaw the Kansas Assessment Program, the Alaska Measures of Progress, the Career Pathways Assessment, two grants, and provided technical support on the Dynamic Learning Maps consortium. She currently serves on five state technical advisory committees (TACs) and the research advisory committee for the College Board. Additionally, she coordinates the state collaborative on Technical Issues in Large Scale Assessment for CCSSO. Previously, she was a Senior Associate with the National Center for the Improvement of Educational Assessment, providing technical assistance to over 16 states and territories on accountability and assessment issues related to Federal policy (2006–2013). Prior to joining the Center, she worked on multiple state and district assessments, the National Assessment of Educational Progress (NAEP), and international assessments as an employee of the American Institutes for Research (1995–2003) and the Educational Testing Service (2003–2006).

APPENDIX C—TEST BLUEPRINTS

Oklahoma School Testing Program
ACE Algebra I EOI – Test Blueprint
School Year 2014-2015

The blueprint describes the content and structure of an assessment and defines the ideal number of test items and actual number of test items by standard and objective of the Priority Academic Student Skills/ Oklahoma Academic Standards (PASS/OAS).

Standards and Objectives	Ideal Number of Items	Ideal Percentage of Items	Actual Number of Items Winter /Tri 2014	Actual Number of Items Spring 2015 Form A	Actual Number of Items Spring 2015 Form B
1.0 Number Sense and Algebraic Operations	**15**	**27%**	**15**	**15**	**15**
1.1 Equations and Formulas	6		6	6	6
1.2 Expressions	9		9	9	9
2.0 Relations and Functions	**31**	**56%**	**32**	**31**	**31**
2.1 Relations/Functions	6		6	6	6
2.2 Linear Equations and Graphs	15		16	15	15
2.3 Linear Inequalities and Graphs	6		6	6	6
2.4 Systems of Equations	4		4	4	4
3.0 Data Analysis, Probability, & Statistics	**9**	**16%**	**8**	**9**	**9**
3.1 Data Analysis	5		4	5	5
3.2 Line of Best Fit	4		4	4	4
Total Test	**55**	**100%**	**55**	**55**	**55**

(Please note this blueprint does not include items that may be field-tested.)

- A minimum of 6 items is required to report a standard, and a minimum of 4 items is required to report results for an objective.
- Percentages are approximations and may result in a sum other than 100 due to rounding.

Oklahoma School Testing Program
ACE Algebra II EOI – Test Blueprint
School Years 2014-2015

The blueprint describes the content and structure of an assessment and defines the ideal number of test items and the actual number of test items by standard and objective of the Priority Academic Student Skills/ Oklahoma Academic Standards (PASS/OAS).

Standards and Objectives	Ideal Number of Items	Ideal Percentage of Items	Actual Number of Items Winter/Tri 2014	Actual Number of Items Spring 2015 Form A	Actual Number of Items Spring 2015 Form B
1.0 Number Sense and Algebraic Operations	**15**	**27%**	**15**	**15**	**15**
1.1 Rational Exponents	5 - 6		6	6	5
1.2 Polynomial and Rational Expressions	5 - 6		5	5	6
1.3 Complex Numbers	4		4	4	4
2.0 Relations and Functions	**31**	**56%**	**31**	**31**	**31**
2.1 Functions and Function Notation	5		5	5	5
2.2 Systems of Equations	5		5	5	5
2.3 Quadratic Equations and Functions	5		5	5	5
2.4 Conic Sections	4		4	4	4
2.5 Exponential and Logarithmic Functions	4		3	4	4
2.6 Polynomial Equations and Functions	4		5	4	4
2.7 Rational Equations and Functions	4		4	4	4
3.0 Data Analysis, Probability, & Statistics	**9**	**16%**	**9**	**9**	**9**
3.1 Analysis of Collected Data	5		5	5	5
3.3 Arithmetic and Geometric Sequences	4		4	4	4
Total Test	**55**	**100%**	**55**	**55**	**55**

(Please note this blueprint does not include items that may be field-tested.)

- A minimum of 6 items is required to report a standard, and a minimum of 4 items is required to report results for an objective.
- Percentages are approximations and may result in a sum other than 100 due to rounding.

Oklahoma School Testing Program
ACE Biology I EOI – Test Blueprint
School Year 2015-2016

The blueprint describes the content and structure of an assessment and defines the ideal number of test items and actual number of test items by standard and objective of the Priority Academic Student Skills/ Oklahoma Academic Standards (PASS-2011/OAS).

Process/Inquiry Standards and Objectives	Ideal Number of Items	Ideal Percentage of Items	Ideal Number of Items Winter/Tri 2015	Ideal Number of Items Spring 2016 Form A	Ideal Number of Items Spring 2016 Form B
P1.0 Observe and Measure	**6**	**10%**	**6**	**6**	6
1.1 Qualitative/Quantitative Observations/Changes	4		4	4	4
1.2 Appropriate Tools and 1.3 Use Appropriate System International SI (metric) Units	2		2	2	2
P2.0 Classify	**7 - 8**	**12% - 13%**	**7**	7	8
2.1 Use Observable Properties to Classify	4		4	4	4
2.2 Identify Properties of a Classification System	3 - 4		3	3	4
P3.0 Experimental Design	**16 - 19**	**27% - 32%**	**18**	**18**	**17**
3.1 Evaluate the Design of Investigations	4 - 5		5	5	5
3.2 Identify Controlled Variables and Experimental Controls in an Experiment and 3.4 Identify a Testable Hypothesis in a Biology Investigation	5 - 6		5	5	5
3.3 Use Mathematics to Show Relationships	4 - 6		5	5	4
3.5 Identify Potential Hazards and Practice Safety Procedures in all Science Activities	3		3	3	3
P4.0 Interpret and Communicate	**20 - 24**	**33% - 40%**	**21**	21	**21**
4.1 Select Predictions Based on Observed Patterns of Evidence	4 - 5		4	5	4
4.3 Interpret Line, Bar, Trend, and Circle Graphs	4 - 5		4	4	4
4.4 Accept or Reject a Hypothesis	4 - 5		4	4	4
4.5 Make Logical Conclusions Based on Experimental Data	4 - 5		5	4	5
4.8 Identify an Appropriate Graph or Chart	4		4	4	4
P5.0 Model	**8**	**13%**	**8**	**8**	8
5.1 Interpret a Model which Explains a Given Set of Observations	4		4	4	4
5.2 Select Predictions Based on Models, Using Mathematics When Appropriate	4		4	4	4
Total Test	**60**	**100%**	**60**	**60**	**60**

(Please note this blueprint does not include items that may be field-tested.)

- A minimum of 6 items is required to report a standard, and a minimum of 4 items is required to report results for an objective.

Oklahoma School Testing Program
ACE Biology I EOI – Test Blueprint
School Year 2015-2016

Content Standards and Objectives	Ideal Number of Items	Ideal Percentage of Items	Actual Number of Items Winter 2015	Actual Number of Items Spring 2016 Form A	Actual Number of Items Spring 2016 Form B
C1.0 The Cell	**12 - 15**	**21% - 27%**	**12**	**12**	**13**
1.1 Cell Structures and Functions	4 - 6		4	4	5
1.2 Differentiation of Cells	4 - 6		4	4	4
1.3 Specialized Cells	4		4	4	4
C2.0 The Molecular Basis of Heredity	**12 - 15**	**21% - 27%**	13	13	**12**
2.1 DNA Structure and Function in Heredity	6 - 8		6	6	6
2.2 Sorting and Recombination of Genes	6 - 7		7	7	6
C3.0 Biological Diversity	**12 - 15**	**21% - 27%**	**12**	**12**	**12**
3.1 Variation Among Organisms	4 - 6		4	4	4
3.2 Natural Selection and Biological Adaptations	4 - 6		4	4	4
3.3 Behavior Patterns Can Be Used To Ensure Reproductive Success	4		4	4	4
C4.0 The Interdependence of Organisms	**8 - 10**	**14% - 18%**	8	**8**	**8**
4.1 Organisms Both Cooperate and Compete	4 - 6		4	4	4
4.2 Population Dynamics	4 - 6		4	4	4
C5.0 Matter/Energy/Organization in Living Systems	**12**	**21%**	**12**	**12**	**12**
5.1 Complexity and Organization Used For Survival	4		4	4	4
5.2 Matter and Energy Flow in Living and Nonliving Systems	4		4	4	4
5.3 Earth Cycles Including Abiotic and Biotic Factors	4		4	4	4
Total Test	**57[1]**	**100%**	**57[1]**	**57[1]**	**57[1]**

(Please note this blueprint does not include items that may be field-tested.)

[1] Each test item aligns to both a Process Standard/Objective and a Content Standard/Objective, except for Safety Items which only align to P3.5.

- A minimum of 6 items is required to report a standard, and a minimum of 4 items is required to report results for an objective.

Oklahoma School Testing Program

ACE English II – Test Blueprint
School Years 2015-2016

The blueprint describes the content and structure of an assessment and defines the ideal number of test items and actual number of test items by standard and objective of the Oklahoma Academic Standards/ Oklahoma Academic Standards (PASS/OAS).

Standards and Objectives	Ideal Number of Items	Ideal Percentage of Items	Actual Number of Items Winter/Tri 2015	Actual Number of Items Spring 2016 Form A	Actual Number of Items Spring 2016For m B
READING/ LITERATURE					
1.0 Vocabulary	**6 - 8**	**9% - 12%**	**6**	**6**	**6**
2.0 Comprehension	**16 - 20**	**24% - 30%**	**17**	**17**	**18**
2.1 Literal Understanding	4 - 5		4	4	4
2.2 Inferences and Interpretation	4 - 5		4	5	5
2.3 Summary and Generalization	4 - 5		5	4	4
2.4 Analysis and Evaluation	4 - 5		4	4	5
3.0 Literature	**17 - 20**	**26% - 30%**	**19**	**19**	**18**
3.1 Literary Genres	4 - 5		5	5	4
3.2 Literary Elements	5 - 6		6	6	5
3.3 Figurative Language	4 - 5		4	4	5
3.4 Literary Works	4 - 5		4	4	4
4.0 Research and Information	**6**	**9%**	**6**	**6**	**6**
WRITING/GRAMMAR/USAGE/MECHANICS					
1.0 and 2.0 Writing	**1**	**9%**	**1**	**1**	**1**
Writing Prompt	1 (6 points)				
3.0 Grammar/Usage and Mechanics	**12**	**18%**	**12**	**12**	**12**
3.1 Standard Usage	4		4	4	4
3.2 Mechanics and Spelling	4		4	4	4
3.3 Sentence and Structure	4		4	4	4
Total Test	**61 (66 points)**	**100%**	**61**	**61**	**61**

(Please note this blueprint does not include items that may be field-tested.)

- A minimum of 6 items is required to report a standard, and a minimum of 4 items is required to report results for an objective.

Oklahoma School Testing Program

ACE English III– Test Blueprint
School Year 2015-2016

The blueprint describes the content and structure of an assessment and defines the ideal number of test items and actual number of test items by standard and objective of the Priority Academic Student Skills/ Oklahoma Academic Standards (PASS/OAS).

Standards and Objectives	Ideal Number of Items	Ideal Percentage of Items	Actual Number of Items Winter/Tri 2015	Actual Number of Items Spring 2016 Form A	Actual Number of Items Spring 2016 Form B
READING /LITERATURE					
1.0 Vocabulary	**6 - 8**	**8% - 11%**	**6**	**6**	**6**
2.0 Comprehension	**16 - 20**	**22% - 28%**	**18**	**17**	**17**
2.1 Literal Understanding	4 - 5		5	4	5
2.2 Inferences and Interpretation	4 - 5		4	4	4
2.3 Summary and Generalizations	4 - 5		5	5	4
2.4 Analysis and Evaluation	4 - 5		4	4	4
3.0 Literature	**17 - 20**	**24% - 28%**	**18**	**18**	**18**
3.1 Literary Genres	4 - 5		4	5	4
3.2 Literary Elements	5 - 6		5	5	5
3.3 Figurative Language	4 - 5		4	4	5
3.4 Literary Works	4 - 5		5	4	4
4.0 Research and Information	**6 - 7**	**8% - 10%**	**6**	**7**	**7**
WRITING/GRAMMAR/USAGE/MECHANICS					
1.0, 2.0 Writing	**1**	**14%**	**1**	**1**	**1**
Writing Prompt	1 (10 points)				
3.0 Grammar/Usage/Mechanics	**14**	**19%**	**14**	**14**	**14**
3.1 Standard English Usage	4 - 5		4	5	4
3.2 Mechanics and Spelling	0 - 2		2	1	2
3.3 Sentence Structure	4 - 5		4	4	4
3.4 Manuscript Conventions	4 – 5		4	4	4
Total Test	**63 (72 points)**	**100%**	**63**	**63**	**63**

(Please note this blueprint does not include items that may be field-tested.)

- A minimum of 6 items is required to report a standard, and a minimum of 4 items is required to report results for an objective.

Oklahoma School Testing Program
ACE Geometry EOI – Test Blueprint
School Year 2014-2015

The blueprint describes the content and structure of an assessment and defines the ideal number of test items and actual number of test items by standard and objective of the Priority Academic Student Skills/ Oklahoma Academic Standards (PASS/OAS).

Standards and Objectives	**Ideal Number of Items**	**Ideal Percentage of Items**	**Ideal Number of Items Winter/ Tri 2014**	**Ideal Number of Items Spring 2015 Form A**	**Ideal Number of Items Spring 2015 Form B**
1.0 Logical Reasoning	**6**	**11%**	**6**	**6**	**6**
1.1 Inductive and Deductive Reasoning	4		4	4	4
1.2 Conditional Statements	2		2	2	2
2.0 Properties of 2-Dimensional Figures	**20**	**36%**	**20**	**20**	**20**
2.2 Line and Angle Relationships	4		4	4	4
2.3 Polygons and Other Plane Figures	4		4	4	4
2.4 Similarity	4		4	4	4
2.5 Congruence	4		4	4	4
2.6 Circles	4		4	4	4
3.0 Triangles and Trigonometric Ratios	**12**	**22%**	**12**	**12**	**12**
3.1 Pythagorean Theorem	4		4	4	4
3.2 Right Triangle Relationships	4		4	4	4
3.3 Trigonometric Functions	4		4	4	4
4.0 Properties of 3-Dimensional Figures	**10**	**18%**	**10**	**10**	**10**
4.1 Polyhedra and Other Solids	6		6	6	6
4.2 Similarity	2		2	2	2
4.3 Models and Perspective	2		2	2	2
5.0 Coordinate Geometry	**7**	**13%**	**7**	**7**	**7**
5.1 Properties of Points, Segments, and Lines	4		4	4	4
5.2 Properties of Figures	3		3	3	3
Total Test	**55**	**100%**	**55**	**55**	**55**

(Please note this blueprint does not include items that may be field-tested.)

- A minimum of 6 items is required to report a standard, and a minimum of 4 items is required to report results for an objective.
- Percentages are approximations and may result in a sum other than 100 due to rounding.

Oklahoma School Testing Program
ACE U.S. History – Test Blueprint
School Years 2015-2016

The blueprint describes the content and structure of an assessment and defines the ideal number of test items and actual number of test items by standard and objective of the Oklahoma Academic Standards (OAS).

Standards and Objectives	Ideal Number of Items	Ideal Percentage of Items	Actual Number of Items Winter/Tri 2015	Actual Number of Items Spring 2016 Form A	Actual Number of Items Spring 2016 Form B
1.0 Transformation of the United States from Post-Reconstruction to the Progressive Era, 1878-1900	**8**	**13% - 15%**	**8**	**8**	8
1.1 Post Reconstruction Amendments	2 - 4		2	3	3
1.2 Immigration, Westward Movement, and Native American Experiences	2 - 4		3	3	3
1.3 Impact of Industrialization on Society, Economics, and Politics	2 - 4		3	2	2
2.0 Expanding Role of the United States in International Affairs	**6**	**10%**	**6**	**6**	**6**
3.0 Cycles of Economic Boom and Bust in the 1920s and 1930s	**8**	**13% - 15%**	**8**	**8**	**8**
3.1 Economic, Political, & Social Transformation Between the World Wars	3 - 5		4	4	4
3.2, 3.3 Economic Destabilization and the Great Depression/New Deal	3 - 5		4	4	4
4.0 Role of the U.S. in International Affairs and World War II, 1933-1946	**8**	**13% - 15%**	**8**	**8**	8
4.1 Mobilization for World War II	3 - 5		4	4	4
4.2, 4.3 World War II and U.S. Reaction to the Holocaust	3 - 5		4	4	4
5.0 U.S. Foreign and Domestic Policies during the Cold War, 1945- 1975	**18**	**30%**	**18**	**18**	**18**
5.1, 5.2 The Cold War - Foreign and Domestic	4 - 5		4	5	4
5.3 The Vietnam War Era	4 - 5		4	5	4
5.4 The African American Civil Rights Movement	4 - 6		6	4	6
5.5 Social Political Transformation	4 - 5		4	4	4
6.0 U.S. Foreign and Domestic Policies, 1976 to the Present	**12**	**20%**	**12**	**12**	**12**
6.1, 6.2, 6.3 End of the Cold War	4 - 8		6	5	6
6.4, 6.5, 6.6 Post Cold War World	4 - 8		6	7	6
Total Test	**60**	**100%**	**60**	**60**	**60**

(Please note this blueprint does not include items that may be field-tested.)

- A minimum of 6 items is required to report a standard, and a minimum of 4 items is required to report results for an objective.

APPENDIX D—PARTICIPATION RATES

Table D-1. 2015–16 OK EOI: Summary of Participation by Demographic Category—Algebra I

Description	Tested	
	Number	*Percent*
All Students	47,227	100.00
Female	23,375	49.49
Male	23,852	50.51
Hispanic or Latino	7,348	15.56
American Indian/Alaskan Native	7,006	14.83
Asian	1,047	2.22
Black/African American	4,269	9.04
Pacific Islander	132	0.28
White/Caucasian	23,927	50.66
Two or More Races	3,498	7.41
Economically Disadvantaged	26,595	56.31
Individual Education Program (IEP)	6,743	14.28
Plan 504	641	1.36
English Language Learners (ELL)	2,261	4.79

Table D-2. 2015–16 OK EOI: Summary of Participation by Demographic Category—Algebra II

Description	Tested	
	Number	*Percent*
All Students	29,729	100.00
Female	15,640	52.61
Male	14,089	47.39
Hispanic or Latino	4,547	15.29
American Indian/Alaskan Native	4,595	15.46
Asian	711	2.39
Black/African American	2,669	8.98
Pacific Islander	66	0.22
White/Caucasian	15,239	51.26
Two or More Races	1,902	6.40
Economically Disadvantaged	14,526	48.86
Individual Education Program (IEP)	2,459	8.27
Plan 504	413	1.39
English Language Learners (ELL)	564	1.90

Table D-3. 2015–16 OK EOI: Summary of Participation by Demographic Category—Biology

Description	Tested	
	Number	*Percent*
All Students	42,768	100.00
Female	21,198	49.57
Male	21,570	50.43
Hispanic or Latino	6,529	15.27
American Indian/Alaskan Native	6,298	14.73

continued

Description	Tested	
	Number	*Percent*
Asian	993	2.32
Black/African American	3,878	9.07
Pacific Islander	114	0.27
White/Caucasian	22,030	51.51
Two or More Races	2,926	6.84
Economically Disadvantaged	22,890	53.52
Individual Education Program (IEP)	5,756	13.46
Plan 504	619	1.45
English Language Learners (ELL)	1,542	3.61

Table D-4. 2015–16 OK EOI: Summary of Participation by Demographic Category—English II

Description	Tested	
	Number	*Percent*
All Students	43,600	100.00
Female	21,561	49.45
Male	22,039	50.55
Hispanic or Latino	6,304	14.46
American Indian/Alaskan Native	6,694	15.35
Asian	930	2.13
Black/African American	3,957	9.08
Pacific Islander	127	0.29
White/Caucasian	22,537	51.69
Two or More Races	3,051	7.00
Economically Disadvantaged	23,260	53.35
Individual Education Program (IEP)	6,189	14.19
Plan 504	657	1.51
English Language Learners (ELL)	1,277	2.93

Table D-5. 2015–16 OK EOI: Summary of Participation by Demographic Category—English III

Description	Tested	
	Number	*Percent*
All Students	32,694	100.00
Female	15,729	48.11
Male	16,965	51.89
Hispanic or Latino	4,684	14.33
American Indian/Alaskan Native	5,450	16.67
Asian	542	1.66
Black/African American	3,093	9.46
Pacific Islander	115	0.35
White/Caucasian	16,745	51.22
Two or More Races	2,065	6.32
Economically Disadvantaged	17,533	53.63
Individual Education Program (IEP)	4,991	15.27
Plan 504	432	1.32
English Language Learners (ELL)	834	2.55

Table D-6. 2015–16 OK EOI: Summary of Participation by Demographic Category—Geometry

Description	Tested	
	Number	*Percent*
All Students	39,108	100.00
Female	19,711	50.40
Male	19,397	49.60
Hispanic or Latino	5,998	15.34
American Indian/Alaskan Native	5,834	14.92
Asian	876	2.24
Black/African American	3,477	8.89
Pacific Islander	135	0.35
White/Caucasian	20,119	51.44
Two or More Races	2,669	6.82
Economically Disadvantaged	20,436	52.26
Individual Education Program (IEP)	4,662	11.92
Plan 504	540	1.38
English Language Learners (ELL)	1,159	2.96

Table D-7. 2015–16 OK EOI: Summary of Participation by Demographic Category—U.S. History

Description	Tested	
	Number	*Percent*
All Students	39,903	100.00
Female	19,731	49.45
Male	20,172	50.55
Hispanic or Latino	5,588	14.00
American Indian/Alaskan Native	6,054	15.17
Asian	908	2.28
Black/African American	3,600	9.02
Pacific Islander	130	0.33
White/Caucasian	20,955	52.51
Two or More Races	2,668	6.69
Economically Disadvantaged	19,924	49.93
Individual Education Program (IEP)	5,236	13.12
Plan 504	577	1.45
English Language Learners (ELL)	976	2.45

APPENDIX E—TEST ACCOMMODATIONS

OKLAHOMA SCHOOL TESTING PROGRAM (OSTP)

ACCOMMODATIONS *for* STUDENTS *with an* INDIVIDUALIZED EDUCATION PROGRAM (IEP) *or* SECTION 504 PLAN

GREAT SEAL OF THE STATE OF OKLAHOMA 1907

2016-2017

Table of Contents

Definition & Purpose of Oklahoma School Testing Program (OSTP) Accommodations

A test accommodation is a change in the way a test is administered or in the way a student responds to test questions. Similar to instructional accommodations, test accommodations are intended to offset the effects of a student's disability and to provide him/her with the opportunity to demonstrate knowledge and skills on statewide assessments.

Eligibility for OSTP Accommodations

The right of a student with a disability to receive allowable accommodations on OSTP tests is protected by both federal and state laws. The student's current IEP/504 plan must specify precisely which test accommodation(s) he/she will receive. In cases where an IEP/504 plan is under development, the school personnel responsible for writing the plan must have already met and agreed upon the necessary accommodation(s) before a student may be provided the accommodation(s).

A student who does not have a documented disability or is not served by a current IEP/504 plan is not eligible to receive accommodations on OSTP tests, except for Emergency Accommodation situations. Scribes may be provided for any student (with or without an IEP or Section 504 plan) who has a short-term medical condition that affects his/her physical dexterity which impedes his/her ability to respond to the assessment format.

Protocol for Emergency Accommodation on State Assessments

If prior to or during testing, the school principal (or designee) determines that a student requires an emergency accommodation (e.g., broken hand). **Form EA** must be completed and submitted to the District Test Coordinator (DTC) for approval. A copy of this form must be filed in the testing archives and a copy must be retained by the DTC at the central office.

Definition of Standard and Nonstandard OSTP Accommodations

For the purposes of the OSTP, a **standard accommodation** is defined as a change in the routine conditions under which students take OSTP tests that does not alter what the test is intended to measure. Standard accommodations are grouped into the following four categories:

- Setting; for example, administering the test in a small group or a separate setting
- Timing or scheduling of the test; for example, administering the test in short intervals or at a specific time of day
- Presentation; for example, using a large-print or Braille edition of the test
- Response; for example, dictating responses to a scribe

For the purposes of the OSTP, a **nonstandard accommodation** is defined as an accommodation that is needed for the student to access the assessment but not included on the allowable list of accommodations and requires OSDE approval for use on OSTP tests.

General Requirements for the Use of Standard and Nonstandard Accommodations

All accommodations require adherence to test security protocols, including the presence of both a Test Administrator and a Test Proctor during periods requiring access to secure testing materials (e.g., human read-aloud). IEP teams must reconvene annually in order to determine which accommodations will be needed and to document any changes to accommodations. If the IEP/504 team believes that a test accommodation listed in the student's IEP/504 plan should be removed because it is no longer necessary and appropriate for the student, the team must amend the plan accordingly prior to testing. If a **nonstandard accommodation** will be provided, the student meets all of the eligibility criteria for that accommodation and has been submitted for consideration and received approval from the Oklahoma State Department of Education. The use of accommodations is based on the individual needs of a student with a disability and may only be provided when **ALL** of the following conditions have been met:

1. The student has a disability that is documented in a current IEP/504 plan.

2. The student uses the **accommodation routinely** (with rare exceptions) during classroom instruction and assessment in the subject, both before and after the OSTP test is administered. However, use of a **nonstandard accommodation** during instruction does not necessarily qualify a student to receive the same nonstandard accommodation during OSTP testing; the student must meet additional eligibility requirements to receive a nonstandard accommodation on an OSTP test.

3. The accommodation is documented on the Assessment page of the student's current IEP/504 Plan.

4. The student requires the accommodation in order to participate in OSTP testing.

5. The accommodation is listed as a current accommodation in this appendix (or, prior to testing, the district or school has consulted with the OSDE and received permission to use a unique accommodation not included in this appendix).

Accommodations **may not:**

1) Alter, explain, simplify, paraphrase, or eliminate any test question, reading passage, writing prompt, or multiple-choice answer option;

2) Provide verbal or other clues or suggestions that hint at or give away the correct response to the student;

3) Contradict test administration requirements or result in the violation of test security; for example,
   - Test questions may not be modified, reordered, or reformatted in any way for any student;
   - Tests may not be photocopied, enlarged, altered, or duplicated;
   - English-language dictionaries are not allowed for any student on any test.

If the above five conditions have been met and the IEP/504 team determines an accommodation is necessary, then it must be provided to the student during OSTP testing. If an accommodation is provided that does not meet the conditions stated above, the student's test score may be invalidated. If a student refuses an accommodation listed in his/her plan, the accommodation must be offered and remain available to the student during testing. The school may want to document in writing that the student refused the accommodation and keep this documentation on file at the school. Students should never be asked to sign an agreement waiving their right to receive an accommodation. Accommodations used by the student must be indicated on the student's answer booklet and/or personal information profile (online).

Test Formatting Options	Paper	Online
3-5 ELA/Math/Grade 5 Science	X	
6-8 ELA/Math/Grade 8 Science		X
Grade 10 ELA/Math/Science + U.S. History		X
Braille Tests	X	
Large Print tests may be provided in paper format for Online tests.	*	*

Paper & Pencil Test Formats

IEP/504 teams are encouraged to provide students with disabilities the same test formats provided to their non-disabled peers based on the test formatting options listed above. IEP/504 teams should base their decision upon individualized, objective evidence to determine whether or not a student is able to access a computer-based test. Students unable to access an OSTP computer-based test must also receive classroom assessments, benchmark assessments, and districtwide assessments in this manner. Consequently, a student on an IEP/504 Plan does not automatically receive paper & pencil test formats. Blanket policies predetermining specific accommodations for students with disabilities are not in accordance with the Individuals with Disabilities Education Act (IDEA) and Section 504 of the Rehabilitation Act of 1973.

OSTP Standard Accommodations

I. Setting/Timing/Schedule	Procedures & Guidance
S1. Individual testing	This accommodation is required for many presentation or response accommodations. This accommodation is intended to reduce student distractions. Students must be actively monitored and may use a testing carrel or test in a special education resource room or other location that maintains test security.
S2. Small group testing (**8-10 maximum**)	This accommodation is intended to reduce student distractions and may be required for certain accommodations. Students must be actively monitored and may use a testing carrel or test in a special education resource room or other location that maintains test security. **Students should be tested with their non-disabled peers to the greatest extent possible.**
S3. Preferential seating	Students may need to sit close to the front of the room so they can see or hear more easily, increase physical access, or have access to special equipment.
S4. Separate location **(No limit on number of students)**	This accommodation is intended to reduce student distractions. Students may use a testing carrel, test in a special education resource room, or other location that maintains test security.
S5. Provide special lighting	Specify type (e.g., 75 Watt incandescent, light box, etc.)
S6. Provide adaptive or special furniture	Students may need accommodations to provide better access (e.g., slant board, stander, etc.)
T1. Flexible schedule same day **Student test book(s) must be secured between sessions.**	Students are scheduled to allow for the best conditions/ timing for their performance, and/or may be allowed to take the test during more than one sitting during a single day. Students are not allowed to study for or discuss tests between sessions. This is not intended for lunch or recess breaks. **(S4)** must be selected for this accommodation.
T2. Administer test over several sessions or "chunking" (except writing tasks/sections). **Student test books must be secured between sessions.**	The test may be separated into smaller sections and administered over several days within the state testing window. Student may only work in one separated section at a time and may not go to previous sections or work ahead. **(S4)** must be selected for this accommodation.
T3. Allow frequent breaks during one test session **(maximum 10-15 minute duration)** **Student test book(s) must be secured during the break(s).**	Students must be monitored during breaks and may not study for or discuss the test during these breaks or view/change previously answered questions after a break. **This accommodation is not intended for lunch or recess breaks—students must complete a Section before being dismissed.**

OSTP Accommodations for Students with an IEP or 504 Plan

II. Presentation	Procedures & Guidance
P1. Alternate Formats a. Large-Print Version (Instructions provided within kits.) b. Contracted Braille Version (Instructions provided within kits.) c. Large-print through Online Testing Client (Vector-based Magnification)	The Test Administrator must transcribe student answers verbatim into the standard answer document/test book that was provided in the large-print (paper/pencil) or Braille kit. Braille test formats will be provided on paper using contracted Braille and Nemeth code for numbers and formulas. Large print formats may be configured in the online testing client for certain assessments.
P2. Reverse Color Contrast	Students who have a visual impairment may require this to access the computer screen. This accommodation option must be selected in the online testing client student profile.
P3. Use of assistive technology (AT) devices or supports: e.g., color overlays, magnifier, pencil grips, auditory amplification devices, noise buffers, slant board, wedge for positioning, and multiplication table/chart.	The specific device or support should be specified in the IEP/504 Plan, be routinely used by the student, and not alter the construct being measured. **(S1, S2, or S4)** may be appropriate for this accommodation as some AT devices may be distracting to other students.
P4. Text-to-Speech, Human Reader, or Sign Language Interpretation a. Text-to-Speech is built into the online testing client, requires the use of ear phones, and may be administered individually, small groups, or regular setting. b. Human Reader reads test directions, test items, and answer choices and must log the test booklet serial number on the Nondisclosure agreement (NDA). This is limited to small group or individualized testing. c. Sign Language Interpretation may be accomplished by using a separate test booklet in a separate location. Please refer to the Human Reader directions on pages 13-14.	**P4 applies to Math, Science, US History, and Grades 5, 8, and 10 ELA <u>writing/constructed response</u> sections only.** <u>Online tests</u> have built in Text-to-Speech functionality **(must be selected in online testing client)**. Ear phones are required. Students may test with nondisabled peers. However, if a Human Reader is required for the student, then the test must be read from the computer screen verbatim. **(S1 or S2)** is required when utilizing a Human Reader for Online Only tests. <u>Paper tests</u> **<u>(test forms must be the same)</u>** are read by a Human Reader. Test Administrator uses separate test booklet or reads over a student's shoulder and must log the test booklet serial number on the Nondisclosure agreement (NDA). Small group testing (**S2: 8-10 maximum**) is required and test forms must be the same. **Students may request items be read more than once.**
P5. Use of Secure Braille Note-taker (students with a visual impairment)	An electronic note-taker, which may have a Braille or QWERTY-type keyboard, is an adaptive device similar to a PDA. This device may have built-in speech output and/or a refreshable Braille display. **(S1 or S2)** must be selected for this accommodation.

P6. Simplification/repetition/signage of directions	Student may ask for clarification, simplification, signage of directions. This does not include test questions or answer choices. Students may have directions reread for each page of questions.
P7. Turn off Universal Tools/Accessibility Features	Disable any tools that may be distracting to a student, or a student does not need to use, or that the student may be unable to use.
P8. Use of an Abacus.	Students who have a visual impairment/blindness or access mathematical calculations tactilely may use an abacus.
P9. Use of a calculator on Grades 3–5 Mathematics. See Calculator Requirements on pages 11-12	A four-function calculator may be used. Calculators with Computer Algebra Systems are prohibited.
P10. Provide cues (arrows, stop signs) on answer form	This applies to Paper Only tests. Cues may not clue a student to a correct or incorrect answer.
P11. Use masking or templates to reduce the amount of visible print.	Masking involves blocking off content that is distracting to the student. Students are able to focus their attention on a specific part of a test item by masking. This feature is built into the online testing client.
P12. Secure paper to work area with tape or magnets.	This applies to Paper Only tests. Please be cautious when adhering tape to the test booklet or answer document by avoiding the tracking marks (black bars) for the scoring process.
P13. Student may read the test aloud or sign the test to himself or herself.	This requires individual testing and non-disclosure forms signed by Test Administrator/Test Proctor. **(S1)** must be selected for this accommodation.
P14. Placeholders, templates, or markers to maintain place	This applies to Paper Only tests.
P15. Audio Calculator	This requires ear phones for group testing. A non-embedded calculator for students needing a special calculator, such as a Braille calculator or a talking calculator, is currently unavailable within the online assessment platform. **(S1, S2, or S4)** may be appropriate for this accommodation.
P16. Paper & Pencil Test Please see Paper & Pencil Test Format guidelines on page 4.	Students unable to access an OSTP computer-based test must also receive classroom assessments, benchmark assessments, and districtwide assessments in this manner. Consequently, a student on an IEP/504 Plan does not automatically receive a paper & pencil test format.

III. Response	Procedures & Guidance
R1. Student marks answers in test book and not on an answer document for later transfer by a Test Administrator to an answer document.	The Test Administrator with the Test Proctor present must transcribe answers verbatim into the standard answer document. **Does not apply to Grade 3 tests.** This accommodation applies to Paper Only tests.
R2. Human Scribe ELA, Mathematics, Science, Social Studies: a. Student dictates response to a scribe who records responses on an answer document or through the Online Testing Client by Test Administrator or Proctor. b. Student signs response to a scribe who records responses on an answer document or through the Online Testing Client by Test Administrator or Proctor. c. Student tapes or records response for a writing portion of the test for verbatim transcription by Test Administrator or Proctor. Please see Scribe Instructions and Guidelines on pages 16-19.	A scribe is a Test Administrator or Proctor who writes down what a student dictates by speech or through an assistive technology communication device. Signed Nondisclosure Agreements (NDAs) are required for both Test Administrator and Proctor. Students who have documented significant motor or processing difficulties that make it difficult to produce responses may need to dictate their responses to a human, who then records the students' responses verbatim. The use of this support may result in the student needing additional overall time to complete the assessment. **The guiding principle in scribing is to assist the student in accessing the test and responding to it.** **(S1)** must be selected for this accommodation.
R3. Use computer or other assistive technology device to respond. a. Student utilizes an electronic input device without the "help" features, such as spell check, an electronic dictionary, a thesaurus, or access to the Internet. Please see Scribe Instructions and Guidelines on pages 16-19.	Students may use a computer, typewriter, or other assistive technology device to respond. This may include software dictation or dictation devices the student uses during routine instruction. Extended written responses must be printed off for transcription. Return the original typed student response for secure materials submission. The Test Administrator must transcribe words verbatim into an answer document/test book or Online Testing Client. The electronic responses or recordings must be destroyed or erased by District Test Coordinator. **(S1 or S2)** must be selected for this accommodation.
R4. Test Administrator monitors placement of student responses on the answer document or the online testing client.	Test Administrator may redirect students. Students may not be directed to correct or incorrect answers in any way.
R5. Brailler/Secure, Braille Note-taker/Abacus (students with a visual impairment)	The Test Administrator must transcribe answers verbatim into the standard answer document/test book that was provided in the large-print (paper/pencil) or Braille kit. **(S1, S2, or S4)** must be selected for this accommodation.

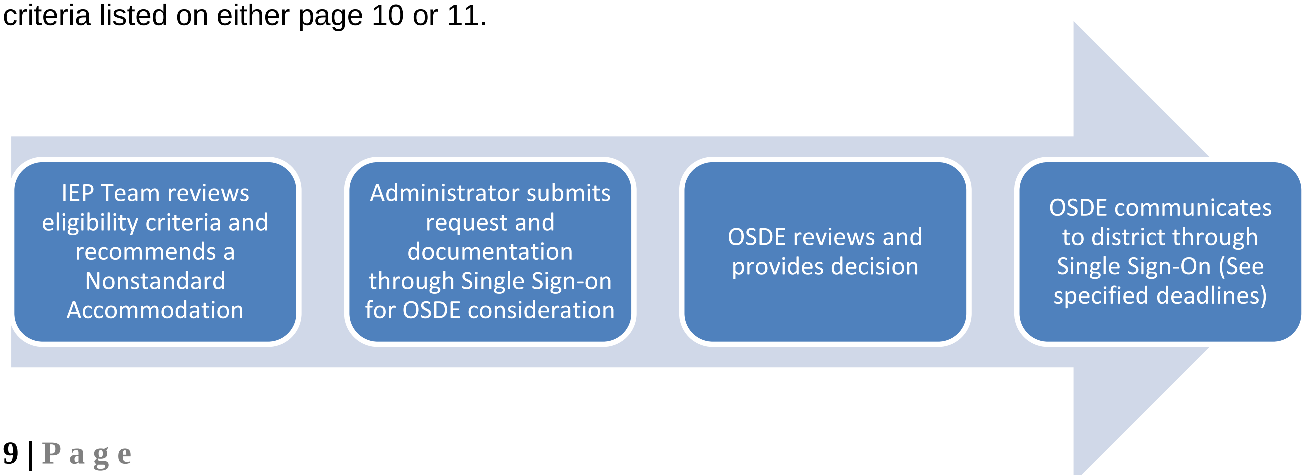
Requirements for the Use of Nonstandard Accommodations

IEP and 504 teams may request the use of one or more of the following OSTP nonstandard accommodations (ELA Read-Aloud or Unique Accommodation) only when all of the criteria are met, as described on either page 10 or 11. The decision to use a nonstandard accommodation is recommended by the IEP/504 team based on the nonstandard accommodation eligibility criteria. Nonstandard accommodations for use on OSTP tests must be approved by the OSDE. The nonstandard accommodation can only be provided to a student with a disability on an OSTP test when it is documented on the Assessment page in a current IEP or listed in the student's 504 plan specifically as an OSTP accommodation. Once OSDE approves the accommodation, this documentation may be addressed through an IEP meeting or an IEP amendment. Use of a nonstandard accommodation during instruction does not necessarily qualify a student to receive the same nonstandard accommodation on an OSTP test.

The **ELA Test Read-Aloud accommodation (NS1)** request may only be submitted when <u>all</u> three prongs of the eligibility requirements are met as described on page 10. The **OSTP ELA Test Read-Aloud Protocol** will be used by the IEP/504 team to document all three prongs, including submission of any documents or evaluations to the OSDE. The information from this protocol must be submitted through the Nonstandard Accommodation Application located on the Single Sign-on Website for consideration by the OSDE.

A **Unique Accommodation (NS 2)** is an accommodation that requires changes or alterations to the test materials/booklet or media presentation. The unique accommodation must be one that is regularly used by the student for classroom instruction, must be on the student's IEP, and must not alter the underlying content of the assessment. The unique accommodation request must be submitted through the Nonstandard Accommodation Tool located on the Single Sign-on Website for consideration by the OSDE. Please refer to page 11 & **Form U**, Unique Accommodation (NS2), for specific requirements.

IEP and 504 teams are encouraged to make consistent, defensible, and appropriate decisions for each student and to amend the IEPs and 504 plans of students who do not meet the nonstandard accommodation eligibility criteria. The OSDE will continue to review the number of students with disabilities who receive nonstandard accommodations in each district. Nonstandard accommodation requests must be approved by the OSDE before a student may use the accommodation on a state test. The use of a nonstandard accommodation on the OSTP without OSDE approval may result in a testing invalidation. Please do not submit a request if the student does not meet the specific eligibility criteria listed on either page 10 or 11.



OSTP Nonstandard Accommodations

IV. ELA Read-Aloud*	Eligibility Requirements
NS1. Text-to-Speech, Human Reader, or Sign Language Interpretation Accommodations for the English Language Arts Assessments. a. Text-to-Speech is built into the testing client and requires the use of ear phones and may be administered individually or small group (preferred method). b. Human Reader reads test directions, test items, and answer choices from separate test booklet and must log the test booklet serial number on the Nondisclosure Agreement (NDA). This is limited to small group or individualized testing c. Sign Language Interpretation may be accomplished by using a separate test booklet. Test directions, test items, and answer choices may be read verbatim. Refer to test formatting options. Students may request items be read more than once. **<u>Due Date for Requests:</u>** Requests must be submitted to the OSDE through the Nonstandard Accommodations on the SDE Single Sign-on by February 1st for the Spring testing window and responses will be provided on a case-by-case basis no later than March 15th. ***Score reports for students receiving a read-aloud on an ELA/Reading test will indicate the student received this nonstandard accommodation.**	This accommodation must be determined by the following 3-pronged approach: 1. The student has a specific disability that severely limits or prevents him/her from decoding printed text at any level of difficulty, even after varied and repeated attempts to teach the student to do so (i.e., the student is a non-reader, not simply reading below grade level); **<u>and</u>** 2. The student can only access printed materials through a screen reader (assistive technology) or human reader and/or is provided with spoken text on audiotape, CD, video, or other electronic format during routine instruction (includes Sign Language Interpretation), except while the student is actually being taught to decode; **<u>and</u>** 3. The IEP/504 team will utilize and provide the required documentation from the **OSTP ELA Test Read-Aloud Protocol**, which includes the use of the Protocol for Accommodations in Reading (PAR) or the AEM Navigator for deaf or blind students. This documentation must be uploaded into the Nonstandard Accommodation Single Sign-on Application for consideration by the OSDE. <u>Paper tests</u> are read by a Human Reader. **(S1 or S2)** is required and test forms must be the same. <u>Online tests</u> have built in Text-to-Speech functionality. This is the preferred method for providing read aloud to students. However, if a human reader is required for the student, then the test must be read from the computer screen verbatim. **(S1, S2, or S4)** is required. **The request will be submitted annually through the Nonstandard Accommodation Tool Single Sign-on application.**

OSTP Accommodations for Students with an IEP or 504 Plan

NS2. Unique Accommodations	A request may be made (pursuant to the IEP/504 team's determination) for a unique accommodation utilizing **Form U** for a student with a disability on any specified subject area(s) of the OSTP.
Students with disabilities who have IEPs/504 plans are eligible for consideration for unique accommodations on state assessments (e.g., allow projection of test for students receiving the Sign Language Interpretation accommodation in small groups, manipulatives, etc.). A unique accommodation is an accommodation that requires changes or alterations to the test materials/ booklet or media presentation. The unique accommodation must be one that is regularly used by the student for classroom instruction, must be on the student's IEP, and must not alter the underlying content of the assessment.	The **Form U** must be submitted: • Due to the student's need for an accommodation that would enable the student to access the state assessment. • Through the Nonstandard Accommodation Tool Single Sign-on Application. • With completed student information and any other requested information. **The requested accommodation must not impact the reliability or validity of the test and the request may not exempt a student from taking any portion of the OSTP test(s).**

Calculator Requirements

The items on the Grades 6-8 and Grade 10 Math and Science assessments are designed so that calculators are not required to solve any of the problems. However, certain tasks are more difficult if a calculator is not available.

Before the first day of the test, students using a calculator for any Grades 6-8 and Grade 10 Math and Science assessments should be familiar with the use of the specific calculator that will be utilized. Students must be instructed in the use of calculators; otherwise, it may hinder students' performance on the assessment.

Subject-Specific Requirements

- Grades 3-5 Math:
  - Calculators are only allowed as an approved accommodation for students on an IEP/ 504 Plan and only a basic four-function calculator with square root and percent may be used.
- Grades 6-7 Math:
  - ***All Students***: Basic four-function calculator with square root and percent.
- Grade 8 Math and Science:
  - ***All Students***: Scientific Calculators meeting general requirements.
- Grade 10 Math and Science:
  - ***All Students***: Graphing Calculators and/or scientific calculators meeting general requirements.

General Requirements

- Calculators are permitted but are not required.
- Calculator capabilities described for a specific subject give the maximum capabilities allowed; calculators with less capability are acceptable.
- Students may not share calculators.
- Students may use their own calculators or those provided by the school.
- Calculators that make noise must have the sound feature turned off.
- Calculators that have paper tape must have the tape removed.
- All calculators must have the memory cleared before and after the test session.
- Any programs or applications must be removed prior to the test session.

Prohibited Calculators

- Pocket organizers
- Handheld or laptop computers
- Electronic writing pads or pen-input devices
- Calculators built into cellular phones, smart watches, tablets or other electronic communication devices
- Calculators with a typewriter keypad (QWERTY format)
- Calculators with programs or applications that cannot be removed or disabled (e.g., Polynomial Root-Finder and Simultaneous Equation Solver on TI-86)
- Calculators with built-in computer algebra systems (CAS), such as, but not limited to:
  - Casio: Algebra fx 2.0, ClassPad 300, and all model numbers that begin with CFX-9970G
  - Texas Instruments: All model numbers that begin with TI-89 or TI-92, TI-Nspire CAS
  - Hewlett-Packard: HP-48GII and all model numbers that begin with HP-40G or HP-49G

Test Security and Validity

Using a calculator that does not meet the above requirements invalidates the test results and is a violation of test security and test validity. Any violation will be reported to the State Superintendent and may result in revocation of teaching and/or administrative certificates.

Protocol for Human Readers Providing Verbatim Read-Aloud Test Accommodations

A Test Administrator (human reader) who provides the verbatim reading accommodation to a student must comply with the following procedures when working with a student in a testing situation:

- Human Reader: A state certified educator who reads orally to a student.
- All Human Readers must receive Test Administrator training by the local district and the district must retain documentation, which may be requested by the OSDE at any time.
- **A test proctor who is employed by the school district is required**. Small group (8-10 maximum) or individual testing required.
- Human Readers must sign the Test Administrator Test Security Form and a Non-Disclosure agreement form (NDA).
- Human Readers must read from the computer screen for online test formats or from a separate test booklet or over the student's shoulder for paper/pencil formats (log test booklet serial number on NDA)
- Students without the verbatim read-aloud accommodation should not be tested in the same location as students with the verbatim read-aloud accommodation.
- If students are taking the paper test, the students grouped together must have the **same paper test form.**

Verbatim Read-Aloud Procedures for Human Reader Accommodators

To ensure uniformity in presentation of standardized tests in Oklahoma, **built-in Text-to-Speech software on the secure online testing client** should be used whenever possible. Human readers must follow the procedures outlined below:

1. Human readers must read, verbatim (word-for-word), only the words in the test book or on the computer screen, without changing or adding words, or otherwise assisting the test-taker in any way to influence the test taker's selection of a response.
2. Human readers must speak in a clear and consistent voice throughout the test administration, using correct pronunciation.
3. Human readers may not clarify, elaborate, or provide assistance to students.
4. Human readers must give special emphasis only to words printed in boldface, italics, or capitals and tell the test-taker that the words are printed in that way. No other emphasis or special vocal inflection is permissible. Readers should use even inflection so that the student does not receive any cues by the way the information is read.
5. Human readers must be patient and understand that the test-taker may need to have test items repeated several times.

6. Human readers must not attempt to solve problems or determine the correct answer to an item while reading as this may result in an unconscious pause or change in inflection which could be misleading to the test-taker.

7. Human readers must maintain a neutral facial expression and must not smile or frown which may be interpreted by the test-taker as approval or disapproval of the student's answers.

8. Human readers must recognize that test-takers who are blind or who have low vision may also have additional special tools or equipment (e.g., abacus, brailler, slate, stylus) that have been approved for use during the test.

9. Human readers must be familiar with the student's IEP/504 Plan and know in advance the exact type of verbatim reading accommodation required by the student. The test-taker may require all or portions of the test to be read aloud, depending on his or her particular set of accommodations.

10. If a human reader finds an unfamiliar word or one that he or she is not sure how to pronounce, advise the test-taker of the uncertainty about the word and spell the word.

11. When reading a word that is pronounced like another word with a different spelling, if there is any doubt about which word is intended, readers must spell the word after pronouncing it.

12. Human readers must spell any words requested by the test-taker.

13. When reading passages, readers must be alert to all punctuation marks. Human readers may read the passage through once so that the test-taker can grasp the content of the passage. Some test-takers may ask for the passage to be read through a second time with punctuation marks indicated. When required or asked to read with punctuation, specific lines within a passage indicate all punctuation found within those lines.

14. When test items refer to particular lines of a passage, reread the lines before reading the question and answer choices. For example, a human reader might say, "Question X refers to the following lines…" Reading the lines referred to would then be followed by reading question X and its response options.

15. When reading selected response items, readers must be particularly careful to give equal stress to each response option and to read all of them before waiting for a response. The test-taker will record the answer or provide the answer to the test scribe, who will record it for the test-taker.

16. If a human reader is also serving as a scribe, and if the test-taker designates a response choice by letter only ("D", for example), the human reader must ask the test-taker if he/she would like the complete response be reread before the answer is recorded.

17. If the test-taker chooses an answer before the reader has read all the answer choices, the human reader must ask if the test-taker wants the other response options to be read.

18. After a human reader finishes reading a test item, the human reader must allow the test-taker to pause before responding. However, if the test-taker pauses for a considerable time following the reading of the answer choices, say: “Do you want me to read the question again...or any part of it?” In rereading questions, readers must be careful to avoid any special emphasis on words not emphasized in the printed copy by italics or capital letters.

Special Guidelines for Reading, Mathematics, and Science Content

Mathematical expressions and science vocabulary must be read precisely and carefully to avoid misrepresentation. For mathematics items involving algebraic expressions or other mathematical notation, it may be preferable for the reader to silently read the entire question before reading it aloud to the test-taker. Use technically correct yet simple terms, and be consistent in the treatment of similar expressions.

Sign Language Interpreters

Test-takers who are deaf or hard of hearing may require the services of an interpreter. The interpreter typically provides support to the student in understanding test instructions that would normally be read aloud to all students.

1. Discussions with the interpreter on testing procedures should be conducted with the test-taker present before (and not during) the test session.

2. Before the session, the interpreter must become familiar with the test instructions and the terminology used in the test that he or she will be interpreting.

3. An interpreter always lags a few words or phrases behind the person who is speaking. Allow short pauses for the test-taker to respond or to ask questions.

4. As the test administrator, remember to speak directly to the test-taker even when an interpreter is present.

5. Courtesy requires that test examiners not say things to the interpreter that they do not want repeated to the test taker. (For example, do not ask the interpreter’s opinion about the test taker or the situation.)

6. An interpreter may also provide a verbatim read-aloud accommodation for students who require this accommodation, as listed in the student’s IEP/504 plan.

Procedures for Scribing and Student Responses

Overview

A scribe is a Test Administrator or Proctor who writes down what a student dictates by speech, or through an assistive technology communication device. The guiding principle in scribing is to assist the student in accessing the test and responding to it. **Alterations or changes to an OSTP tests are not allowed and will result in test invalidation.** Any variation in the assessment environment or process that fundamentally alters what the test measures or affects the comparability of scores is considered a modification.

A scribe must be currently employed educator/paraprofessional, must be familiar with scribing, and must have been trained as a Test Administrator or Proctor, and must have on file a signed Non-Disclosure (NDA) Form (See Test Preparation Manual). Individuals who serve as scribes need to be carefully prepared to ensure that they know the vocabulary involved and understand the boundaries of the assistance to be provided.

Scribes must be impartial and experienced in transcription. It is preferable for the scribe to be a familiar person, such as the teacher who is typically responsible for scribing during regular instruction. Scribes will review the test security procedures and will sign all statements required of Test Administrators/Proctors.

Scribes must fulfill the following duties:

- Sign a test security form acknowledging that they will ensure that the content of the written responses directly represents the independent work of the student.
- Sign a Nondisclosure Agreement (NDA) form.
- List the names and enrollment grades of the students whose responses were transcribed and send the form to the building test coordinator upon completion.
- Demonstrate proficiency in signing (ASL and/or signed English) if serving as both the interpreter and scribe.
- Test in a location where other examinees are not able to hear or see other students' responses.
- Remain silent while students are dictating or signing.
- Ask students to repeat a word or phrase for understanding when needed.
- Indicate when he/she was unable to understand the student's oral or signed response.
- Record the interpreter's response.

Produce legible text so that the written portion of the test can be scored.

- When transcribing from a handwritten or word-processed response, record punctuation, capitalization, and spelling as provided by the student.

Refrain from

- Communicating verbally or nonverbally whether the response is correct or incorrect
- Prompting the student in any way that would result in a better response or essay
- Influencing the student's response in any way
- Editing student work or completing a student's incomplete essay
- Discussing the student's essay with the student or any other person

Scribing Multiple-Choice Questions

The scribe should confirm the student's response before recording the student's answer on the score sheet or entering the student's response into the secure online testing client. If the scribe cannot understand a student's pattern of speech, or it is barely audible, large cards, each indicating one of the response options (e.g., A-D), can be used. The student can then choose the card that indicates the student's desired response to the multiple-choice question.

Scribing Constructed/Extended-Response Questions (Writing Tasks)

The scribe should determine the preferred mode of recording the student's response ***before*** the date of the test. At testing time, the student may then dictate the constructed/extended response directly to a scribe. A student with disabilities must be given the same opportunity as other students to plan, draft, and revise the constructed/extended response. The scribe's responsibility is to be both accurate and fair, neither diminishing the fluency of the student's response nor helping to improve or alter what the student asks to be recorded. This means that the scribe may write an outline or other plan as directed by the student. For Online Only tests, transcribing involves the transfer of a student's written response into the secure testing client.

The student does not have to specify repeatedly spelling and language conventions once the student has demonstrated knowledge and skills in the use of these spelling and language conventions. The scribe may apply these conventions automatically. Examples include the following:

- Once a student has demonstrated the knowledge of indicating the beginning of sentences with a capital letter, the student does not need to specify this throughout the remainder of the constructed/extended response. That is, scribes can automatically capitalize the first letter in the beginning of a sentence if the student has indicated punctuation ending the previous sentence. If the student has not indicated punctuation ending the previous sentence and says, "The dog ran. The dog jumped," the scribe would write "the dog ran the dog jumped".

- Homonyms and often-confused words such as "to," "two," and "too," or "there," "their," and "they're," or "than" and "then" should be spelled by the student each time they are used.

Scribing Procedures

To maintain the student's fluency of thought and to allow the student to demonstrate the requisite knowledge and skill in English-language arts conventions, the scribe should adhere to the following process:

1. The student dictates the response without interruption directly to the scribe or electronic recording device.

    a. Students may punctuate as they dictate. For example, when stating the sentence "The cat ran.", the student may say, "The cat ran period."

    b. Students may dictate more than one sentence at a time and add punctuation after the fact, when given the scribed sentences to proofread.

    c. The scribe transcribes a draft of the student's response exactly as dictated without including any conventions other than spelling. Probing or clarifying questions are not allowed except in the case of classifiers for students using ASL. Scribes may not question or correct student choices. Scribes may draw a diagram or a picture described by the student if the student is unable to draw the diagram or picture.

2. The scribe reads the draft to the student without vocal inflection that would indicate punctuation or alert the student to possible mistakes.

3. The student then provides letter-by-letter spelling for each word in the response that the scribe has determined must be spelled by the student. The scribe edits the draft of the constructed/extended response as spelled by the student.

4. The student views the draft and/or listens to the scribe as the scribe reads the draft of the constructed/extended response (i.e., written transcription). Students MUST be given the opportunity to review their responses in the way that the student prefers:

    a. Scribes may read back the dictation for proofreading to the student; or

    b. Students may review the written or typed response on paper or on the computer screen after having indicated word-for-word spelling according to these guidelines.

5. The student indicates additional edits to the scribe, including but not limited to paragraph structure, capitalization (for proper nouns, acronyms, and so forth), wording, spelling, or punctuation. The scribe will make those changes exactly as dictated by student, even if incorrect.

6. The scribe records the final written response. Scribes may handwrite (there is no penalty for cross-outs and insertions), type, or use a laptop to record the student's work. If the scribe types and prints out the student's responses, the responses need to be transcribed into the response booklet for paper based tests or typed directly into the secure testing client for online tests. The transcriber must copy the student's marks or responses exactly as he/she has written—including all errors in grammar, mechanics, spelling, etc.

    If necessary, proofread the student essay with another scribe before word processing the student response.

    - ✓ For an accuracy check, scribes may record the session on audio or videotape for play back.
    - ✓ Corrections of exclusively Braille errors will be at the discretion of the Scribe. Braille errors are those errors that occur specifically to that population due to recording medium. An example could be the result of the physical typing on a Braille machine, such as typing an 'f' as opposed to the intended 'd' due to finger misplacement. The transcriber has the option to verify student response with another examiner trained in Braille.
    - ✓ To increase accuracy, it is advisable to have one person reading the student's responses, as another transcribes them to the test booklet. The persons then switch roles to check the transcription. Transcriptions must take place in a secure environment and, whenever possible, under the direction of the building test coordinator. Please note that all test material—including the test booklet the student originally used—must be returned to the testing vendor.
    - ✓ Collect scratch paper, rough drafts, and login information immediately at the end of the testing session. These items are considered secure material and must be collected and shredded by the building testing coordinator at the end of the testing session.

Oklahoma Alternate Assessment Program (OAAP)

Oklahoma has developed the Oklahoma Alternate Assessment Program (OAAP) in order to to provide an appropriate assessment for students with the most significant cognitive disabilities. The Every Student Succeeds Act (ESSA) language identifies that only 1% of the total tested population can take the alternate assessment. The Criteria Checklist is intended to assist IEP teams in determining whether a student should participate in the regular assessment, with or without accommodations, or in an alternate assessment and to address documentation requirements under IDEA. For additional information on the OAAP, visit **http://ok.gov/sde/assessment** or contact the Special Education Office at (405) 521-3351.

Supporting Documents

OSTP ELA/Reading Test Read-Aloud Protocol

Form EA (Emergency Accommodation)

Form U (Unique Accommodation)

APPENDIX F—ACCOMMODATION FREQUENCIES

Table F-1. 2015–16 OK EOI: Numbers of Students Tested With Accommodations by Accommodation Type and Grade—Algebra I

Accommodation Code	HS
AccomClarification	0
AccomColorContrast	208
AccomDictionary	0
AccomGeneralMasking	203
AccomGrouping	0
AccomMagnification	207
AccomPresentation	0
AccomReadAloud	2,676
AccomReadAloudIEP	59
AccomReadAloudReading	0
AccomResponse	0
AccomSetting	0
AccomTiming	0
AccomTranscribe	0
AccomTranslator	0
AccomTurnoffUniversal	22
ELLWithAccoms	460
IEPWithAccoms	2,727
Plan504WithAccoms	68

Table F-2. 2015–16 OK EOI: Numbers of Students Tested With Accommodations by Accommodation Type and Grade—Algebra II

Accommodation Code	HS
AccomClarification	0
AccomColorContrast	91
AccomDictionary	0
AccomGeneralMasking	88
AccomGrouping	0
AccomMagnification	91
AccomPresentation	0
AccomReadAloud	766
AccomReadAloudIEP	31
AccomReadAloudReading	0
AccomResponse	0
AccomSetting	0
AccomTiming	0
AccomTranscribe	0
AccomTranslator	0
AccomTurnoffUniversal	8
ELLWithAccoms	76
IEPWithAccoms	836
Plan504WithAccoms	40

Table F-3. 2015–16 OK EOI: Numbers of Students Tested With Accommodations by Accommodation Type and Grade—Biology

Accommodation Code	HS
AccomClarification	0
AccomColorContrast	190
AccomDictionary	0
AccomGeneralMasking	171
AccomGrouping	0
AccomMagnification	176
AccomPresentation	0
AccomReadAloud	2,092
AccomReadAloudIEP	55
AccomReadAloudReading	0
AccomResponse	0
AccomSetting	0
AccomTiming	0
AccomTranscribe	0
AccomTranslator	0
AccomTurnoffUniversal	20
ELLWithAccoms	343
IEPWithAccoms	2,392
Plan504WithAccoms	67

Table F-4. 2015–16 OK EOI: Numbers of Students Tested With Accommodations by Accommodation Type and Grade—English II

Accommodation Code	HS
AccomClarification	0
AccomColorContrast	204
AccomDictionary	0
AccomGeneralMasking	189
AccomGrouping	0
AccomMagnification	190
AccomPresentation	0
AccomReadAloud	0
AccomReadAloudIEP	61
AccomReadAloudReading	61
AccomResponse	0
AccomSetting	0
AccomTiming	0
AccomTranscribe	0
AccomTranslator	0
AccomTurnoffUniversal	23
ELLWithAccoms	106
IEPWithAccoms	1,997
Plan504WithAccoms	84

Table F-5. 2015–16 OK EOI: Numbers of Students Tested With Accommodations by Accommodation Type and Grade—English III

Accommodation Code	HS
AccomClarification	0
AccomColorContrast	157
AccomDictionary	0
AccomGeneralMasking	152
AccomGrouping	0
AccomMagnification	162
AccomPresentation	0
AccomReadAloud	0
AccomReadAloudIEP	72
AccomReadAloudReading	72
AccomResponse	0
AccomSetting	0
AccomTiming	0
AccomTranscribe	0
AccomTranslator	0
AccomTurnoffUniversal	22
ELLWithAccoms	61
IEPWithAccoms	1,613
Plan504WithAccoms	35

Table F-6. 2015–16 OK EOI: Numbers of Students Tested With Accommodations by Accommodation Type and Grade—Geometry

Accommodation Code	HS
AccomClarification	0
AccomColorContrast	136
AccomDictionary	0
AccomGeneralMasking	118
AccomGrouping	0
AccomMagnification	127
AccomPresentation	0
AccomReadAloud	1,822
AccomReadAloudIEP	50
AccomReadAloudReading	0
AccomResponse	0
AccomSetting	0
AccomTiming	0
AccomTranscribe	0
AccomTranslator	0
AccomTurnoffUniversal	22
ELLWithAccoms	192
IEPWithAccoms	1,903
Plan504WithAccoms	64

Table F-7. 2015–16 OK EOI: Numbers of Students Tested With Accommodations by Accommodation Type and Grade—U.S. History

Accommodation Code	HS
AccomClarification	0
AccomColorContrast	151
AccomDictionary	0
AccomGeneralMasking	148
AccomGrouping	0
AccomMagnification	155
AccomPresentation	0
AccomReadAloud	1,533
AccomReadAloudIEP	59
AccomReadAloudReading	0
AccomResponse	0
AccomSetting	0
AccomTiming	0
AccomTranscribe	0
AccomTranslator	0
AccomTurnoffUniversal	27
ELLWithAccoms	122
IEPWithAccoms	2,051
Plan504WithAccoms	84

APPENDIX G—INTERRATER AGREEMENT

Table G-1. 2015–16 OK EOI: Item-Level Interrater Agreement Statistics

Subject	Grade	Item	Number of Score Categories	Number of Responses Scored Twice	Percent Exact	Percent Adjacent	Correlation	Percent of Third Scores
English II	HS	177003AG	5	25,664	69.34	30.13	0.55	0.52
		177321AG	5	16,889	68.78	30.53	0.53	0.69
		177003AI	5	25,664	70.39	28.84	0.54	0.76
		177321AI	5	16,889	67.04	32.03	0.51	0.92
		177003AO	5	25,664	70.32	29.20	0.55	0.48
		177321AO	5	16,889	68.73	30.53	0.52	0.74
		177003AS	5	25,664	68.98	30.49	0.55	0.52
		177321AS	5	16,889	69.06	30.26	0.53	0.69
		177003AW	5	25,664	71.90	27.75	0.56	0.35
		177321AW	5	16,889	71.01	28.35	0.54	0.64
English III	HS	182004AG	5	12,622	64.40	34.31	0.54	1.28
		182007AG	5	19,037	60.89	37.66	0.63	1.44
		182004AI	5	12,622	66.25	32.79	0.56	0.96
		182007AI	5	19,037	60.83	37.89	0.64	1.28
		182004AO	5	12,622	66.69	32.46	0.57	0.85
		182007AO	5	19,037	60.52	38.14	0.64	1.33
		182004AS	5	12,622	65.47	33.38	0.56	1.16
		182007AS	5	19,037	60.97	37.51	0.64	1.52
		182004AW	5	12,622	66.86	32.40	0.56	0.74
		182007AW	5	19,037	61.33	37.36	0.64	1.30

APPENDIX H—ITEM-LEVEL CLASSICAL STATISTICS

Table H-1. 2015–16 OK EOI: Item-Level Classical Test Theory Statistics
Algebra I

Item Number	Item Type	Difficulty	Discrimination	Percent Omitted
142537A	MC	0.49	0.34	0
142680A	MC	0.75	0.48	0
142703A	MC	0.78	0.46	0
142771A	MC	0.63	0.48	0
142790A	MC	0.82	0.42	0
142863A	MC	0.61	0.51	0
142904A	MC	0.45	0.38	0
142909A	MC	0.64	0.50	0
143082A	MC	0.88	0.44	0
143092A	MC	0.35	0.39	0
143120A	MC	0.70	0.37	0
143140A	MC	0.71	0.35	0
143141A	MC	0.54	0.53	0
143144A	MC	0.67	0.36	0
143145A	MC	0.49	0.44	0
143147A	MC	0.62	0.36	0
143609A	MC	0.79	0.41	0
143610A	MC	0.80	0.38	0
143645A	MC	0.56	0.44	0
155718A	MC	0.58	0.40	
164071A	MC	0.52	0.24	0
164426A	MC	0.25	0.13	0
164565A	MC	0.46	0.38	0
164568A	MC	0.82	0.48	0
164573A	MC	0.43	0.37	0
164641A	MC	0.64	0.43	0
164651A	MC	0.83	0.45	0
164691A	MC	0.70	0.53	0
164695A	MC	0.47	0.44	0
164697A	MC	0.63	0.35	
164751A	MC	0.81	0.48	0
165067A	MC	0.63	0.53	0
165640A	MC	0.46	0.28	0
165662A	MC	0.67	0.51	0
165712A	MC	0.62	0.42	
165729A	MC	0.59	0.48	0
165748A	MC	0.72	0.50	0
165759A	MC	0.64	0.45	0
165761A	MC	0.74	0.51	0
165767A	MC	0.70	0.36	0
165782A	MC	0.74	0.34	0
165786A	MC	0.73	0.40	0
165835A	MC	0.78	0.46	0
165838A	MC	0.54	0.54	0
165839A	MC	0.60	0.33	0
165918A	MC	0.72	0.41	0
165978A	MC	0.56	0.40	0
165980A	MC	0.67	0.40	0
165988A	MC	0.73	0.53	0
165991A	MC	0.58	0.40	0
169896A	MC	0.58	0.44	0
169999A	MC	0.48	0.29	0
170039A	MC	0.51	0.32	0
170040A	MC	0.61	0.46	0
170043A	MC	0.60	0.50	0
170066A	MC	0.57	0.50	0
170071A	MC	0.80	0.33	
170076A	MC	0.59	0.13	0
170078A	MC	0.81	0.45	0
170080A	MC	0.82	0.35	0
170081A	MC	0.78	0.48	0
170097A	MC	0.65	0.35	0

continued

Item		Difficulty	Discrimination	Percent Omitted
Number	*Type*			
170108A	MC	0.82	0.40	0
170111A	MC	0.74	0.46	0
170163A	MC	0.46	0.48	0
170169A	MC	0.50	0.49	0
170206A	MC	0.54	0.48	0
170209A	MC	0.36	0.29	0
170211A	MC	0.57	0.54	0
170373A	MC	0.54	0.45	0
170374A	MC	0.73	0.26	
170435A	MC	0.59	0.52	0
170448A	MC	0.76	0.45	0
170505A	MC	0.60	0.43	0
170551A	MC	0.75	0.41	0
170748A	MC	0.81	0.50	0
170775A	MC	0.49	0.49	0
170846A	MC	0.76	0.42	0
170853A	MC	0.67	0.45	0
170870A	MC	0.53	0.52	
171330A	MC	0.18	0.25	0
171361A	MC	0.28	0.19	0
171446A	MC	0.25	0.10	0
171584A	MC	0.53	0.50	0
171770A	MC	0.73	0.33	0
171910A	MC	0.53	0.29	0
172084A	MC	0.85	0.36	0
172247A	MC	0.74	0.50	0

Item		Difficulty	Discrimination	Percent Omitted
Number	*Type*			
172377A	MC	0.82	0.39	0
172407A	MC	0.72	0.43	
172430A	MC	0.84	0.26	0
172468A	MC	0.70	0.44	0
172845A	MC	0.72	0.26	0
172870A	MC	0.78	0.36	0
172871A	MC	0.86	0.30	
172884A	MC	0.46	0.53	0
173303A	MC	0.65	0.38	0
173318A	MC	0.48	0.35	0
173543A	MC	0.77	0.54	0
173548A	MC	0.84	0.47	0
173583A	MC	0.80	0.42	0
173644A	MC	0.61	0.35	0
173702A	MC	0.24	0.20	0
173725A	MC	0.42	0.33	0
173745A	MC	0.70	0.38	0
173760A	MC	0.68	0.38	0
173839A	MC	0.19	0.24	0
173914A	MC	0.62	0.44	0
174002A	MC	0.81	0.44	0

Table H-2. 2015–16 OK EOI: Item-Level Classical Test Theory Statistics
Algebra II

Item Number	Item Type	Difficulty	Discrimination	Percent Omitted
141978A	MC	0.76	0.37	0
142803A	MC	0.56	0.31	0
142847A	MC	0.62	0.33	0
142905A	MC	0.74	0.48	
142907A	MC	0.56	0.46	
142996A	MC	0.51	0.50	
143020A	MC	0.33	0.40	0
143025A	MC	0.32	0.36	0
143026A	MC	0.62	0.36	0
143159A	MC	0.68	0.40	0
143160A	MC	0.74	0.42	0
143306A	MC	0.63	0.43	0
143448A	MC	0.84	0.33	
143740A	MC	0.47	0.11	
143750A	MC	0.48	0.30	0
155715A	MC	0.71	0.22	0
155727A	MC	0.52	0.28	
155760A	MC	0.54	0.33	0
155761A	MC	0.43	0.46	0
155762A	MC	0.58	0.38	0
155767A	MC	0.65	0.40	
155770A	MC	0.63	0.28	0
155776A	MC	0.57	0.39	0
155834A	MC	0.63	0.31	0
155847A	MC	0.57	0.37	0
155848A	MC	0.72	0.38	
155853A	MC	0.70	0.46	0
156088A	MC	0.90	0.33	0
156129A	MC	0.58	0.50	0
156131A	MC	0.65	0.42	
156286A	MC	0.53	0.31	0
157602A	MC	0.48	0.45	0
164081A	MC	0.62	0.45	0
164125A	MC	0.22	0.17	0
164217A	MC	0.22	0.14	0
164683A	MC	0.61	0.42	0
164684A	MC	0.67	0.32	0
164689A	MC	0.52	0.40	0
164692A	MC	0.69	0.42	
164694A	MC	0.54	0.45	
164705A	MC	0.93	0.28	0
164710A	MC	0.65	0.41	0
164729A	MC	0.44	0.43	0
164736A	MC	0.58	0.27	0
164750A	MC	0.69	0.38	
164753A	MC	0.78	0.37	0
164755A	MC	0.64	0.39	0
164758A	MC	0.64	0.16	0
164799A	MC	0.69	0.32	
164809A	MC	0.88	0.20	0
164814A	MC	0.86	0.34	0
164821A	MC	0.67	0.39	0
164837A	MC	0.43	0.20	
164857A	MC	0.63	0.47	
164861A	MC	0.68	0.50	0
164898A	MC	0.58	0.29	0
164908A	MC	0.65	0.43	
164922A	MC	0.83	0.44	0
164937A	MC	0.71	0.48	0
164943A	MC	0.65	0.30	0
164952A	MC	0.44	0.40	0
164955A	MC	0.74	0.30	

continued

Item Number	Item Type	Difficulty	Discrimination	Percent Omitted
164969A	MC	0.71	0.39	
164972A	MC	0.74	0.37	0
164976A	MC	0.58	0.45	
165011A	MC	0.47	0.41	0
165019A	MC	0.76	0.37	0
165023A	MC	0.64	0.49	0
165052A	MC	0.67	0.50	0
165065A	MC	0.54	0.25	0
165076A	MC	0.66	0.38	0
173109A	MC	0.69	0.40	0
173156A	MC	0.41	0.31	0
173170A	MC	0.66	0.38	
173342A	MC	0.95	0.21	
173355A	MC	0.78	0.34	0
173491A	MC	0.70	0.47	0
173845A	MC	0.61	0.29	0
173963A	MC	0.61	0.38	0
174052A	MC	0.63	0.42	0
174260A	MC	0.55	0.42	0
176130A	MC	0.71	0.36	
176153A	MC	0.81	0.42	
176279A	MC	0.43	0.35	0
178685A	MC	0.62	0.45	
178696A	MC	0.58	0.51	0
178710A	MC	0.71	0.34	
178897A	MC	0.54	0.40	0
178960A	MC	0.69	0.39	0

Item Number	Item Type	Difficulty	Discrimination	Percent Omitted
179103A	MC	0.58	0.28	0
179150A	MC	0.47	0.47	0
179316A	MC	0.73	0.42	0
179342A	MC	0.43	0.35	0
179406A	MC	0.84	0.32	0
179407A	MC	0.80	0.33	0
179425A	MC	0.25	0.13	0
179502A	MC	0.30	0.25	0
179597A	MC	0.63	0.42	0
179939A	MC	0.67	0.45	0
180262A	MC	0.39	0.22	0
180275A	MC	0.83	0.42	0
180390A	MC	0.61	0.44	0
180543A	MC	0.45	0.09	0
180697A	MC	0.36	0.10	0
180830A	MC	0.84	0.42	0
180865A	MC	0.64	0.34	
180977A	MC	0.38	0.16	0
181091A	MC	0.24	0.26	0

Table H-3. 2015–16 OK EOI: Item-Level Classical Test Theory Statistics
Biology

Item Number	Item Type	Difficulty	Discrimination	Percent Omitted
142587A	MC	0.61	0.39	0
142590A	MC	0.50	0.26	0
142597A	MC	0.84	0.40	0
142621A	MC	0.55	0.37	0
142664A	MC	0.76	0.45	0
142682A	MC	0.71	0.40	0
142690A	MC	0.74	0.48	0
142706A	MC	0.42	0.49	0
143161A	MC	0.75	0.48	0
143172A	MC	0.43	0.32	0
143185A	MC	0.73	0.44	0
143199A	MC	0.56	0.33	0
143201A	MC	0.71	0.48	0
143205A	MC	0.65	0.52	0
143236A	MC	0.48	0.38	0
143242A	MC	0.74	0.51	0
143243A	MC	0.61	0.33	0
143247A	MC	0.68	0.45	0
143256A	MC	0.55	0.42	0
143267A	MC	0.63	0.37	0
143269A	MC	0.40	0.43	0
143270A	MC	0.83	0.52	0
143303A	MC	0.58	0.42	0
143322A	MC	0.62	0.43	0
143385A	MC	0.73	0.44	0
143390A	MC	0.50	0.52	0
143461A	MC	0.80	0.46	0
143474A	MC	0.86	0.34	0
143482A	MC	0.68	0.46	0
143500A	MC	0.55	0.35	0
143501A	MC	0.57	0.44	0

Item Number	Item Type	Difficulty	Discrimination	Percent Omitted
143507A	MC	0.81	0.19	0
143537A	MC	0.50	0.21	0
143539A	MC	0.82	0.46	0
143556A	MC	0.38	0.17	0
155748A	MC	0.62	0.43	0
155779A	MC	0.78	0.42	0
155780A	MC	0.52	0.38	0
155786A	MC	0.51	0.30	0
155789A	MC	0.54	0.48	0
155791A	MC	0.82	0.47	0
155794A	MC	0.76	0.41	0
155802A	MC	0.66	0.22	0
155804A	MC	0.87	0.27	0
155806A	MC	0.81	0.44	0
155808A	MC	0.79	0.23	0
155814A	MC	0.58	0.39	0
155815A	MC	0.45	0.38	0
155820A	MC	0.67	0.35	0
155833A	MC	0.70	0.19	0
155841A	MC	0.59	0.42	0
155864A	MC	0.58	0.42	0
155875A	MC	0.66	0.40	0
155877A	MC	0.77	0.49	0
155878A	MC	0.90	0.38	0
155880A	MC	0.59	0.31	0
155881A	MC	0.73	0.37	0
155891A	MC	0.52	0.34	0
155912A	MC	0.53	0.43	0
155917A	MC	0.59	0.33	0
155919A	MC	0.77	0.42	0
155958A	MC	0.64	0.42	0

continued

Item Number	Item Type	Difficulty	Discrimination	Percent Omitted
155962A	MC	0.73	0.35	0
155963A	MC	0.66	0.47	0
155971A	MC	0.50	0.29	0
155973A	MC	0.76	0.46	0
156693A	MC	0.46	0.43	0
156703A	MC	0.46	0.51	0
156745A	MC	0.67	0.52	0
157007A	MC	0.73	0.36	0
157071A	MC	0.77	0.36	0
157168A	MC	0.48	0.50	0
157177A	MC	0.45	0.15	0
157707A	MC	0.59	0.46	0
157709A	MC	0.47	0.38	0
157720A	MC	0.78	0.48	0
157722A	MC	0.50	0.30	0
157725A	MC	0.52	0.35	0
157781A	MC	0.58	0.44	0
157785A	MC	0.54	0.36	0
157829A	MC	0.74	0.30	0
158645A	MC	0.86	0.33	0
168637A	MC	0.81	0.43	0
168658A	MC	0.64	0.23	0
168663A	MC	0.49	0.39	0
168670A	MC	0.84	0.35	0
168671A	MC	0.83	0.39	0
168672A	MC	0.65	0.45	0

Item Number	Item Type	Difficulty	Discrimination	Percent Omitted
168712A	MC	0.56	0.35	0
168723A	MC	0.56	0.24	0
168725A	MC	0.63	0.44	0
168731A	MC	0.75	0.37	0
168743A	MC	0.68	0.57	0
168744A	MC	0.38	0.35	0
168762A	MC	0.56	0.48	0
168793A	MC	0.62	0.45	0
168796A	MC	0.56	0.39	0
168807A	MC	0.44	0.31	0
168831A	MC	0.73	0.44	0
168897A	MC	0.52	0.31	0
168905A	MC	0.52	0.41	0
168910A	MC	0.63	0.52	0
169030A	MC	0.77	0.40	0
169088A	MC	0.71	0.40	0
169148A	MC	0.62	0.43	0
174676A	MC	0.75	0.41	0
175100A	MC	0.62	0.30	0
175113A	MC	0.79	0.44	0
175247A	MC	0.76	0.39	0
175278A	MC	0.71	0.29	0

Table H-4. 2015–16 OK EOI: Item-Level Classical Test Theory Statistics
English II

Item Number	Item Type	Difficulty	Discrimination	Percent Omitted
141042A	MC	0.67	0.29	0
141043A	MC	0.68	0.37	0
141052A	MC	0.57	0.36	0
141053A	MC	0.57	0.27	0
141059A	MC	0.73	0.37	0
141062A	MC	0.31	0.10	0
141293A	MC	0.71	0.34	0
141298A	MC	0.79	0.33	0
141300A	MC	0.53	0.24	0
141313A	MC	0.77	0.45	0
141314A	MC	0.73	0.41	
141315A	MC	0.38	0.29	0
141316A	MC	0.67	0.42	0
141430A	MC	0.57	0.33	0
141461A	MC	0.81	0.42	0
141465A	MC	0.69	0.43	0
141469A	MC	0.77	0.30	0
141540A	MC	0.91	0.47	0
141544A	MC	0.74	0.41	0
141579A	MC	0.93	0.49	0
141582A	MC	0.68	0.50	0
141584A	MC	0.64	0.49	0
141585A	MC	0.82	0.39	0
141586A	MC	0.80	0.55	0
141587A	MC	0.90	0.49	0
141588A	MC	0.69	0.29	0
141632A	MC	0.65	0.44	0
141633A	MC	0.74	0.47	0
141634A	MC	0.80	0.42	0
141635A	MC	0.91	0.44	0
141637A	MC	0.51	0.37	0
141638A	MC	0.47	0.31	2
144193A	MC	0.62	0.29	0
144194A	MC	0.57	0.34	0
144196A	MC	0.71	0.22	0
144198A	MC	0.69	0.23	0
144199A	MC	0.63	0.39	0
144201A	MC	0.73	0.36	0
144203A	MC	0.79	0.33	0
144205A	MC	0.58	0.35	0
144206A	MC	0.49	0.28	0
144207A	MC	0.57	0.20	0
144208A	MC	0.60	0.18	0
144229A	MC	0.58	0.26	0
144253A	MC	0.53	0.39	0
144254A	MC	0.78	0.41	0
144256A	MC	0.53	0.33	0
144258A	MC	0.78	0.39	0
144288A	MC	0.48	0.28	0
144289A	MC	0.88	0.43	0
144291A	MC	0.74	0.48	0
144292A	MC	0.53	0.31	0
144293A	MC	0.73	0.42	0
157564A	MC	0.62	0.31	0
157568A	MC	0.86	0.51	0
157570A	MC	0.65	0.17	0
157572A	MC	0.48	0.22	0
176876A	MC	0.40	0.29	0
176880A	MC	0.22	0.17	0
176883A	MC	0.75	0.41	0
176919A	MC	0.82	0.41	0
176934A	MC	0.80	0.41	0
176935A	MC	0.55	0.24	0
176937A	MC	0.86	0.49	0

continued

Item Number	Item Type	Difficulty	Discrimination	Percent Omitted
176938A	MC	0.72	0.33	0
176939A	MC	0.80	0.51	0
176944A	MC	0.79	0.35	0
176945A	MC	0.49	0.12	0
177003AG	WP	0.66	0.67	0
177003AI	WP	0.67	0.62	0
177003AO	WP	0.67	0.64	0
177003AS	WP	0.66	0.67	0
177003AW	WP	0.67	0.67	0
177004A	MC	0.79	0.28	
177007A	MC	0.69	0.23	0
177009A	MC	0.48	0.27	0
177011A	MC	0.93	0.35	0
177287A	MC	0.89	0.45	0
177293A	MC	0.72	0.39	0
177294A	MC	0.94	0.42	0
177297A	MC	0.84	0.48	0
177321AG	WP	0.65	0.69	0
177321AI	WP	0.65	0.64	0
177321AO	WP	0.66	0.66	0
177321AS	WP	0.65	0.68	0
177321AW	WP	0.67	0.68	0
177483A	MC	0.66	0.33	0
177484A	MC	0.68	0.20	0
178097A	MC	0.45	0.22	0
178099A	MC	0.73	0.45	0
178101A	MC	0.77	0.31	0
178102A	MC	0.70	0.29	0
178103A	MC	0.49	0.34	0
178104A	MC	0.82	0.55	0
178399A	MC	0.82	0.35	0
178401A	MC	0.81	0.36	0
178403A	MC	0.56	0.30	0

Item Number	Item Type	Difficulty	Discrimination	Percent Omitted
178404A	MC	0.78	0.17	0
179039A	MC	0.71	0.33	0
179042A	MC	0.80	0.45	0
179051A	MC	0.57	0.37	0
179081A	MC	0.56	0.34	0
179091A	MC	0.91	0.43	0
179099A	MC	0.71	0.40	0
179101A	MC	0.64	0.26	0
179822A	MC	0.74	0.33	0
179824A	MC	0.83	0.37	0
179830A	MC	0.70	0.41	0
179832A	MC	0.68	0.43	0
179834A	MC	0.49	0.30	0
180524A	MC	0.88	0.34	0
180526A	MC	0.37	0.31	0
180529A	MC	0.76	0.34	0
180530A	MC	0.37	0.27	0
180542A	MC	0.38	0.25	0
180545A	MC	0.83	0.42	0
180736A	MC	0.83	0.30	0
180755A	MC	0.66	0.41	0
180767A	MC	0.81	0.40	0
180769A	MC	0.87	0.52	0
180771A	MC	0.74	0.24	0
180772A	MC	0.81	0.27	0
180774A	MC	0.86	0.20	0
180798A	MC	0.62	0.32	0

Table H-5. 2015–16 OK EOI: Item-Level Classical Test Theory Statistics
English III

Item Number	Item Type	Difficulty	Discrimination	Percent Omitted
157116A	MC	0.71	0.45	0
157117A	MC	0.74	0.36	0
157118A	MC	0.43	0.19	0
157119A	MC	0.50	0.26	0
157120A	MC	0.53	0.24	0
157139A	MC	0.71	0.33	0
157140A	MC	0.61	0.41	
157141A	MC	0.50	0.19	
157144A	MC	0.70	0.34	0
157147A	MC	0.54	0.19	0
157329A	MC	0.87	0.33	0
157330A	MC	0.71	0.37	0
157331A	MC	0.37	0.26	0
157332A	MC	0.83	0.29	
157379A	MC	0.67	0.39	0
157381A	MC	0.53	0.25	0
157382A	MC	0.77	0.37	0
157384A	MC	0.78	0.37	0
157385A	MC	0.48	0.34	0
157393A	MC	0.50	0.23	0
157394A	MC	0.70	0.24	0
157395A	MC	0.77	0.42	0
157396A	MC	0.64	0.36	0
157399A	MC	0.39	0.21	0
157401A	MC	0.69	0.40	0
157402A	MC	0.69	0.44	0
157403A	MC	0.79	0.21	0
157415A	MC	0.75	0.41	0
157416A	MC	0.88	0.45	
157417A	MC	0.21	0.26	0
157420A	MC	0.63	0.27	
157422A	MC	0.62	0.41	0
157487A	MC	0.51	0.43	0
157488A	MC	0.67	0.31	0
157489A	MC	0.58	0.32	0
157490A	MC	0.12	0.17	0
157508A	MC	0.80	0.45	0
157509A	MC	0.79	0.42	0
157510A	MC	0.69	0.19	0
157513A	MC	0.88	0.42	0
157516A	MC	0.75	0.40	
157517A	MC	0.63	0.36	0
157559A	MC	0.48	0.30	0
157560A	MC	0.63	0.31	
179537A	MC	0.71	0.41	0
179544A	MC	0.54	0.25	0
179545A	MC	0.80	0.33	0
179547A	MC	0.64	0.36	0
179549A	MC	0.86	0.47	0
179550A	MC	0.52	0.47	0
179697A	MC	0.69	0.38	0
179698A	MC	0.65	0.41	0
179699A	MC	0.80	0.44	0
179701A	MC	0.70	0.40	0
179702A	MC	0.87	0.45	0
179703A	MC	0.70	0.49	0
179704A	MC	0.77	0.39	0
179712A	MC	0.70	0.43	0
179716A	MC	0.79	0.49	0
180025A	MC	0.46	0.22	0
180026A	MC	0.34	0.32	0
180541A	MC	0.74	0.37	0

continued

Item Number	Item Type	Difficulty	Discrimination	Percent Omitted
180552A	MC	0.39	0.26	0
180621A	MC	0.49	0.20	0
180625A	MC	0.73	0.20	0
180630A	MC	0.81	0.33	0
180665A	MC	0.57	0.30	0
180666A	MC	0.63	0.25	0
180667A	MC	0.41	0.22	0
180810A	MC	0.46	0.18	0
180829A	MC	0.77	0.43	0
181000A	MC	0.47	0.37	0
181002A	MC	0.86	0.30	0
181004A	MC	0.66	0.39	
181007A	MC	0.44	0.26	0
181011A	MC	0.49	0.24	
181157A	MC	0.63	0.36	
181158A	MC	0.63	0.27	
181161A	MC	0.40	0.29	0
181169A	MC	0.29	0.21	
181345A	MC	0.85	0.44	
181349A	MC	0.64	0.30	0
181355A	MC	0.67	0.37	0
181357A	MC	0.83	0.44	0
181358A	MC	0.87	0.46	0
181507A	MC	0.68	0.23	0
181509A	MC	0.73	0.24	0
181510A	MC	0.91	0.36	
181511A	MC	0.73	0.33	0
181512A	MC	0.90	0.45	0
181514A	MC	0.55	0.23	0
181518A	MC	0.70	0.34	
181520A	MC	0.77	0.39	0
181522A	MC	0.66	0.29	0
181523A	MC	0.38	0.17	0
181661A	MC	0.32	0.08	0
181662A	MC	0.22	0.12	0
181663A	MC	0.81	0.28	
181664A	MC	0.43	0.31	0
181666A	MC	0.54	0.19	0
181667A	MC	0.69	0.25	0
181668A	MC	0.65	0.33	0
181669A	MC	0.65	0.36	0
181670A	MC	0.53	0.31	0
181671A	MC	0.70	0.31	0
181672A	MC	0.66	0.35	0
181781A	MC	0.81	0.41	0
181782A	MC	0.79	0.35	
181783A	MC	0.68	0.31	
181784A	MC	0.86	0.38	
181785A	MC	0.52	0.29	0
181925A	MC	0.80	0.33	0
181926A	MC	0.56	0.43	0
181929A	MC	0.61	0.26	0
181930A	MC	0.54	0.34	0
181933A	MC	0.73	0.36	0
181935A	MC	0.76	0.41	0
181936A	MC	0.85	0.40	0
181938A	MC	0.48	0.26	0
181939A	MC	0.83	0.41	0
181954A	MC	0.44	0.16	0
181955A	MC	0.51	0.14	0
181957A	MC	0.70	0.26	
181958A	MC	0.25	0.19	
182004AG	WP	0.67	0.66	0
182004AI	WP	0.68	0.63	0
182004AO	WP	0.68	0.64	0
182004AS	WP	0.67	0.65	0
182004AW	WP	0.68	0.65	0
182007AG	WP	0.69	0.71	1

continued

Item Number	Item Type	Difficulty	Discrimination	Percent Omitted
182007AI	WP	0.69	0.69	1
182007AO	WP	0.69	0.69	1

Item Number	Item Type	Difficulty	Discrimination	Percent Omitted
182007AS	WP	0.69	0.71	1
182007AW	WP	0.69	0.71	1

Table H-6. 2015–16 OK EOI: Item-Level Classical Test Theory Statistics
Geometry

Item Number	Item Type	Difficulty	Discrimination	Percent Omitted
142036A	MC	0.59	0.46	0
142044A	MC	0.54	0.22	0
142049A	MC	0.58	0.48	0
142053A	MC	0.79	0.28	0
142059A	MC	0.67	0.39	0
142069A	MC	0.63	0.41	0
142076A	MC	0.51	0.38	0
142078A	MC	0.92	0.25	0
142081A	MC	0.82	0.45	0
142085A	MC	0.74	0.42	0
142186A	MC	0.77	0.41	0
142190A	MC	0.72	0.34	0
142198A	MC	0.74	0.39	0
142205A	MC	0.70	0.49	0
142210A	MC	0.86	0.48	0
142216A	MC	0.95	0.35	0
142219A	MC	0.59	0.50	0
142220A	MC	0.89	0.45	0
142221A	MC	0.81	0.36	0
142228A	MC	0.77	0.39	0
142230A	MC	0.48	0.36	0
142232A	MC	0.78	0.44	0
142233A	MC	0.40	0.34	0
142234A	MC	0.60	0.37	0
142243A	MC	0.91	0.44	0
142395A	MC	0.70	0.38	0

Item Number	Item Type	Difficulty	Discrimination	Percent Omitted
142409A	MC	0.86	0.39	0
142421A	MC	0.63	0.39	0
142441A	MC	0.66	0.38	0
142472A	MC	0.63	0.45	0
142491A	MC	0.81	0.44	0
142500A	MC	0.76	0.40	0
142503A	MC	0.66	0.40	0
142512A	MC	0.63	0.49	0
142533A	MC	0.85	0.32	
142535A	MC	0.61	0.25	0
142625A	MC	0.80	0.27	0
142638A	MC	0.71	0.22	0
142644A	MC	0.63	0.43	0
142657A	MC	0.60	0.47	0
142714A	MC	0.97	0.24	0
142718A	MC	0.72	0.46	0
142723A	MC	0.81	0.42	
142784A	MC	0.22	0.34	0
142919A	MC	0.78	0.36	0
142921A	MC	0.88	0.36	
142926A	MC	0.83	0.43	0
142942A	MC	0.81	0.40	0
142957A	MC	0.81	0.38	0
143829A	MC	0.62	0.45	0
143830A	MC	0.69	0.54	0
143869A	MC	0.75	0.22	0

continued

Item Number	Item Type	Difficulty	Discrimination	Percent Omitted
143877A	MC	0.66	0.37	0
143923A	MC	0.72	0.38	0
143963A	MC	0.59	0.37	0
143997A	MC	0.61	0.38	0
143998A	MC	0.48	0.25	0
157209A	MC	0.58	0.55	0
157210A	MC	0.87	0.28	0
157211A	MC	0.91	0.36	0
157212A	MC	0.42	0.46	0
157220A	MC	0.65	0.43	0
157227A	MC	0.50	0.46	0
157229A	MC	0.78	0.52	0
157232A	MC	0.87	0.37	0
157239A	MC	0.51	0.22	0
157244A	MC	0.72	0.28	0
157249A	MC	0.61	0.46	0
157254A	MC	0.79	0.50	0
157270A	MC	0.73	0.41	
157275A	MC	0.61	0.57	0
157282A	MC	0.76	0.38	0
157285A	MC	0.73	0.51	
157631A	MC	0.81	0.35	0
157639A	MC	0.65	0.36	0
157642A	MC	0.73	0.40	
157663A	MC	0.67	0.46	0
157668A	MC	0.47	0.36	0
157679A	MC	0.29	0.23	

Item Number	Item Type	Difficulty	Discrimination	Percent Omitted
157681A	MC	0.69	0.47	0
157731A	MC	0.58	0.53	0
157732A	MC	0.67	0.42	0
157740A	MC	0.85	0.28	0
157743A	MC	0.67	0.48	0
157744A	MC	0.78	0.48	
157748A	MC	0.83	0.37	0
165151A	MC	0.28	0.31	0
165404A	MC	0.34	0.37	0
165419A	MC	0.39	0.24	0
165423A	MC	0.31	0.22	0
165457A	MC	0.66	0.14	0
165463A	MC	0.33	0.26	0
165489A	MC	0.50	0.35	0
165746A	MC	0.67	0.34	0
165768A	MC	0.74	0.31	0
165776A	MC	0.76	0.48	0
165783A	MC	0.94	0.25	
165801A	MC	0.36	0.42	0
165820A	MC	0.81	0.44	0
165955A	MC	0.71	0.19	0
165956A	MC	0.90	0.35	0
175544A	MC	0.42	0.47	0

Table H-7. 2015–16 OK EOI: Item-Level Classical Test Theory Statistics U.S. History

Item Number	Item Type	Difficulty	Discrimination	Percent Omitted
140941A	MC	0.56	0.31	0
141057A	MC	0.59	0.28	
141078A	MC	0.52	0.28	0
141099A	MC	0.89	0.44	0
141113A	MC	0.66	0.34	0
141140A	MC	0.82	0.44	0
141143A	MC	0.77	0.46	0
141225A	MC	0.86	0.44	0
141231A	MC	0.82	0.49	0
143252A	MC	0.73	0.28	0
143261A	MC	0.68	0.31	0
143262A	MC	0.47	0.34	0
143286A	MC	0.68	0.36	0
143287A	MC	0.67	0.35	0
143291A	MC	0.68	0.38	0
143292A	MC	0.79	0.48	0
143295A	MC	0.75	0.36	0
143301A	MC	0.59	0.42	0
143331A	MC	0.82	0.36	0
143337A	MC	0.85	0.48	0
143344A	MC	0.70	0.43	0
143345A	MC	0.89	0.47	0
143349A	MC	0.75	0.50	0
143361A	MC	0.57	0.43	0
143364A	MC	0.66	0.39	0
143374A	MC	0.80	0.40	0
143389A	MC	0.65	0.32	0
143398A	MC	0.63	0.40	0
143402A	MC	0.68	0.28	0
143416A	MC	0.82	0.31	0
143417A	MC	0.71	0.54	0
143445A	MC	0.59	0.49	0
143446A	MC	0.67	0.35	0
143519A	MC	0.76	0.16	0
143521A	MC	0.85	0.46	0
143525A	MC	0.67	0.31	0
143526A	MC	0.54	0.35	0
143527A	MC	0.80	0.52	0
143528A	MC	0.71	0.52	0
143533A	MC	0.70	0.21	0
156304A	MC	0.34	0.31	0
156378A	MC	0.62	0.35	0
156382A	MC	0.52	0.18	0
156441A	MC	0.80	0.40	0
156444A	MC	0.85	0.46	0
156447A	MC	0.67	0.38	0
156448A	MC	0.42	0.25	0
156451A	MC	0.81	0.42	0
156452A	MC	0.63	0.51	0
156460A	MC	0.75	0.37	0
156469A	MC	0.42	0.17	0
156477A	MC	0.85	0.37	0
156490A	MC	0.63	0.29	0
156491A	MC	0.60	0.15	0
156494A	MC	0.71	0.41	0
156495A	MC	0.51	0.44	0
156515A	MC	0.72	0.37	0
156518A	MC	0.35	0.34	0
156522A	MC	0.70	0.28	0
156524A	MC	0.41	0.26	0
156528A	MC	0.71	0.27	0
156531A	MC	0.65	0.36	0
156540A	MC	0.34	0.36	0
157470A	MC	0.61	0.22	0

continued

Item Number	Item Type	Difficulty	Discrimination	Percent Omitted
157482A	MC	0.57	0.35	0
157496A	MC	0.30	0.28	0
158336A	MC	0.73	0.30	0
158340A	MC	0.81	0.40	0
158448A	MC	0.85	0.45	0
158596A	MC	0.56	0.44	0
158654A	MC	0.81	0.43	0
164757A	MC	0.64	0.41	0
164760A	MC	0.66	0.18	0
164965A	MC	0.50	0.41	0
164967A	MC	0.69	0.27	0
164984A	MC	0.76	0.24	0
164989A	MC	0.55	0.18	0
165077A	MC	0.28	0.32	0
165292A	MC	0.53	0.36	0
165295A	MC	0.67	0.41	0
165304A	MC	0.63	0.39	0
165310A	MC	0.66	0.34	0
165654A	MC	0.90	0.31	0
165688A	MC	0.47	0.49	0
166047A	MC	0.63	0.27	0
166128A	MC	0.72	0.18	0
166425A	MC	0.51	0.30	0
166433A	MC	0.47	0.43	0
167658A	MC	0.41	0.23	0
167663A	MC	0.26	0.18	0
167682A	MC	0.72	0.46	0
167684A	MC	0.69	0.50	0

Item Number	Item Type	Difficulty	Discrimination	Percent Omitted
167688A	MC	0.53	0.33	0
167702A	MC	0.26	0.19	0
167706A	MC	0.57	0.21	0
167718A	MC	0.34	0.25	0
167748A	MC	0.75	0.26	0
167749A	MC	0.76	0.35	0
167750A	MC	0.70	0.29	0
167768A	MC	0.78	0.44	0
167774A	MC	0.89	0.42	0
167777A	MC	0.79	0.43	0
167780A	MC	0.68	0.29	0
167783A	MC	0.74	0.46	0
167788A	MC	0.75	0.43	0
167799A	MC	0.73	0.31	0
167806A	MC	0.58	0.36	0
167807A	MC	0.76	0.39	0
167808A	MC	0.54	0.28	0
167818A	MC	0.81	0.46	0
167820A	MC	0.53	0.54	0
167821A	MC	0.58	0.40	0
167823A	MC	0.43	0.37	0
176211A	MC	0.57	0.16	0
176782A	MC	0.52	0.28	0

APPENDIX I—ITEM-LEVEL SCORE POINT DISTRIBUTIONS

Table I-1. 2015–16 OK EOI: Item-Level Score Distributions for Constructed Response Items

Subject	Grade	Item Number	Total Possible Points	Percent of Students at Score Point				
				0	*1*	*2*	*3*	*4*
English II	HS	177003AG	4	1.28	2.22	17.26	51.29	1.35
		177003AI	4	1.28	2.02	15.93	53.78	1.41
		177003AO	4	1.28	2.07	15.82	53.87	1.30
		177003AS	4	1.28	2.20	17.15	51.13	1.36
		177003AW	4	1.28	1.98	14.93	55.79	1.58
		177321AG	4	1.16	1.96	19.76	48.44	1.12
		177321AI	4	1.16	2.03	18.95	47.82	1.28
		177321AO	4	1.16	1.76	17.94	50.47	1.33
		177321AS	4	1.16	1.92	19.01	49.50	1.20
		177321AW	4	1.16	1.74	16.60	53.72	1.39
English III	HS	182004AG	4	0.41	2.31	17.54	46.19	2.65
		182004AI	4	0.41	2.11	16.19	48.98	3.07
		182004AO	4	0.41	2.18	16.76	48.91	2.93
		182004AS	4	0.41	2.29	18.18	46.58	2.72
		182004AW	4	0.41	2.00	16.21	49.88	2.87
		182007AG	4	1.05	3.46	15.30	37.10	8.86
		182007AI	4	1.05	3.56	15.23	36.30	9.54
		182007AO	4	1.05	3.48	15.40	36.17	9.30
		182007AS	4	1.05	3.50	15.33	36.97	8.96
		182007AW	4	1.05	3.42	14.91	37.58	9.16

APPENDIX J—DIFFERENTIAL ITEM FUNCTIONING RESULTS

Table J-1. 2015–16 OK EOI: Number of Items Classified as "Low" or "High" DIF Overall and by Grade and Group Favored

Subject	Grade	Group: Reference	Group: Focal	Item Type	Number of Items	Number "Low": Total	Number "Low": Favoring Reference	Number "Low": Favoring Focal	Number "High": Total	Number "High": Favoring Reference	Number "High": Favoring Focal
Algebra I	HS	Male	Female	MC	109	16	9	7	3	3	0
		Non-EconDis	EconDis	MC	109	0	0	0	0	0	0
		Non-ELL	ELL	MC	109	32	17	15	10	10	0
		Non-IEP	IEP	MC	109	12	12	0	1	1	0
		White/Caucasian	Black/African American	MC	109	8	8	0	3	3	0
			Hispanic or Latino	MC	109	6	5	1	0	0	0
			American Indian/	MC	109	0	0	0	0	0	0
			Asian	MC	109	25	9	16	4	0	4
			Pacific Islander	MC	109	0	0	0	0	0	0
			Two or More Races	MC	109	0	0	0	0	0	0
Algebra II	HS	Male	Female	MC	108	5	5	0	3	3	0
		Non-EconDis	EconDis	MC	108	1	1	0	0	0	0
		Non-ELL	ELL	MC	108	12	8	4	5	5	0
		Non-IEP	IEP	MC	108	13	13	0	1	1	0
		White/Caucasian	Black/African American	MC	108	14	11	3	1	1	0
			Hispanic or Latino	MC	108	7	7	0	0	0	0
			American Indian/	MC	108	0	0	0	0	0	0
			Asian	MC	108	31	12	19	5	2	3
			Pacific Islander	MC	108	0	0	0	0	0	0
			Two or More Races	MC	108	0	0	0	0	0	0
Biology	HS	Male	Female	MC	110	11	5	6	1	1	0
		Non-EconDis	EconDis	MC	110	0	0	0	0	0	0
		Non-ELL	ELL	MC	110	27	22	5	4	3	1
		Non-IEP	IEP	MC	110	1	1	0	0	0	0
		White/Caucasian	Black/African American	MC	110	8	7	1	1	1	0
			Hispanic or Latino	MC	110	4	4	0	0	0	0
			American Indian/	MC	110	0	0	0	0	0	0
			Asian	MC	110	27	10	17	4	2	2
			Pacific Islander	MC	110	0	0	0	0	0	0
			Two or More Races	MC	110	0	0	0	0	0	0

continued

Subject	Grade	Group: Reference	Group: Focal	Item Type	Number of Items	Number "Low" Total	Number "Low" Favoring Reference	Number "Low" Favoring Focal	Number "High" Total	Number "High" Favoring Reference	Number "High" Favoring Focal
English II	HS	Male	Female	MC	114	13	9	4	1	1	0
				OR	10	0	0	0	0	0	0
		Non-EconDis	EconDis	MC	114	1	1	0	0	0	0
				OR	10	0	0	0	0	0	0
		Non-ELL	ELL	MC	114	27	23	4	6	5	1
				OR	10	0	0	0	0	0	0
		Non-IEP	IEP	MC	114	11	11	0	0	0	0
				OR	10	0	0	0	0	0	0
		White/Caucasian	Black/African American	MC	114	14	11	3	2	2	0
				OR	10	0	0	0	0	0	0
			Hispanic or Latino	MC	114	8	6	2	1	1	0
				OR	10	0	0	0	0	0	0
			American Indian/ Alaskan Native	MC	114	1	1	0	0	0	0
				OR	10	0	0	0	0	0	0
			Asian	MC	114	22	14	8	6	2	4
				OR	10	0	0	0	0	0	0
			Pacific Islander	MC	114	0	0	0	0	0	0
				OR	10	0	0	0	0	0	0
			Two or More Races	MC	114	0	0	0	0	0	0
				OR	10	0	0	0	0	0	0
English III	HS	Male	Female	MC	124	20	11	9	5	4	1
				OR	10	0	0	0	0	0	0
		Non-EconDis	EconDis	MC	124	0	0	0	0	0	0
				OR	10	0	0	0	0	0	0
		Non-ELL	ELL	MC	124	36	33	3	14	12	2
				OR	10	0	0	0	0	0	0
		Non-IEP	IEP	MC	124	13	10	3	1	1	0
				OR	10	0	0	0	0	0	0
		White/Caucasian	Black/African American	MC	124	24	20	4	2	2	0
				OR	10	0	0	0	0	0	0
			Hispanic or Latino	MC	124	12	9	3	2	2	0
				OR	10	0	0	0	0	0	0

continued

Subject	Grade	Group: Reference	Group: Focal	Item Type	Number of Items	Number "Low": Total	Number "Low": Favoring Reference	Number "Low": Favoring Focal	Number "High": Total	Number "High": Favoring Reference	Number "High": Favoring Focal
English III	HS	White/Caucasian	American Indian/ Alaskan Native	MC	124	0	0	0	0	0	0
English III	HS	White/Caucasian	American Indian/ Alaskan Native	OR	10	0	0	0	0	0	0
English III	HS	White/Caucasian	Asian	MC	124	37	22	15	11	7	4
English III	HS	White/Caucasian	Asian	OR	10	0	0	0	0	0	0
English III	HS	White/Caucasian	Pacific Islander	MC	124	0	0	0	0	0	0
English III	HS	White/Caucasian	Pacific Islander	OR	10	0	0	0	0	0	0
English III	HS	White/Caucasian	Two or More Races	MC	124	0	0	0	0	0	0
English III	HS	White/Caucasian	Two or More Races	OR	10	0	0	0	0	0	0
Geometry	HS	Male	Female	MC	102	13	6	7	0	0	0
Geometry	HS	Non-EconDis	EconDis	MC	102	0	0	0	0	0	0
Geometry	HS	Non-ELL	ELL	MC	102	17	10	7	4	4	0
Geometry	HS	Non-IEP	IEP	MC	102	6	6	0	0	0	0
Geometry	HS	White/Caucasian	Black/African American	MC	102	8	8	0	0	0	0
Geometry	HS	White/Caucasian	Hispanic or Latino	MC	102	2	2	0	1	1	0
Geometry	HS	White/Caucasian	American Indian/	MC	102	0	0	0	0	0	0
Geometry	HS	White/Caucasian	Asian	MC	102	17	4	13	4	2	2
Geometry	HS	White/Caucasian	Pacific Islander	MC	102	0	0	0	0	0	0
Geometry	HS	White/Caucasian	Two or More Races	MC	102	0	0	0	0	0	0
U.S. History	HS	Male	Female	MC	115	14	11	3	1	1	0
U.S. History	HS	Non-EconDis	EconDis	MC	115	0	0	0	0	0	0
U.S. History	HS	Non-ELL	ELL	MC	115	23	19	4	10	5	5
U.S. History	HS	Non-IEP	IEP	MC	115	17	14	3	0	0	0
U.S. History	HS	White/Caucasian	Black/African American	MC	115	10	7	3	1	1	0
U.S. History	HS	White/Caucasian	Hispanic or Latino	MC	115	6	5	1	0	0	0
U.S. History	HS	White/Caucasian	American Indian/	MC	115	0	0	0	0	0	0
U.S. History	HS	White/Caucasian	Asian	MC	115	13	6	7	6	4	2
U.S. History	HS	White/Caucasian	Pacific Islander	MC	115	0	0	0	0	0	0
U.S. History	HS	White/Caucasian	Two or More Races	MC	115	0	0	0	0	0	0

APPENDIX K—ITEM RESPONSE THEORY PARAMETERS

Table K-1. 2015–16 OK EOI: IRT Parameters for Dichotomous Items - U.S. History - Form A

IREF	Parameters and Measures of Standard Error					
	a	SE (*a*)	*b*	SE (*b*)	*c*	SE (*c*)
141140A	0.84272	0.01592	-1.47984	0.02829	0.02831	0.01186
141225A	0.98422	0.02076	-1.59982	0.03317	0.05385	0.01773
141231A	1.01417	0.01970	-1.33507	0.02572	0.03869	0.01274
143262A	0.94890	0.03225	0.71755	0.02288	0.23882	0.00791
143286A	0.77525	0.02606	-0.24006	0.04575	0.28298	0.01578
143291A	0.74863	0.02631	-0.21993	0.04928	0.29604	0.01635
143292A	1.11137	0.03105	-0.77234	0.03466	0.31705	0.01529
143295A	0.55088	0.01887	-1.23505	0.09882	0.13998	0.03510
143301A	0.87959	0.02092	0.08834	0.02334	0.22752	0.00890
143331A	0.63698	0.01179	-1.75268	0.04566	0.04782	0.01947
143344A	0.81203	0.02211	-0.61325	0.04030	0.16307	0.01676
143349A	1.03198	0.02338	-0.83621	0.02806	0.12105	0.01394
143364A	0.66990	0.02088	-0.47753	0.05226	0.15251	0.01927
143374A	0.70646	0.01236	-1.54634	0.02241	0.00000	0.00000
143389A	0.90374	0.03581	0.31083	0.03635	0.42177	0.01066
143402A	0.39584	0.00903	-1.30269	0.03237	0.00000	0.00000
143417A	1.24063	0.02669	-0.59777	0.01986	0.13081	0.01024
143445A	0.98216	0.02291	-0.14734	0.02160	0.11371	0.00946
143446A	0.61873	0.02431	-0.29784	0.06883	0.26133	0.02123
143521A	0.97340	0.01899	-1.52244	0.02782	0.03612	0.01354
143526A	0.89796	0.03143	0.50752	0.02770	0.28381	0.00945
143527A	1.46125	0.03572	-0.81793	0.02229	0.24649	0.01225
143528A	1.56366	0.04013	-0.28297	0.01808	0.30540	0.00889
156304A	0.52026	0.01910	0.97010	0.03311	0.04309	0.01028
156382A	0.48439	0.03356	1.12918	0.07027	0.31102	0.01742
156441A	0.73951	0.01732	-1.37207	0.04752	0.06677	0.02158
156447A	0.73618	0.02287	-0.37895	0.04609	0.19904	0.01709
156448A	0.61232	0.02868	1.09583	0.03699	0.18820	0.01126
156451A	1.07464	0.03458	-0.64776	0.04056	0.42846	0.01484
156452A	1.16798	0.02697	-0.23396	0.01963	0.16213	0.00923
156469A	0.49247	0.03581	1.67071	0.05808	0.24963	0.01398
156477A	0.79656	0.02864	-1.20764	0.07911	0.38745	0.02762

IREF	Parameters and Measures of Standard Error					
	a	SE (*a*)	*b*	SE (*b*)	*c*	SE (*c*)
156491A	0.35718	0.03120	1.16244	0.13029	0.39998	0.02339
156494A	0.62820	0.01084	-1.09553	0.01962	0.00000	0.00000
156522A	0.52826	0.02698	-0.28536	0.10756	0.34551	0.02653
156528A	0.36704	0.00714	-1.60720	0.03191	0.00000	0.00000
156531A	0.73699	0.02612	-0.13050	0.04790	0.28419	0.01584
158340A	0.73063	0.01476	-1.51141	0.03610	0.03550	0.01493
158596A	1.09851	0.02991	0.20453	0.02052	0.22273	0.00844
164984A	0.31583	0.00922	-2.41814	0.06717	0.00000	0.00000
164989A	0.24210	0.00793	-0.50973	0.03633	0.00000	0.00000
165295A	0.89390	0.02832	-0.12654	0.03555	0.30194	0.01286
165304A	0.56878	0.01967	-0.45256	0.06674	0.12785	0.02260
165310A	0.73513	0.02856	0.00803	0.04984	0.34051	0.01514
165688A	1.40635	0.03226	0.35848	0.01259	0.13344	0.00553
166047A	0.41002	0.01419	-0.68428	0.09132	0.06644	0.02576
166128A	0.21709	0.00846	-2.76753	0.10640	0.00000	0.00000
166433A	1.56074	0.04197	0.52725	0.01331	0.22610	0.00564
167658A	0.30694	0.00848	0.69115	0.03288	0.00000	0.00000
167682A	1.00338	0.02848	-0.45788	0.03341	0.28920	0.01366
167702A	0.51003	0.03282	2.10908	0.05935	0.11622	0.00980
167749A	0.55495	0.01057	-1.47768	0.02633	0.00000	0.00000
167780A	0.94022	0.03961	0.37312	0.03663	0.47365	0.00997
167788A	1.38705	0.04308	-0.23515	0.02528	0.44579	0.00976
167806A	1.28328	0.04087	0.41835	0.02003	0.34980	0.00742
167807A	0.80319	0.02127	-0.62180	0.04300	0.32606	0.01510
167818A	1.13068	0.03333	-0.79468	0.03694	0.36882	0.01552
167820A	1.28384	0.02691	0.05960	0.01364	0.09804	0.00622
167821A	0.80357	0.02567	0.09293	0.03412	0.22701	0.01236
167823A	0.63678	0.02151	0.55833	0.03181	0.09526	0.01116

Table K-2. 2015–16 OK EOI: IRT Parameters for Dichotomous Items - U.S. History – Form B

IREF	Parameters and Measures of Standard Error					
	a	SE (*a*)	*B*	SE (*b*)	*c*	SE (*c*)
140941A	1.01529	0.04876	0.64190	0.03275	0.35066	0.01068
141057A	0.41869	0.02516	-0.21840	0.14089	0.14145	0.03750
141078A	0.65513	0.03672	0.63942	0.05373	0.25614	0.01668
141099A	1.15139	0.03310	-1.60400	0.04086	0.08988	0.02388
141113A	0.76528	0.03701	0.01191	0.05941	0.34317	0.01863
141143A	0.90825	0.02608	-1.03618	0.04240	0.08976	0.02038
143252A	0.41759	0.02140	-1.26126	0.18241	0.14716	0.05114
143261A	0.45994	0.01217	-1.09993	0.03321	0.00000	0.00000
143287A	0.79431	0.03649	-0.06994	0.05671	0.33446	0.01853
143301A	0.87959	0.02092	0.08834	0.02334	0.22752	0.00890
143331A	0.63698	0.01179	-1.75268	0.04566	0.04782	0.01947
143337A	1.12119	0.02784	-1.41658	0.03031	0.04447	0.01522
143345A	1.30891	0.03720	-1.55577	0.03410	0.08545	0.02074
143361A	0.88703	0.02968	-0.02220	0.03266	0.14433	0.01357
143398A	0.73904	0.02714	-0.29622	0.04977	0.14546	0.01934
143416A	0.65269	0.03596	-1.00601	0.13496	0.42825	0.03709
143519A	0.28713	0.03151	-1.10427	0.56464	0.37876	0.08327
143525A	0.45154	0.01205	-1.05454	0.03302	0.00000	0.00000
143533A	0.31186	0.01115	-1.63431	0.06128	0.00000	0.00000
156378A	0.52937	0.01259	-0.64447	0.02396	0.00000	0.00000
156444A	1.02170	0.02504	-1.46420	0.03231	0.03996	0.01518
156460A	0.58217	0.01375	-1.31642	0.03026	0.00000	0.00000
156490A	0.73630	0.04217	0.41499	0.05895	0.38576	0.01651
156491A	0.35718	0.03120	1.16244	0.13029	0.39998	0.02339
156495A	1.00801	0.03222	0.23545	0.02412	0.13257	0.01019
156515A	0.76860	0.03028	-0.55925	0.06201	0.23196	0.02349
156518A	1.07499	0.04097	0.91959	0.02136	0.13665	0.00719
156524A	0.67463	0.03997	1.11142	0.04309	0.21316	0.01304
156528A	0.36704	0.00714	-1.60720	0.03191	0.00000	0.00000
156540A	0.89355	0.03508	0.91610	0.02459	0.11078	0.00821
157470A	0.54043	0.04333	0.70603	0.09447	0.38552	0.02216
157482A	1.27422	0.05330	0.48741	0.02563	0.35217	0.00943

IREF	Parameters and Measures of Standard Error					
	a	SE (*a*)	*B*	SE (*b*)	*c*	SE (*c*)
157496A	1.08045	0.04969	1.25509	0.02527	0.16151	0.00668
158336A	0.46341	0.02401	-1.08404	0.16336	0.17005	0.04820
158448A	1.24432	0.04643	-0.95276	0.04526	0.37819	0.02059
158654A	0.94929	0.03557	-0.92994	0.05848	0.30225	0.02464
164757A	0.68805	0.01916	-0.58257	0.03845	0.04087	0.01452
164760A	0.28828	0.01673	-1.03622	0.23016	0.11015	0.04713
164965A	1.04161	0.03608	0.37745	0.02442	0.17465	0.01000
164967A	0.43195	0.01512	-1.10883	0.08520	0.05585	0.02461
165077A	0.99711	0.03968	1.14989	0.02322	0.09776	0.00637
165292A	0.73634	0.02984	0.23446	0.04152	0.15880	0.01534
165654A	0.86543	0.04520	-1.24995	0.11051	0.53998	0.03173
166425A	0.91118	0.04199	0.66392	0.03297	0.27223	0.01128
167663A	0.77908	0.05480	1.89151	0.05453	0.16227	0.00790
167684A	1.02511	0.02784	-0.57908	0.02876	0.08811	0.01373
167688A	0.86135	0.03968	0.56428	0.03626	0.27022	0.01245
167706A	0.32186	0.03202	0.34720	0.25175	0.21903	0.04995
167718A	0.58115	0.03772	1.43946	0.04820	0.14141	0.01316
167748A	0.41265	0.01230	-1.74853	0.05059	0.00000	0.00000
167750A	0.76622	0.04302	0.11440	0.06732	0.44705	0.01788
167768A	0.81621	0.01871	-1.27134	0.03023	0.02385	0.01048
167774A	1.07624	0.04192	-1.39923	0.06620	0.34473	0.03092
167777A	1.02784	0.03840	-0.71542	0.04924	0.33392	0.02038
167783A	0.85310	0.02184	-0.97351	0.03496	0.04571	0.01526
167799A	0.45675	0.02510	-1.05775	0.17650	0.19056	0.05028
167807A	0.80319	0.02127	-0.62180	0.04300	0.32606	0.01510
167808A	1.14443	0.05767	0.82499	0.02919	0.37293	0.00905
176211A	0.22707	0.01023	-0.78096	0.05493	0.00000	0.00000
176782A	0.37635	0.01124	-0.13359	0.02844	0.00000	0.00000

Table K-3. 2015–16 OK EOI: IRT Parameters for Dichotomous Items – Algebra I- Form A

IREF	Parameters and Measures of Standard Error					
	a	SE (*a*)	*B*	SE (*b*)	*c*	SE (*c*)
142537A	1.02080	0.00000	0.73611	0.00000	0.25650	0.00000
142703A	0.95755	0.00000	-0.76820	0.00000	0.13058	0.00000
142771A	0.85984	0.00000	-0.42921	0.00000	0.06630	0.00000
142863A	1.51216	0.00000	0.21217	0.00000	0.19596	0.00000
142904A	1.29106	0.00000	0.25798	0.00000	0.15100	0.00000
142909A	0.94758	0.00000	-0.17391	0.00000	0.12227	0.00000
143092A	1.32814	0.00000	0.94553	0.00000	0.17420	0.00000
143140A	0.66402	0.00000	-0.12780	0.00000	0.16084	0.00000
143147A	0.74983	0.00000	0.01064	0.00000	0.22944	0.00000
143609A	1.02660	0.00000	-0.99434	0.00000	0.17760	0.00000
143610A	1.12404	0.00000	-0.32553	0.00000	0.17760	0.00000
143645A	1.44246	0.00000	-0.10928	0.00000	0.17190	0.00000
155718A	1.45928	0.00000	0.26463	0.00000	0.32567	0.00000
164426A	1.48828	0.00000	1.77978	0.00000	0.22080	0.00000
164568A	0.95679	0.00000	-1.48301	0.00000	0.04010	0.00000
164641A	0.93158	0.00000	-0.01811	0.00000	0.20331	0.00000
165640A	0.59204	0.00000	0.64336	0.00000	0.07968	0.00000
165662A	1.16319	0.00000	-0.52206	0.00000	0.07680	0.00000
165729A	1.07469	0.00000	0.05315	0.00000	0.13587	0.00000
165759A	1.11748	0.00000	-0.04784	0.00000	0.24570	0.00000
165761A	1.04256	0.00000	-0.87193	0.00000	0.09629	0.00000
165782A	1.08620	0.00000	-0.15373	0.00000	0.33853	0.00000
165786A	0.83123	0.00000	-0.66306	0.00000	0.20559	0.00000
165838A	1.74539	0.00000	0.10738	0.00000	0.16360	0.00000
165980A	0.94567	0.00000	-0.18915	0.00000	0.22539	0.00000
170043A	1.16635	0.00000	0.04085	0.00000	0.16977	0.00000
170078A	0.98466	0.00000	-1.24761	0.00000	0.07799	0.00000
170081A	1.29591	0.00000	-0.65460	0.00000	0.32016	0.00000

IREF	Parameters and Measures of Standard Error					
	a	SE (*a*)	*B*	SE (*b*)	*c*	SE (*c*)
170163A	1.13561	0.00000	0.26487	0.00000	0.12205	0.00000
170169A	0.99200	0.00000	0.78217	0.00000	0.18230	0.00000
170206A	1.39342	0.00000	0.39626	0.00000	0.19259	0.00000
170209A	0.77974	0.00000	1.02792	0.00000	0.16540	0.00000
170211A	1.21658	0.00000	-0.24617	0.00000	0.17958	0.00000
170373A	0.82344	0.00000	0.02730	0.00000	0.09196	0.00000
170448A	0.94031	0.00000	-0.72277	0.00000	0.08500	0.00000
170551A	0.89138	0.00000	-0.42578	0.00000	0.19263	0.00000
170748A	1.33643	0.00000	-0.64612	0.00000	0.20221	0.00000
170870A	1.14642	0.00000	-0.15381	0.00000	0.13481	0.00000
171330A	1.12633	0.00000	1.85279	0.00000	0.11466	0.00000
171361A	2.42345	0.00000	1.28851	0.00000	0.18092	0.00000
171446A	1.70436	0.00000	1.61387	0.00000	0.17236	0.00000
171584A	1.38565	0.00000	0.16807	0.00000	0.17208	0.00000
171770A	0.61684	0.00000	-0.36410	0.00000	0.30958	0.00000
171910A	1.23058	0.00000	0.68566	0.00000	0.35550	0.00000
172377A	1.05391	0.00000	-0.45510	0.00000	0.42007	0.00000
172430A	1.19421	0.00000	-0.00589	0.00000	0.61425	0.00000
172468A	0.89258	0.00000	-0.55519	0.00000	0.19290	0.00000
172845A	1.07597	0.00000	0.23881	0.00000	0.57571	0.00000
172884A	1.64262	0.00000	0.60464	0.00000	0.08149	0.00000
173318A	1.33322	0.00000	0.99427	0.00000	0.24609	0.00000
173583A	0.88004	0.00000	-1.19845	0.00000	0.09325	0.00000
173725A	0.88803	0.00000	0.80339	0.00000	0.20801	0.00000
173760A	1.17956	0.00000	-0.08353	0.00000	0.40231	0.00000
173914A	1.32209	0.00000	0.34074	0.00000	0.30878	0.00000
174002A	0.70174	0.00000	-1.37953	0.00000	0.10883	0.00000

Table K-4. 2015–16 OK EOI: IRT Parameters for Dichotomous Items – Algebra I- Form B

IREF	Parameters and Measures of Standard Error					
	a	SE (*a*)	*b*	SE (*b*)	*c*	SE (*c*)
142680A	1.45521	0.00000	-0.20777	0.00000	0.33937	0.00000
142790A	0.93820	0.00000	-0.93676	0.00000	0.26652	0.00000
143082A	1.33049	0.00000	-0.99258	0.00000	0.13060	0.00000
143120A	0.84178	0.00000	-0.01774	0.00000	0.24782	0.00000
143141A	1.23974	0.00000	0.15765	0.00000	0.03297	0.00000
143144A	0.96300	0.00000	0.04530	0.00000	0.28396	0.00000
143145A	1.55967	0.00000	0.34550	0.00000	0.19521	0.00000
164071A	1.18900	0.00000	1.27988	0.00000	0.35260	0.00000
164565A	1.27948	0.00000	0.62331	0.00000	0.12940	0.00000
164573A	1.00428	0.00000	0.78223	0.00000	0.21881	0.00000
164651A	1.40140	0.00000	-0.63977	0.00000	0.26990	0.00000
164691A	1.16472	0.00000	-0.15272	0.00000	0.16383	0.00000
164695A	1.00970	0.00000	0.96249	0.00000	0.14393	0.00000
164697A	0.58444	0.00000	0.14525	0.00000	0.16684	0.00000
164751A	1.21061	0.00000	-0.75809	0.00000	0.18036	0.00000
165067A	1.29413	0.00000	0.16491	0.00000	0.15187	0.00000
165712A	0.95332	0.00000	-0.08146	0.00000	0.12262	0.00000
165748A	1.18445	0.00000	-0.20793	0.00000	0.27833	0.00000
165767A	0.95576	0.00000	0.00361	0.00000	0.21983	0.00000
165835A	0.93741	0.00000	-0.99267	0.00000	0.07617	0.00000
165839A	0.87001	0.00000	0.49194	0.00000	0.40475	0.00000
165918A	0.92990	0.00000	-0.22051	0.00000	0.19943	0.00000
165978A	0.97356	0.00000	0.04824	0.00000	0.13709	0.00000
165988A	1.54702	0.00000	-0.27495	0.00000	0.13956	0.00000
165991A	1.42099	0.00000	0.13895	0.00000	0.28927	0.00000
169896A	0.99243	0.00000	0.06780	0.00000	0.18148	0.00000
169999A	1.45294	0.00000	0.75947	0.00000	0.28190	0.00000
170039A	1.73791	0.00000	0.71994	0.00000	0.28215	0.00000
170040A	1.16985	0.00000	0.01658	0.00000	0.07350	0.00000
170066A	1.55452	0.00000	0.07054	0.00000	0.20455	0.00000
170071A	0.71807	0.00000	-1.10602	0.00000	0.06373	0.00000
170076A	0.16090	0.00000	-0.29946	0.00000	0.17800	0.00000
170080A	0.65279	0.00000	-1.17236	0.00000	0.11581	0.00000
170097A	0.63403	0.00000	-0.16453	0.00000	0.23432	0.00000
170108A	0.88068	0.00000	-0.79266	0.00000	0.13625	0.00000
170111A	1.62111	0.00000	-0.06996	0.00000	0.38058	0.00000
170374A	1.38822	0.00000	0.62821	0.00000	0.55051	0.00000
170435A	1.32720	0.00000	0.29942	0.00000	0.13607	0.00000
170505A	1.18904	0.00000	0.21422	0.00000	0.18248	0.00000
170775A	1.51494	0.00000	0.57115	0.00000	0.15945	0.00000
170846A	1.00617	0.00000	-0.49513	0.00000	0.23353	0.00000
170853A	0.90165	0.00000	-0.28910	0.00000	0.12646	0.00000
171330A	1.12633	0.00000	1.85279	0.00000	0.11466	0.00000
172084A	0.70356	0.00000	-0.86970	0.00000	0.16250	0.00000
172247A	1.18001	0.00000	-0.32449	0.00000	0.17260	0.00000
172407A	0.99889	0.00000	-0.15039	0.00000	0.28063	0.00000
172870A	0.70462	0.00000	-0.81569	0.00000	0.12895	0.00000
172871A	0.75803	0.00000	-0.70460	0.00000	0.48762	0.00000
173303A	1.41452	0.00000	0.58140	0.00000	0.32486	0.00000
173543A	1.25167	0.00000	-0.48358	0.00000	0.14574	0.00000
173548A	1.52704	0.00000	-0.34733	0.00000	0.31893	0.00000
173644A	1.05014	0.00000	0.56971	0.00000	0.34962	0.00000
173702A	1.97773	0.00000	1.51596	0.00000	0.19477	0.00000
173745A	0.63170	0.00000	-0.47701	0.00000	0.10423	0.00000
173839A	1.15969	0.00000	1.67172	0.00000	0.10481	0.00000

Table K-5. 2015–16 OK EOI: IRT Parameters for Dichotomous Items – Algebra II- Form A

IREF	Parameters and Measures of Standard Error					
	a	SE (*a*)	*b*	SE (*b*)	*c*	SE (*c*)
141978A	0.76191	0.00000	-0.44892	0.00000	0.08500	0.00000
142847A	1.65739	0.00000	0.99238	0.00000	0.33113	0.00000
143020A	0.95848	0.00000	1.67151	0.00000	0.09901	0.00000
143160A	0.97090	0.00000	-0.24308	0.00000	0.09280	0.00000
143306A	1.16908	0.00000	0.56093	0.00000	0.22110	0.00000
143740A	0.86293	0.00000	2.16962	0.00000	0.37390	0.00000
143750A	1.31483	0.00000	1.42440	0.00000	0.28020	0.00000
155727A	0.61153	0.00000	0.80082	0.00000	0.20778	0.00000
155760A	0.99017	0.00000	1.04726	0.00000	0.31600	0.00000
155761A	1.38424	0.00000	0.92919	0.00000	0.12288	0.00000
155762A	1.12821	0.00000	0.81923	0.00000	0.26169	0.00000
155767A	0.80818	0.00000	0.23572	0.00000	0.12220	0.00000
155770A	0.53133	0.00000	0.45813	0.00000	0.25314	0.00000
155776A	1.18991	0.00000	0.78278	0.00000	0.28569	0.00000
155847A	1.02411	0.00000	0.69607	0.00000	0.20729	0.00000
156088A	0.93311	0.00000	-1.28977	0.00000	0.24032	0.00000
157602A	1.25261	0.00000	1.02939	0.00000	0.17350	0.00000
164081A	1.33026	0.00000	0.29447	0.00000	0.19900	0.00000
164125A	0.83209	0.00000	2.46284	0.00000	0.17290	0.00000
164217A	1.33026	0.00000	2.64167	0.00000	0.20060	0.00000
164689A	1.25467	0.00000	0.85132	0.00000	0.20081	0.00000
164692A	1.06461	0.00000	0.13849	0.00000	0.18325	0.00000
164705A	0.81631	0.00000	-1.65612	0.00000	0.10876	0.00000
164729A	0.96917	0.00000	0.62399	0.00000	0.11760	0.00000
164755A	1.40179	0.00000	0.87536	0.00000	0.28374	0.00000
164799A	0.78332	0.00000	0.56088	0.00000	0.27552	0.00000
164809A	0.67213	0.00000	-1.40869	0.00000	0.13786	0.00000
164814A	0.74186	0.00000	-0.57958	0.00000	0.10381	0.00000

IREF	Parameters and Measures of Standard Error					
	a	SE (*a*)	*b*	SE (*b*)	*c*	SE (*c*)
164821A	0.77367	0.00000	0.05067	0.00000	0.12460	0.00000
164857A	1.29090	0.00000	0.46358	0.00000	0.21432	0.00000
164861A	1.39873	0.00000	0.30922	0.00000	0.18943	0.00000
164922A	1.38340	0.00000	-0.09996	0.00000	0.09018	0.00000
164937A	1.08418	0.00000	0.30023	0.00000	0.14401	0.00000
164943A	0.60448	0.00000	-0.09233	0.00000	0.11293	0.00000
164952A	0.78431	0.00000	0.89242	0.00000	0.09701	0.00000
164972A	1.20152	0.00000	0.56746	0.00000	0.43504	0.00000
165011A	1.00484	0.00000	0.83113	0.00000	0.15648	0.00000
165023A	1.41549	0.00000	0.42485	0.00000	0.23335	0.00000
165065A	1.09191	0.00000	0.79746	0.00000	0.39672	0.00000
173109A	0.79160	0.00000	-0.27959	0.00000	0.06669	0.00000
173342A	0.80175	0.00000	-1.74958	0.00000	0.03069	0.00000
174052A	0.84358	0.00000	0.50180	0.00000	0.07272	0.00000
174260A	1.34932	0.00000	0.92277	0.00000	0.19502	0.00000
176130A	0.59884	0.00000	-0.56622	0.00000	0.08218	0.00000
178685A	1.01817	0.00000	0.52584	0.00000	0.23794	0.00000
178960A	1.05335	0.00000	0.21785	0.00000	0.27490	0.00000
179150A	1.44878	0.00000	1.08359	0.00000	0.17649	0.00000
179406A	0.79466	0.00000	-0.72712	0.00000	0.11953	0.00000
179407A	0.90391	0.00000	0.51711	0.00000	0.55577	0.00000
179502A	0.79122	0.00000	2.09207	0.00000	0.12528	0.00000
180262A	0.89923	0.00000	1.84986	0.00000	0.24366	0.00000
180275A	1.00348	0.00000	-0.48823	0.00000	0.12653	0.00000
180697A	0.87675	0.00000	2.40797	0.00000	0.30287	0.00000
180830A	1.16759	0.00000	-0.25254	0.00000	0.21463	0.00000
181091A	1.55680	0.00000	1.61681	0.00000	0.13559	0.00000

Table K-6. 2015–16 OK EOI: IRT Parameters for Dichotomous Items – Algebra II- Form B

IREF	Parameters and Measures of Standard Error					
	a	SE (*a*)	*b*	SE (*b*)	*c*	SE (*c*)
142803A	0.77733	0.00000	0.49773	0.00000	0.20700	0.00000
142905A	0.84283	0.00000	-0.27228	0.00000	0.03901	0.00000
142907A	1.22329	0.00000	0.65690	0.00000	0.14667	0.00000
142996A	1.57019	0.00000	0.63654	0.00000	0.16063	0.00000
143025A	1.72686	0.00000	1.73454	0.00000	0.14525	0.00000
143026A	0.94650	0.00000	0.40335	0.00000	0.22112	0.00000
143159A	0.97861	0.00000	0.24321	0.00000	0.14590	0.00000
143448A	0.89763	0.00000	-0.50359	0.00000	0.15570	0.00000
155715A	0.39098	0.00000	-0.88315	0.00000	0.13682	0.00000
155834A	0.81975	0.00000	0.59619	0.00000	0.19044	0.00000
155848A	0.90997	0.00000	-0.29907	0.00000	0.12969	0.00000
155853A	1.00328	0.00000	0.25733	0.00000	0.07873	0.00000
156129A	1.41509	0.00000	0.48271	0.00000	0.12548	0.00000
156131A	0.92463	0.00000	0.30024	0.00000	0.15711	0.00000
156286A	0.64932	0.00000	0.97243	0.00000	0.16266	0.00000
164683A	0.67072	0.00000	0.19376	0.00000	0.14899	0.00000
164684A	0.53961	0.00000	-0.20039	0.00000	0.13986	0.00000
164694A	1.33906	0.00000	0.73046	0.00000	0.23329	0.00000
164710A	1.03143	0.00000	0.88107	0.00000	0.27277	0.00000
164736A	0.84887	0.00000	0.58731	0.00000	0.24489	0.00000
164750A	1.10641	0.00000	0.85636	0.00000	0.21061	0.00000
164753A	0.78075	0.00000	-0.23913	0.00000	0.13508	0.00000
164758A	0.78289	0.00000	1.15281	0.00000	0.42935	0.00000
164837A	0.51434	0.00000	1.73648	0.00000	0.22541	0.00000
164898A	0.55615	0.00000	0.52349	0.00000	0.22020	0.00000
164908A	1.03036	0.00000	0.52354	0.00000	0.14145	0.00000
164952A	0.78431	0.00000	0.89242	0.00000	0.09701	0.00000
164955A	0.59934	0.00000	-0.33124	0.00000	0.17083	0.00000
164969A	1.11243	0.00000	0.55816	0.00000	0.13484	0.00000
164976A	1.21612	0.00000	0.75124	0.00000	0.18081	0.00000
165019A	0.84024	0.00000	-0.21516	0.00000	0.15463	0.00000
165052A	1.34772	0.00000	0.63174	0.00000	0.15954	0.00000
165076A	1.01920	0.00000	0.12453	0.00000	0.20055	0.00000
173109A	0.79160	0.00000	-0.27959	0.00000	0.06669	0.00000
173156A	0.81712	0.00000	0.87733	0.00000	0.14452	0.00000
173170A	1.13962	0.00000	0.40368	0.00000	0.30801	0.00000
173355A	0.83962	0.00000	-0.10633	0.00000	0.38567	0.00000
173491A	1.06627	0.00000	-0.16987	0.00000	0.12880	0.00000
173845A	0.70026	0.00000	0.40023	0.00000	0.24721	0.00000
173963A	1.01729	0.00000	0.67126	0.00000	0.21020	0.00000
176153A	1.09985	0.00000	-0.34783	0.00000	0.14518	0.00000
176279A	0.85582	0.00000	0.79485	0.00000	0.10010	0.00000
178696A	1.39230	0.00000	0.53884	0.00000	0.20755	0.00000
178710A	0.54691	0.00000	-0.26606	0.00000	0.17768	0.00000
178897A	0.91013	0.00000	0.42988	0.00000	0.14918	0.00000
179103A	1.03561	0.00000	1.34647	0.00000	0.33359	0.00000
179316A	1.07525	0.00000	0.09080	0.00000	0.14959	0.00000
179342A	0.79041	0.00000	1.09003	0.00000	0.09625	0.00000
179425A	1.43347	0.00000	2.01949	0.00000	0.21884	0.00000
179597A	1.14099	0.00000	0.29109	0.00000	0.23740	0.00000
179939A	1.06957	0.00000	0.15484	0.00000	0.17436	0.00000
180390A	0.87115	0.00000	0.10655	0.00000	0.07785	0.00000
180543A	0.96455	0.00000	2.06640	0.00000	0.41264	0.00000
180865A	0.78828	0.00000	-0.06293	0.00000	0.16838	0.00000
180977A	1.36562	0.00000	2.13765	0.00000	0.30100	0.00000

Table K-7. 2015–16 OK EOI: IRT Parameters for Dichotomous Items – Biology- Form A

IREF	Parameters and Measures of Standard Error					
	a	SE (*a*)	*b*	SE (*b*)	*c*	SE (*c*)
142590A	1.38229	0.00000	0.59447	0.00000	0.34314	0.00000
142597A	0.81772	0.00000	-1.71107	0.00000	0.32938	0.00000
142621A	0.60507	0.00000	-0.29041	0.00000	0.16844	0.00000
142664A	0.89728	0.00000	-1.42025	0.00000	0.24683	0.00000
142682A	0.71488	0.00000	-1.07125	0.00000	0.12331	0.00000
143161A	1.05486	0.00000	-0.70636	0.00000	0.40830	0.00000
143172A	0.79478	0.00000	0.77415	0.00000	0.18450	0.00000
143185A	0.66474	0.00000	-1.55483	0.00000	0.08360	0.00000
143247A	1.03038	0.00000	-0.88352	0.00000	0.27830	0.00000
143256A	0.84373	0.00000	0.17874	0.00000	0.27890	0.00000
143322A	0.89651	0.00000	-0.40475	0.00000	0.26180	0.00000
143385A	1.03420	0.00000	-0.86109	0.00000	0.32580	0.00000
143390A	1.07321	0.00000	-0.22701	0.00000	0.14530	0.00000
143500A	0.57447	0.00000	-0.51412	0.00000	0.12840	0.00000
143501A	0.56835	0.00000	-0.39904	0.00000	0.07940	0.00000
143537A	0.72134	0.00000	0.53859	0.00000	0.28240	0.00000
143556A	1.17036	0.00000	1.11551	0.00000	0.31680	0.00000
155780A	1.10840	0.00000	-0.06309	0.00000	0.26183	0.00000
155786A	0.48574	0.00000	0.66494	0.00000	0.24555	0.00000
155789A	0.94470	0.00000	-0.28296	0.00000	0.16213	0.00000
155802A	0.31210	0.00000	-1.15159	0.00000	0.18991	0.00000
155808A	0.36105	0.00000	-2.92180	0.00000	0.00000	0.00000
155815A	1.20634	0.00000	0.02228	0.00000	0.23290	0.00000
155833A	0.31210	0.00000	-1.95489	0.00000	0.11147	0.00000
155841A	0.79172	0.00000	-0.57243	0.00000	0.16093	0.00000
155864A	0.94623	0.00000	-0.29891	0.00000	0.20082	0.00000
155875A	0.81696	0.00000	-0.66576	0.00000	0.24325	0.00000
155878A	0.96306	0.00000	-2.56083	0.00000	0.06179	0.00000
155880A	0.72440	0.00000	-0.07084	0.00000	0.34845	0.00000
155891A	0.48727	0.00000	-0.66270	0.00000	0.05204	0.00000
155917A	0.52093	0.00000	-0.17221	0.00000	0.22960	0.00000
155919A	0.69610	0.00000	-1.72371	0.00000	0.03038	0.00000
155958A	0.92558	0.00000	-0.51311	0.00000	0.23613	0.00000
155962A	0.50104	0.00000	-1.30711	0.00000	0.18331	0.00000
155963A	1.06557	0.00000	-0.57706	0.00000	0.27397	0.00000
155973A	0.87203	0.00000	-1.28450	0.00000	0.19068	0.00000
156745A	0.84832	0.00000	-0.87390	0.00000	0.09640	0.00000
157007A	0.43050	0.00000	-2.81063	0.00000	0.14461	0.00000
157071A	0.70686	0.00000	-1.10039	0.00000	0.27270	0.00000
157177A	0.22109	0.00000	1.71622	0.00000	0.18993	0.00000
157707A	0.87982	0.00000	-0.55201	0.00000	0.18093	0.00000
157709A	0.80009	0.00000	0.20819	0.00000	0.18405	0.00000
168637A	0.95523	0.00000	-1.54979	0.00000	0.35790	0.00000
168658A	0.25785	0.00000	-0.76603	0.00000	0.16958	0.00000
168663A	1.15443	0.00000	0.22062	0.00000	0.20662	0.00000
168670A	0.50456	0.00000	-1.52165	0.00000	0.22834	0.00000
168712A	0.95522	0.00000	0.27598	0.00000	0.40211	0.00000
168723A	0.33483	0.00000	-0.01416	0.00000	0.15847	0.00000
168731A	0.54183	0.00000	-1.83092	0.00000	0.13116	0.00000
168743A	1.08640	0.00000	-0.86543	0.00000	0.14119	0.00000
168762A	1.24844	0.00000	-0.16885	0.00000	0.20699	0.00000
168793A	1.36363	0.00000	-0.42153	0.00000	0.39808	0.00000
168796A	0.93331	0.00000	0.06115	0.00000	0.31158	0.00000
168807A	1.18763	0.00000	0.54030	0.00000	0.36739	0.00000
168831A	0.76770	0.00000	-1.50770	0.00000	0.11624	0.00000
168905A	0.67025	0.00000	-0.53054	0.00000	0.07346	0.00000
168910A	1.04062	0.00000	-0.56105	0.00000	0.26085	0.00000
169088A	0.82843	0.00000	-0.44657	0.00000	0.25820	0.00000
169148A	0.69151	0.00000	-0.58180	0.00000	0.11240	0.00000
175113A	0.72042	0.00000	-2.00960	0.00000	0.09854	0.00000

Table K-8. 2015–16 OK EOI: IRT Parameters for Dichotomous Items – Biology- Form B

IREF	Parameters and Measures of Standard Error					
	a	SE (*a*)	*b*	SE (*b*)	*c*	SE (*c*)
142587A	0.93185	0.00000	-0.11241	0.00000	0.32653	0.00000
142664A	0.89728	0.00000	-1.42025	0.00000	0.24683	0.00000
142690A	0.97989	0.00000	-1.05223	0.00000	0.19201	0.00000
142706A	0.93037	0.00000	0.14317	0.00000	0.04779	0.00000
143172A	0.79478	0.00000	0.77415	0.00000	0.18450	0.00000
143199A	0.78636	0.00000	-0.01475	0.00000	0.24510	0.00000
143201A	1.18719	0.00000	-0.56992	0.00000	0.23040	0.00000
143205A	1.16424	0.00000	-0.48453	0.00000	0.18480	0.00000
143236A	0.92329	0.00000	0.28058	0.00000	0.14330	0.00000
143242A	1.06098	0.00000	-0.80249	0.00000	0.15920	0.00000
143243A	0.71063	0.00000	-0.20225	0.00000	0.26500	0.00000
143247A	1.03038	0.00000	-0.88352	0.00000	0.27830	0.00000
143267A	1.18566	0.00000	0.09970	0.00000	0.39495	0.00000
143269A	1.15353	0.00000	0.50029	0.00000	0.15910	0.00000
143270A	1.26522	0.00000	-1.49604	0.00000	0.07550	0.00000
143303A	0.85215	0.00000	-0.51731	0.00000	0.09670	0.00000
143322A	0.89651	0.00000	-0.40475	0.00000	0.26180	0.00000
143461A	0.97224	0.00000	-1.34818	0.00000	0.17420	0.00000
143474A	0.50027	0.00000	-2.49962	0.00000	0.20000	0.00000
143482A	1.05486	0.00000	-0.60879	0.00000	0.24790	0.00000
143507A	0.30827	0.00000	-2.88991	0.00000	0.20000	0.00000
143539A	1.08316	0.00000	-1.20516	0.00000	0.23310	0.00000
155748A	1.15430	0.00000	-0.23794	0.00000	0.25245	0.00000
155779A	0.77565	0.00000	-1.33174	0.00000	0.14868	0.00000
155780A	1.10840	0.00000	-0.06309	0.00000	0.26183	0.00000
155791A	0.94394	0.00000	-1.69946	0.00000	0.03093	0.00000
155794A	0.82614	0.00000	-1.05712	0.00000	0.22166	0.00000
155804A	0.44137	0.00000	-3.19541	0.00000	0.00000	0.00000
155806A	0.88427	0.00000	-1.56531	0.00000	0.16375	0.00000
155808A	0.36105	0.00000	-2.92180	0.00000	0.00000	0.00000

IREF	Parameters and Measures of Standard Error					
	a	SE (*a*)	*b*	SE (*b*)	*c*	SE (*c*)
155814A	0.80778	0.00000	-0.52636	0.00000	0.18631	0.00000
155820A	0.59589	0.00000	-0.86865	0.00000	0.16327	0.00000
155841A	0.79172	0.00000	-0.57243	0.00000	0.16093	0.00000
155864A	0.94623	0.00000	-0.29891	0.00000	0.20082	0.00000
155875A	0.81696	0.00000	-0.66576	0.00000	0.24325	0.00000
155877A	1.03420	0.00000	-1.28318	0.00000	0.17940	0.00000
155881A	0.73129	0.00000	-0.98441	0.00000	0.31498	0.00000
155912A	0.67544	0.00000	-0.34446	0.00000	0.06224	0.00000
155971A	0.55994	0.00000	0.39280	0.00000	0.27716	0.00000
156693A	0.87946	0.00000	-0.11013	0.00000	0.11859	0.00000
156703A	1.37919	0.00000	0.24592	0.00000	0.12910	0.00000
157168A	0.93706	0.00000	0.03092	0.00000	0.10580	0.00000
157720A	0.81623	0.00000	-1.27011	0.00000	0.13841	0.00000
157722A	0.43263	0.00000	-0.21838	0.00000	0.09258	0.00000
157725A	0.62743	0.00000	-0.12787	0.00000	0.15215	0.00000
157781A	1.11452	0.00000	0.00269	0.00000	0.23619	0.00000
157785A	0.64867	0.00000	-0.23022	0.00000	0.13832	0.00000
157829A	0.42880	0.00000	-1.76393	0.00000	0.00000	0.00000
158645A	0.62037	0.00000	-2.14491	0.00000	0.24154	0.00000
168671A	0.65085	0.00000	-1.75155	0.00000	0.11889	0.00000
168672A	0.88842	0.00000	-0.97460	0.00000	0.18090	0.00000
168725A	0.61879	0.00000	-0.87528	0.00000	0.09268	0.00000
168744A	1.05007	0.00000	0.77771	0.00000	0.16860	0.00000
168831A	0.76770	0.00000	-1.50770	0.00000	0.11624	0.00000
168897A	0.73682	0.00000	0.23852	0.00000	0.17239	0.00000
169030A	0.61195	0.00000	-1.37608	0.00000	0.20000	0.00000
174676A	0.84030	0.00000	-1.06061	0.00000	0.22794	0.00000
175100A	0.76995	0.00000	0.20569	0.00000	0.34680	0.00000
175247A	0.64068	0.00000	-1.57510	0.00000	0.03524	0.00000
175278A	0.66587	0.00000	-0.15620	0.00000	0.36217	0.00000

Table K-9. 2015–16 OK EOI: IRT Parameters for Dichotomous Items – English II- Form A

IREF	Parameters and Measures of Standard Error					
	a	SE (*a*)	*b*	SE (*b*)	*c*	SE (*c*)
141540A	1.23646	0.00000	-1.52986	0.00000	0.07865	0.00000
141544A	0.84296	0.00000	-0.42421	0.00000	0.27388	0.00000
141579A	1.47815	0.00000	-1.53470	0.00000	0.14224	0.00000
141582A	1.52395	0.00000	0.00287	0.00000	0.21952	0.00000
141584A	1.08805	0.00000	-0.10579	0.00000	0.10935	0.00000
141585A	0.67420	0.00000	-1.33302	0.00000	0.10398	0.00000
141586A	1.54515	0.00000	-0.60298	0.00000	0.19355	0.00000
141587A	1.54685	0.00000	-1.12213	0.00000	0.24873	0.00000
141588A	0.46558	0.00000	-1.23902	0.00000	0.00000	0.00000
141632A	1.09568	0.00000	-0.09208	0.00000	0.21529	0.00000
141633A	1.29752	0.00000	-0.33721	0.00000	0.23664	0.00000
141634A	0.82091	0.00000	-0.87658	0.00000	0.11102	0.00000
141635A	1.08890	0.00000	-1.55883	0.00000	0.06552	0.00000
141637A	1.02529	0.00000	0.63050	0.00000	0.16300	0.00000
141638A	0.68862	0.00000	0.56838	0.00000	0.14704	0.00000
144193A	0.84381	0.00000	0.21353	0.00000	0.40570	0.00000
144194A	0.78360	0.00000	0.13883	0.00000	0.25630	0.00000
144196A	0.35788	0.00000	-1.30699	0.00000	0.20000	0.00000
144198A	0.32396	0.00000	-1.30790	0.00000	0.20000	0.00000
144199A	1.03293	0.00000	0.24234	0.00000	0.26640	0.00000
144201A	0.46304	0.00000	-1.00819	0.00000	0.20000	0.00000
144203A	0.84805	0.00000	-0.27519	0.00000	0.37710	0.00000
144205A	1.01173	0.00000	0.31779	0.00000	0.21030	0.00000
144206A	0.94558	0.00000	0.83782	0.00000	0.26370	0.00000
144207A	0.45880	0.00000	0.58438	0.00000	0.30790	0.00000
144208A	0.24169	0.00000	0.29383	0.00000	0.20000	0.00000
144229A	0.42063	0.00000	-0.48069	0.00000	0.00000	0.00000
144253A	1.08381	0.00000	0.34955	0.00000	0.19610	0.00000
144254A	0.88876	0.00000	-0.78130	0.00000	0.20000	0.00000
144256A	1.08211	0.00000	0.82390	0.00000	0.28170	0.00000
144258A	0.77258	0.00000	-0.88080	0.00000	0.19070	0.00000

IREF	Parameters and Measures of Standard Error					
	a	SE (*a*)	*b*	SE (*b*)	*c*	SE (*c*)
144288A	0.68692	0.00000	0.88492	0.00000	0.18240	0.00000
144289A	1.07703	0.00000	-1.02573	0.00000	0.20000	0.00000
144291A	1.06176	0.00000	-0.28857	0.00000	0.14120	0.00000
144292A	1.17116	0.00000	0.87456	0.00000	0.35000	0.00000
144293A	1.04226	0.00000	-0.31337	0.00000	0.20850	0.00000
157564A	0.93151	0.00000	0.54895	0.00000	0.32989	0.00000
157568A	1.10885	0.00000	-1.18453	0.00000	0.05727	0.00000
157570A	0.25785	0.00000	-1.02216	0.00000	0.12350	0.00000
157572A	0.33187	0.00000	0.51879	0.00000	0.12476	0.00000
176934A	0.54094	0.00000	-0.78442	0.00000	0.16801	0.00000
176935A	0.48801	0.00000	0.54310	0.00000	0.15469	0.00000
176937A	1.14462	0.00000	-0.98213	0.00000	0.47958	0.00000
176938A	0.44343	0.00000	-0.68095	0.00000	0.13995	0.00000
176939A	1.55614	0.00000	-0.63519	0.00000	0.28154	0.00000
176944A	0.49245	0.00000	-1.27871	0.00000	0.10919	0.00000
176945A	0.48204	0.00000	-0.03165	0.00000	0.27326	0.00000
179039A	0.51201	0.00000	-0.53922	0.00000	0.05066	0.00000
179042A	1.23825	0.00000	-0.44488	0.00000	0.23568	0.00000
179051A	1.19652	0.00000	0.45608	0.00000	0.15902	0.00000
179081A	0.63447	0.00000	0.26763	0.00000	0.07191	0.00000
179091A	1.37050	0.00000	-1.18697	0.00000	0.11339	0.00000
179099A	1.38091	0.00000	0.14402	0.00000	0.21375	0.00000
179101A	0.45846	0.00000	-0.63231	0.00000	0.05813	0.00000
180524A	0.57670	0.00000	-2.67792	0.00000	0.21926	0.00000
180526A	0.84988	0.00000	0.31843	0.00000	0.14307	0.00000
180529A	0.91666	0.00000	-0.06738	0.00000	0.50058	0.00000
180530A	0.94094	0.00000	0.97893	0.00000	0.21417	0.00000
180542A	1.26268	0.00000	1.05776	0.00000	0.23148	0.00000
180545A	0.91059	0.00000	-0.89259	0.00000	0.43979	0.00000

Table K-10. 2015–16 OK EOI: IRT Parameters for Dichotomous Items – English II- Form B

IREF	Parameters and Measures of Standard Error					
	a	SE (*a*)	*b*	SE (*b*)	*c*	SE (*c*)
141042A	0.47491	0.00000	-0.80781	0.00000	0.05911	0.00000
141043A	0.76833	0.00000	-0.34369	0.00000	0.16793	0.00000
141052A	0.76833	0.00000	0.30380	0.00000	0.18067	0.00000
141053A	0.65978	0.00000	0.67173	0.00000	0.27048	0.00000
141059A	0.82176	0.00000	-0.34698	0.00000	0.20647	0.00000
141062A	0.52410	0.00000	3.24833	0.00000	0.21682	0.00000
141293A	0.83703	0.00000	0.02036	0.00000	0.32077	0.00000
141298A	0.63265	0.00000	-1.34638	0.00000	0.09604	0.00000
141300A	0.71576	0.00000	0.68761	0.00000	0.28270	0.00000
141313A	0.69540	0.00000	-0.51749	0.00000	0.06520	0.00000
141314A	1.04565	0.00000	-0.30781	0.00000	0.19034	0.00000
141315A	0.60975	0.00000	1.05270	0.00000	0.11455	0.00000
141316A	1.13300	0.00000	0.19630	0.00000	0.27803	0.00000
141430A	0.70388	0.00000	0.18848	0.00000	0.15588	0.00000
141461A	0.93710	0.00000	-0.83304	0.00000	0.21301	0.00000
141465A	0.77258	0.00000	-0.50967	0.00000	0.11206	0.00000
141469A	0.41300	0.00000	-1.66499	0.00000	0.00000	0.00000
176876A	1.30105	0.00000	1.11164	0.00000	0.22882	0.00000
176880A	0.90907	0.00000	1.37284	0.00000	0.10654	0.00000
176883A	0.66500	0.00000	-0.83124	0.00000	0.22964	0.00000
176919A	0.66903	0.00000	-1.04717	0.00000	0.15827	0.00000
177004A	0.32642	0.00000	-1.93497	0.00000	0.13942	0.00000
177007A	0.34024	0.00000	-1.04705	0.00000	0.14261	0.00000
177009A	1.06447	0.00000	0.75889	0.00000	0.27368	0.00000
177011A	1.00472	0.00000	-1.56965	0.00000	0.18985	0.00000
177287A	1.40168	0.00000	-1.27154	0.00000	0.19695	0.00000
177293A	1.03727	0.00000	-0.19035	0.00000	0.33337	0.00000
177294A	1.55308	0.00000	-1.50957	0.00000	0.14692	0.00000
177297A	0.93311	0.00000	-1.40835	0.00000	0.10459	0.00000
177483A	0.39282	0.00000	-0.42106	0.00000	0.03213	0.00000

IREF	Parameters and Measures of Standard Error					
	a	SE (*a*)	*b*	SE (*b*)	*c*	SE (*c*)
177484A	0.38613	0.00000	-1.19378	0.00000	0.06423	0.00000
178097A	0.49986	0.00000	0.57016	0.00000	0.14504	0.00000
178099A	1.40185	0.00000	-0.29319	0.00000	0.30442	0.00000
178101A	0.54044	0.00000	-1.06683	0.00000	0.07789	0.00000
178102A	0.32693	0.00000	0.26406	0.00000	0.11755	0.00000
178103A	0.79972	0.00000	1.09699	0.00000	0.18687	0.00000
178104A	1.76815	0.00000	-0.56056	0.00000	0.21559	0.00000
178399A	0.77202	0.00000	-1.20483	0.00000	0.22296	0.00000
178401A	0.83607	0.00000	-1.00310	0.00000	0.18437	0.00000
178403A	0.68082	0.00000	0.25812	0.00000	0.23635	0.00000
178404A	0.37413	0.00000	-1.64438	0.00000	0.14405	0.00000
179822A	0.64608	0.00000	-1.00004	0.00000	0.16953	0.00000
179824A	0.79567	0.00000	-1.28696	0.00000	0.08399	0.00000
179830A	0.88045	0.00000	-0.79286	0.00000	0.13482	0.00000
179832A	1.41879	0.00000	0.29503	0.00000	0.30302	0.00000
179834A	0.80646	0.00000	0.23033	0.00000	0.11866	0.00000
180524A	0.57670	0.00000	-2.67792	0.00000	0.21926	0.00000
180526A	0.84988	0.00000	0.31843	0.00000	0.14307	0.00000
180529A	0.91666	0.00000	-0.06738	0.00000	0.50058	0.00000
180530A	0.94094	0.00000	0.97893	0.00000	0.21417	0.00000
180542A	1.26268	0.00000	1.05776	0.00000	0.23148	0.00000
180545A	0.91059	0.00000	-0.89259	0.00000	0.43979	0.00000
180736A	1.42134	0.00000	-0.12638	0.00000	0.62024	0.00000
180755A	1.27851	0.00000	0.25154	0.00000	0.24586	0.00000
180767A	0.94589	0.00000	-0.38804	0.00000	0.36872	0.00000
180769A	1.39861	0.00000	-0.91003	0.00000	0.13111	0.00000
180771A	0.30449	0.00000	-1.67644	0.00000	0.15840	0.00000
180772A	0.67931	0.00000	-0.08800	0.00000	0.38848	0.00000
180774A	0.55286	0.00000	-2.24688	0.00000	0.14425	0.00000
180798A	0.81474	0.00000	0.35029	0.00000	0.30350	0.00000

Table K-11. 2015–16 OK EOI: IRT Parameters for Dichotomous Items – English III- Form A

IREF	Parameters and Measures of Standard Error					
	a	SE (*a*)	*b*	SE (*b*)	*c*	SE (*c*)
157116A	1.40600	0.00000	-0.44617	0.00000	0.13116	0.00000
157117A	0.94936	0.00000	-0.47171	0.00000	0.11867	0.00000
157118A	0.55625	0.00000	1.13103	0.00000	0.17499	0.00000
157119A	0.77555	0.00000	0.96720	0.00000	0.23079	0.00000
157120A	0.92398	0.00000	0.96331	0.00000	0.32774	0.00000
157379A	1.12608	0.00000	-0.30302	0.00000	0.15063	0.00000
157381A	0.51361	0.00000	-0.14283	0.00000	0.00000	0.00000
157382A	1.04730	0.00000	-0.65589	0.00000	0.08882	0.00000
157384A	0.87931	0.00000	-0.68267	0.00000	0.08586	0.00000
157385A	1.20041	0.00000	0.66348	0.00000	0.20600	0.00000
157393A	1.04061	0.00000	0.94075	0.00000	0.30011	0.00000
157394A	0.42739	0.00000	-1.14779	0.00000	0.00000	0.00000
157395A	1.20933	0.00000	-0.52967	0.00000	0.15599	0.00000
157396A	0.95215	0.00000	-0.02154	0.00000	0.16380	0.00000
157399A	0.69646	0.00000	0.96917	0.00000	0.13928	0.00000
157401A	1.24501	0.00000	-0.25715	0.00000	0.20219	0.00000
157402A	1.47097	0.00000	0.11565	0.00000	0.26143	0.00000
157403A	0.60801	0.00000	-1.46886	0.00000	0.00000	0.00000
157487A	1.59213	0.00000	0.20284	0.00000	0.00000	0.00000
157488A	0.58497	0.00000	-0.31936	0.00000	0.08940	0.00000
157489A	2.08493	0.00000	0.39421	0.00000	0.38780	0.00000
157490A	2.54056	0.00000	1.15308	0.00000	0.04378	0.00000
179537A	1.20154	0.00000	-0.33409	0.00000	0.16192	0.00000
179544A	0.47441	0.00000	0.16803	0.00000	0.12722	0.00000
179545A	0.62993	0.00000	-0.92015	0.00000	0.27415	0.00000
179547A	0.79864	0.00000	-0.35029	0.00000	0.10643	0.00000
179549A	1.33028	0.00000	-0.66196	0.00000	0.17537	0.00000
179550A	1.78329	0.00000	0.18492	0.00000	0.12530	0.00000
179697A	0.71829	0.00000	-0.34589	0.00000	0.14112	0.00000
179698A	1.20350	0.00000	-0.25752	0.00000	0.24295	0.00000
179699A	1.15633	0.00000	-0.67403	0.00000	0.19162	0.00000

IREF	Parameters and Measures of Standard Error					
	a	SE (*a*)	*b*	SE (*b*)	*c*	SE (*c*)
179701A	0.90156	0.00000	-0.12312	0.00000	0.22884	0.00000
179702A	1.38346	0.00000	-0.78885	0.00000	0.26540	0.00000
179703A	1.21385	0.00000	-0.08135	0.00000	0.19851	0.00000
179704A	0.89390	0.00000	-0.63050	0.00000	0.11112	0.00000
179712A	1.01371	0.00000	-0.08569	0.00000	0.22350	0.00000
179716A	1.90846	0.00000	-0.46800	0.00000	0.26655	0.00000
180025A	0.60929	0.00000	1.27967	0.00000	0.31506	0.00000
180026A	1.81674	0.00000	0.80477	0.00000	0.19274	0.00000
180621A	1.42743	0.00000	1.25915	0.00000	0.33104	0.00000
180625A	0.52468	0.00000	-1.22571	0.00000	0.07011	0.00000
180630A	0.88271	0.00000	-0.96818	0.00000	0.19289	0.00000
180810A	0.55576	0.00000	0.78178	0.00000	0.19119	0.00000
181000A	1.32660	0.00000	0.62126	0.00000	0.15334	0.00000
181002A	0.53378	0.00000	-1.99708	0.00000	0.10559	0.00000
181355A	0.78583	0.00000	-0.79254	0.00000	0.09290	0.00000
181357A	1.28382	0.00000	-1.02776	0.00000	0.18261	0.00000
181358A	1.26910	0.00000	-1.21902	0.00000	0.07068	0.00000
181520A	0.92317	0.00000	-0.87577	0.00000	0.07000	0.00000
181522A	0.58106	0.00000	-0.61488	0.00000	0.19421	0.00000
181523A	0.83061	0.00000	1.20881	0.00000	0.25619	0.00000
181661A	1.28137	0.00000	1.53204	0.00000	0.31401	0.00000
181662A	1.62410	0.00000	1.43539	0.00000	0.13743	0.00000
181925A	0.64312	0.00000	-1.41124	0.00000	0.11144	0.00000
181926A	1.41822	0.00000	0.21497	0.00000	0.13562	0.00000
181929A	0.64821	0.00000	0.60310	0.00000	0.31950	0.00000
181930A	0.79476	0.00000	0.18847	0.00000	0.09024	0.00000
181933A	0.54213	0.00000	-0.93714	0.00000	0.07524	0.00000
181935A	0.86400	0.00000	-0.49122	0.00000	0.12798	0.00000
181936A	1.09947	0.00000	-0.97168	0.00000	0.26962	0.00000
181938A	0.93907	0.00000	0.70022	0.00000	0.24067	0.00000
181939A	1.00281	0.00000	-0.41341	0.00000	0.41441	0.00000

Table K-12. 2015–16 OK EOI: IRT Parameters for Dichotomous Items – English III- Form B

IREF	Parameters and Measures of Standard Error					
	a	SE (*a*)	*b*	SE (*b*)	*c*	SE (*c*)
157139A	0.95317	0.00000	-0.15124	0.00000	0.22182	0.00000
157140A	1.47608	0.00000	0.28371	0.00000	0.22270	0.00000
157141A	0.49706	0.00000	0.85193	0.00000	0.16169	0.00000
157144A	0.95759	0.00000	-0.20155	0.00000	0.19394	0.00000
157147A	0.44676	0.00000	0.34897	0.00000	0.11696	0.00000
157329A	0.99155	0.00000	-0.99365	0.00000	0.07015	0.00000
157330A	1.16919	0.00000	-0.10945	0.00000	0.17302	0.00000
157331A	1.27623	0.00000	1.10113	0.00000	0.18902	0.00000
157332A	0.85850	0.00000	-1.11490	0.00000	0.00000	0.00000
157415A	1.04358	0.00000	-0.38230	0.00000	0.13816	0.00000
157416A	1.44644	0.00000	-0.76960	0.00000	0.09560	0.00000
157417A	2.13324	0.00000	1.16593	0.00000	0.11659	0.00000
157420A	0.56639	0.00000	-0.12032	0.00000	0.07217	0.00000
157422A	0.99898	0.00000	0.30354	0.00000	0.13530	0.00000
157508A	1.39515	0.00000	-0.46884	0.00000	0.15094	0.00000
157509A	1.21454	0.00000	-0.46301	0.00000	0.19512	0.00000
157510A	0.36421	0.00000	-1.11132	0.00000	0.00000	0.00000
157513A	1.46874	0.00000	-0.79703	0.00000	0.13828	0.00000
157516A	0.90384	0.00000	-0.41647	0.00000	0.05413	0.00000
157517A	0.92168	0.00000	-0.00105	0.00000	0.13583	0.00000
157559A	1.10304	0.00000	0.98602	0.00000	0.20483	0.00000
157560A	0.70613	0.00000	0.05552	0.00000	0.12841	0.00000
180541A	1.09935	0.00000	-0.28441	0.00000	0.27561	0.00000
180552A	1.03322	0.00000	0.81985	0.00000	0.15392	0.00000
180665A	0.74257	0.00000	0.31172	0.00000	0.19588	0.00000
180666A	0.76019	0.00000	0.33377	0.00000	0.35136	0.00000
180667A	1.14020	0.00000	0.90073	0.00000	0.33963	0.00000
180829A	1.05801	0.00000	-0.66322	0.00000	0.15085	0.00000
181004A	1.03132	0.00000	-0.45592	0.00000	0.11063	0.00000
181007A	0.59497	0.00000	0.94953	0.00000	0.19922	0.00000
181011A	1.10711	0.00000	0.62613	0.00000	0.31774	0.00000
181157A	1.38565	0.00000	0.18409	0.00000	0.30974	0.00000
181158A	0.93172	0.00000	0.21977	0.00000	0.34144	0.00000
181161A	1.71839	0.00000	1.05186	0.00000	0.16446	0.00000
181169A	1.55729	0.00000	1.17452	0.00000	0.19206	0.00000
181345A	1.24419	0.00000	-1.20708	0.00000	0.08449	0.00000
181349A	0.69525	0.00000	0.40034	0.00000	0.33821	0.00000
181507A	0.53254	0.00000	-1.19716	0.00000	0.08041	0.00000
181509A	0.52280	0.00000	-0.87393	0.00000	0.09520	0.00000
181510A	1.17386	0.00000	-1.65931	0.00000	0.09867	0.00000
181511A	0.76307	0.00000	-0.65152	0.00000	0.09175	0.00000
181512A	1.39702	0.00000	-1.06843	0.00000	0.13712	0.00000
181514A	0.48670	0.00000	0.26025	0.00000	0.12414	0.00000
181518A	0.81405	0.00000	-0.33391	0.00000	0.21260	0.00000
181663A	0.44086	0.00000	-1.76611	0.00000	0.06767	0.00000
181664A	0.86530	0.00000	0.49142	0.00000	0.06231	0.00000
181666A	0.45936	0.00000	0.38397	0.00000	0.14704	0.00000
181667A	0.57644	0.00000	-0.24579	0.00000	0.16138	0.00000
181668A	0.45018	0.00000	-0.77366	0.00000	0.04774	0.00000
181669A	0.79355	0.00000	-0.22185	0.00000	0.09355	0.00000
181670A	0.67017	0.00000	0.31036	0.00000	0.04602	0.00000
181671A	0.65474	0.00000	-0.42707	0.00000	0.05763	0.00000
181672A	1.04714	0.00000	0.38246	0.00000	0.25365	0.00000
181781A	1.02563	0.00000	-0.57299	0.00000	0.26075	0.00000
181782A	0.51629	0.00000	-0.84733	0.00000	0.14739	0.00000
181783A	0.65568	0.00000	0.31923	0.00000	0.15774	0.00000
181784A	0.89418	0.00000	-1.46069	0.00000	0.13525	0.00000
181785A	1.03530	0.00000	0.72037	0.00000	0.26033	0.00000
181954A	1.01989	0.00000	1.03300	0.00000	0.31563	0.00000
181955A	0.34569	0.00000	0.65680	0.00000	0.12594	0.00000
181957A	0.88095	0.00000	-0.21919	0.00000	0.20922	0.00000
181958A	1.04802	0.00000	1.21996	0.00000	0.13934	0.00000

Table K-13. 2015–16 OK EOI: IRT Parameters for Dichotomous Items – Geometry- Form A

IREF	Parameters and Measures of Standard Error					
	a	SE (*a*)	*b*	SE (*b*)	*c*	SE (*c*)
142036A	1.27471	0.00000	0.31120	0.00000	0.17854	0.00000
142044A	0.77404	0.00000	1.26994	0.00000	0.34885	0.00000
142049A	1.63039	0.00000	0.41353	0.00000	0.21221	0.00000
142059A	0.99530	0.00000	0.22887	0.00000	0.31337	0.00000
142069A	1.57375	0.00000	0.38396	0.00000	0.30820	0.00000
142078A	0.67360	0.00000	-1.95644	0.00000	0.10985	0.00000
142081A	0.96358	0.00000	-0.75623	0.00000	0.07149	0.00000
142085A	0.73250	0.00000	-0.86603	0.00000	0.00000	0.00000
142198A	1.09196	0.00000	0.01550	0.00000	0.30464	0.00000
142205A	1.65304	0.00000	0.05028	0.00000	0.25530	0.00000
142210A	1.23167	0.00000	-0.92382	0.00000	0.09088	0.00000
142221A	0.71665	0.00000	-1.01898	0.00000	0.00000	0.00000
142228A	0.69022	0.00000	-0.88465	0.00000	0.00000	0.00000
142230A	1.24677	0.00000	0.89771	0.00000	0.22143	0.00000
142232A	1.21505	0.00000	-0.64137	0.00000	0.23109	0.00000
142233A	0.85484	0.00000	1.29305	0.00000	0.16861	0.00000
142234A	1.88337	0.00000	0.72475	0.00000	0.39399	0.00000
142243A	1.58508	0.00000	-1.22424	0.00000	0.04497	0.00000
142395A	0.75969	0.00000	-0.11167	0.00000	0.19110	0.00000
142421A	1.30643	0.00000	0.45383	0.00000	0.33250	0.00000
142491A	1.34418	0.00000	-0.09056	0.00000	0.33180	0.00000
142500A	1.09876	0.00000	-0.45091	0.00000	0.17140	0.00000
142503A	0.95075	0.00000	0.14845	0.00000	0.18560	0.00000
142535A	0.77102	0.00000	0.80772	0.00000	0.32870	0.00000
142638A	0.48632	0.00000	-0.26421	0.00000	0.20000	0.00000
142657A	1.89621	0.00000	0.50698	0.00000	0.26070	0.00000
142718A	1.08970	0.00000	-0.27233	0.00000	0.08890	0.00000

IREF	Parameters and Measures of Standard Error					
	a	SE (*a*)	*b*	SE (*b*)	*c*	SE (*c*)
142784A	1.11313	0.00000	1.32730	0.00000	0.05429	0.00000
142926A	0.91046	0.00000	-1.10141	0.00000	0.07894	0.00000
142957A	1.25931	0.00000	0.32328	0.00000	0.66104	0.00000
143830A	1.25130	0.00000	-0.11691	0.00000	0.06500	0.00000
143923A	1.18258	0.00000	0.17905	0.00000	0.35530	0.00000
143963A	0.92960	0.00000	0.48602	0.00000	0.22630	0.00000
143997A	1.46954	0.00000	0.69391	0.00000	0.34300	0.00000
157210A	0.62376	0.00000	-1.74832	0.00000	0.00000	0.00000
157211A	0.97491	0.00000	-1.47823	0.00000	0.11784	0.00000
157212A	1.47407	0.00000	0.84733	0.00000	0.13658	0.00000
157232A	0.82010	0.00000	-1.33293	0.00000	0.11434	0.00000
157254A	1.54128	0.00000	-0.29088	0.00000	0.26519	0.00000
157275A	1.38496	0.00000	-0.07904	0.00000	0.07805	0.00000
157631A	1.35045	0.00000	0.09091	0.00000	0.49584	0.00000
157639A	0.70827	0.00000	0.03884	0.00000	0.13708	0.00000
157668A	1.41266	0.00000	0.76285	0.00000	0.18083	0.00000
157679A	1.56474	0.00000	1.41826	0.00000	0.17271	0.00000
157681A	1.72800	0.00000	0.14247	0.00000	0.32546	0.00000
165151A	1.03230	0.00000	1.83983	0.00000	0.11660	0.00000
165419A	0.85635	0.00000	1.62385	0.00000	0.23900	0.00000
165457A	0.22126	0.00000	-1.07895	0.00000	0.20000	0.00000
165489A	1.00738	0.00000	0.91967	0.00000	0.22790	0.00000
165746A	0.50817	0.00000	-0.00353	0.00000	0.15232	0.00000
165768A	0.47432	0.00000	-1.10610	0.00000	0.03187	0.00000
165776A	1.27503	0.00000	-0.37453	0.00000	0.12458	0.00000
165820A	0.99006	0.00000	-1.13112	0.00000	0.07067	0.00000
165955A	0.18822	0.00000	-1.89387	0.00000	0.11104	0.00000
165956A	0.87737	0.00000	-1.29531	0.00000	0.11764	0.00000

Table K-14. 2015–16 OK EOI: IRT Parameters for Dichotomous Items – Geometry- Form B

IREF	Parameters and Measures of Standard Error					
	a	SE (*a*)	*b*	SE (*b*)	*c*	SE (*c*)
142053A	0.57317	0.00000	-0.89748	0.00000	0.17372	0.00000
142059A	0.99530	0.00000	0.22887	0.00000	0.31337	0.00000
142076A	1.24752	0.00000	0.56585	0.00000	0.24068	0.00000
142078A	0.67360	0.00000	-1.95644	0.00000	0.10985	0.00000
142186A	0.92356	0.00000	-0.25605	0.00000	0.28277	0.00000
142190A	0.58449	0.00000	-0.72604	0.00000	0.00000	0.00000
142216A	1.58055	0.00000	-1.32612	0.00000	0.04742	0.00000
142219A	1.28981	0.00000	0.36093	0.00000	0.16860	0.00000
142220A	1.34720	0.00000	-1.05571	0.00000	0.04316	0.00000
142228A	0.69022	0.00000	-0.88465	0.00000	0.00000	0.00000
142233A	0.85484	0.00000	1.29305	0.00000	0.16861	0.00000
142409A	1.15766	0.00000	-0.72448	0.00000	0.20000	0.00000
142441A	1.07082	0.00000	0.03578	0.00000	0.22080	0.00000
142472A	1.68854	0.00000	0.42801	0.00000	0.26450	0.00000
142500A	1.09876	0.00000	-0.45091	0.00000	0.17140	0.00000
142512A	1.75348	0.00000	0.50607	0.00000	0.25770	0.00000
142533A	0.87221	0.00000	-0.85393	0.00000	0.20000	0.00000
142625A	0.71740	0.00000	-1.03767	0.00000	0.20000	0.00000
142644A	2.11520	0.00000	0.66331	0.00000	0.31190	0.00000
142714A	0.64523	0.00000	-2.77511	0.00000	0.20097	0.00000
142723A	1.04967	0.00000	-0.60186	0.00000	0.10320	0.00000
142919A	0.80184	0.00000	-0.59432	0.00000	0.16330	0.00000
142921A	0.93182	0.00000	-1.34750	0.00000	0.07540	0.00000
142926A	0.91046	0.00000	-1.10141	0.00000	0.07894	0.00000
142942A	1.39146	0.00000	-0.39589	0.00000	0.29677	0.00000
143829A	1.64096	0.00000	0.51571	0.00000	0.26160	0.00000
143869A	0.35568	0.00000	-1.26720	0.00000	0.20000	0.00000
143877A	0.94546	0.00000	0.31412	0.00000	0.26450	0.00000
143998A	1.12368	0.00000	0.97362	0.00000	0.29650	0.00000
157209A	2.15447	0.00000	0.29890	0.00000	0.13710	0.00000
157212A	1.47407	0.00000	0.84733	0.00000	0.13658	0.00000
157220A	1.45444	0.00000	0.41782	0.00000	0.33000	0.00000
157227A	1.20297	0.00000	0.62398	0.00000	0.11359	0.00000
157229A	1.61755	0.00000	-0.31904	0.00000	0.09397	0.00000
157239A	0.95603	0.00000	1.41356	0.00000	0.36312	0.00000
157244A	0.52257	0.00000	-0.34786	0.00000	0.25155	0.00000
157249A	1.59716	0.00000	0.47682	0.00000	0.25516	0.00000
157270A	0.85560	0.00000	-0.40926	0.00000	0.13204	0.00000
157282A	0.79065	0.00000	-0.37492	0.00000	0.13304	0.00000
157285A	1.36155	0.00000	-0.26236	0.00000	0.01699	0.00000
157642A	1.00733	0.00000	0.06500	0.00000	0.26337	0.00000
157663A	1.57347	0.00000	0.24770	0.00000	0.29972	0.00000
157681A	1.72800	0.00000	0.14247	0.00000	0.32546	0.00000
157731A	1.51334	0.00000	0.38274	0.00000	0.17985	0.00000
157732A	0.91148	0.00000	-0.04493	0.00000	0.16387	0.00000
157740A	0.58223	0.00000	-1.57710	0.00000	0.00000	0.00000
157743A	1.90074	0.00000	0.32039	0.00000	0.27002	0.00000
157744A	2.06083	0.00000	-0.02738	0.00000	0.40467	0.00000
157748A	0.90770	0.00000	-0.65224	0.00000	0.19518	0.00000
165404A	1.18182	0.00000	1.40803	0.00000	0.12130	0.00000
165423A	1.83730	0.00000	1.54083	0.00000	0.22370	0.00000
165463A	1.52844	0.00000	1.48809	0.00000	0.24800	0.00000
165783A	0.96391	0.00000	-1.66391	0.00000	0.10505	0.00000
165801A	1.68555	0.00000	1.09492	0.00000	0.15982	0.00000
175544A	1.93334	0.00000	0.95194	0.00000	0.16550	0.00000

K-15. 2015–16 OK EOI: IRT Parameters for Polytomous Items – English II –Form A

Item Number	Parameters and Measures of Standard Error										
	a	SE (*a*)	*b*	SE (*b*)	*D*0	SE (*D*0)	*D*1	SE (*D*1)	*D*2	SE (*D*2)	*D*3
177003A	0.47911	0.00000	0.01576	0.00000	0.00000	0.00000	3.48465	0.00000	0.05020	0.00000	0.87424

Item Number	Parameters and Measures of Standard Error				
	SE (*D*3)	*D*4	SE (*D*4)	*D*5	SE(*D*5)
177003A	0.00000	-3.39559	0.00000	-1.01351	0.00000

K-16. 2015–16 OK EOI: IRT Parameters for Polytomous Items – English II –Form B

Item Number	Parameters and Measures of Standard Error										
	a	SE (*a*)	*b*	SE (*b*)	*D*0	SE (*D*0)	*D*1	SE (*D*1)	*D*2	SE (*D*2)	*D*3
177321A	0.61991	0.00000	-0.71863	0.00000	0.00000	0.00000	2.70204	0.00000	1.23149	0.00000	0.35993

Item Number	Parameters and Measures of Standard Error				
	SE (*D*3)	*D*4	SE (*D*4)	*D*5	SE(*D*5)
177321A	0.00000	-1.77071	0.00000	-2.52275	0.00000

K-17. 2015–16 OK EOI: IRT Parameters for Polytomous Items – English III –Form A

Item Number	Parameters and Measures of Standard Error										
	a	SE (*a*)	*b*	SE (*b*)	*D*0	SE (*D*0)	*D*1	SE (*D*1)	*D*2	SE (*D*2)	*D*3
182007A	0.34404	0.00000	0.33410	0.00000	0.00000	0.00000	0.66725	0.00000	1.76868	0.00000	2.61139

Item Number	Parameters and Measures of Standard Error				
	SE (*D*3)	*D*4	SE (*D*4)	*D*5	SE(*D*5)
182007A	0.00000	0.72726	0.00000	-1.12101	0.00000

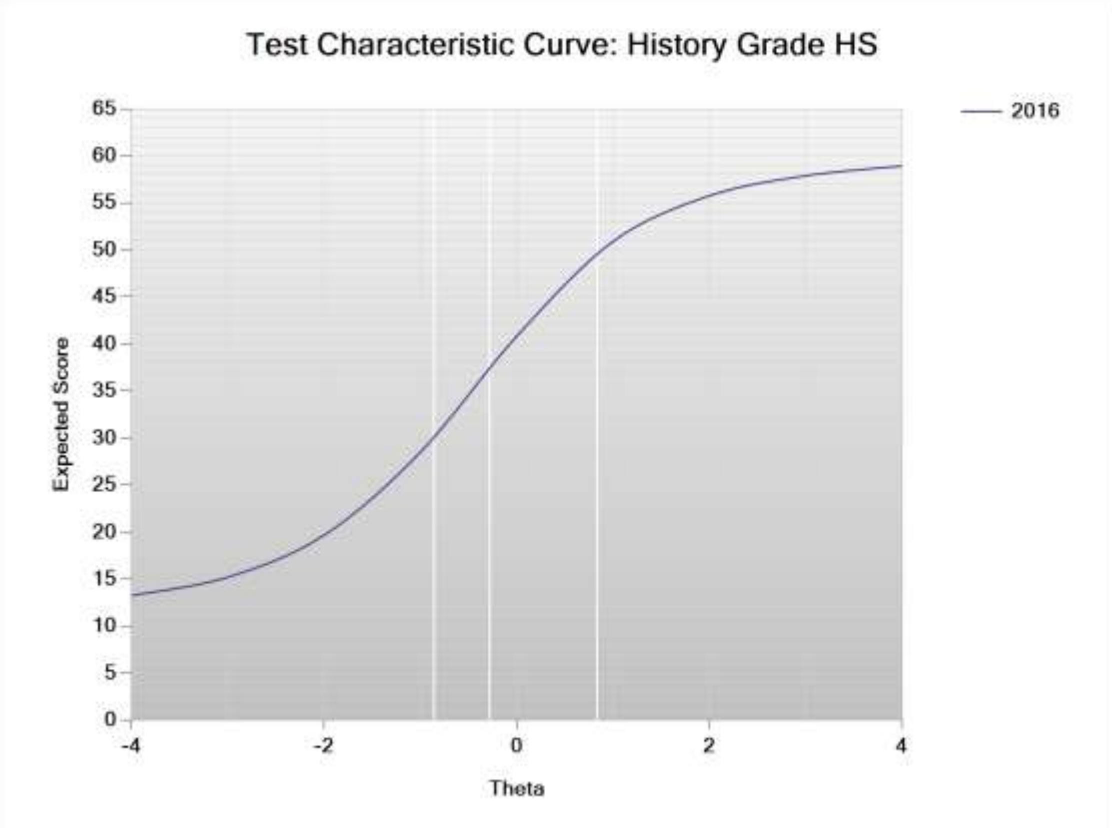
K-18. 2015–16 OK EOI: IRT Parameters for Polytomous Items – English III –Form B

Item Number	Parameters and Measures of Standard Error										
	a	SE (*a*)	*b*	SE (*b*)	*D*0	SE (*D*0)	*D*1	SE (*D*1)	*D*2	SE (*D*2)	*D*3
182004A	0.53347	0.00000	-0.29929	0.00000	0.00000	0.00000	0.22211	0.00000	2.63345	0.00000	2.22739

Item Number	Parameters and Measures of Standard Error				
	SE (*D*3)	*D*4	SE (*D*4)	*D*5	SE(*D*5)
182004A	0.00000	-0.02873	0.00000	0.86083	0.00000

APPENDIX L—TEST CHARACTERISTIC CURVES AND TEST INFORMATION FUNCTION PLOTS

Figure L-1. 2015–16 OK EOI: U.S. History – Form A
Top: Test Characteristic Curve Bottom: Test Information Function



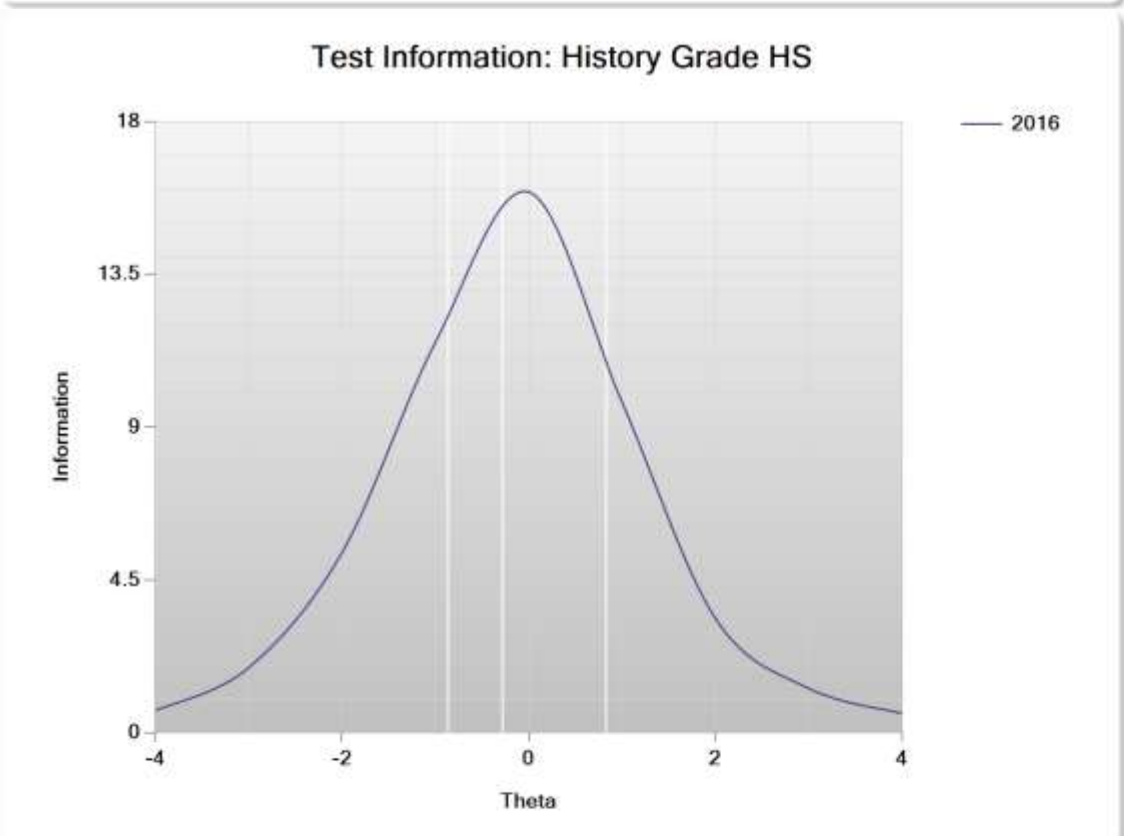
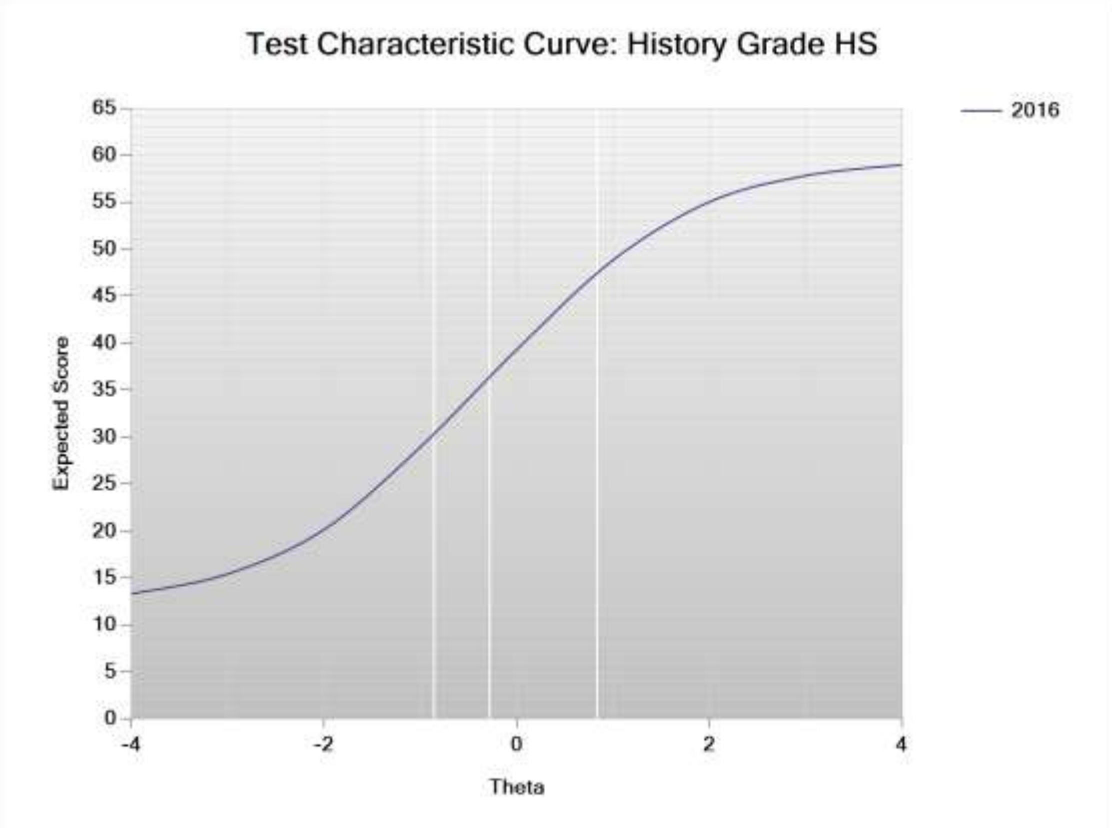


Figure L-2. 2015–16 OK EOI: U.S. History – Form B
Top: Test Characteristic Curve Bottom: Test Information Function



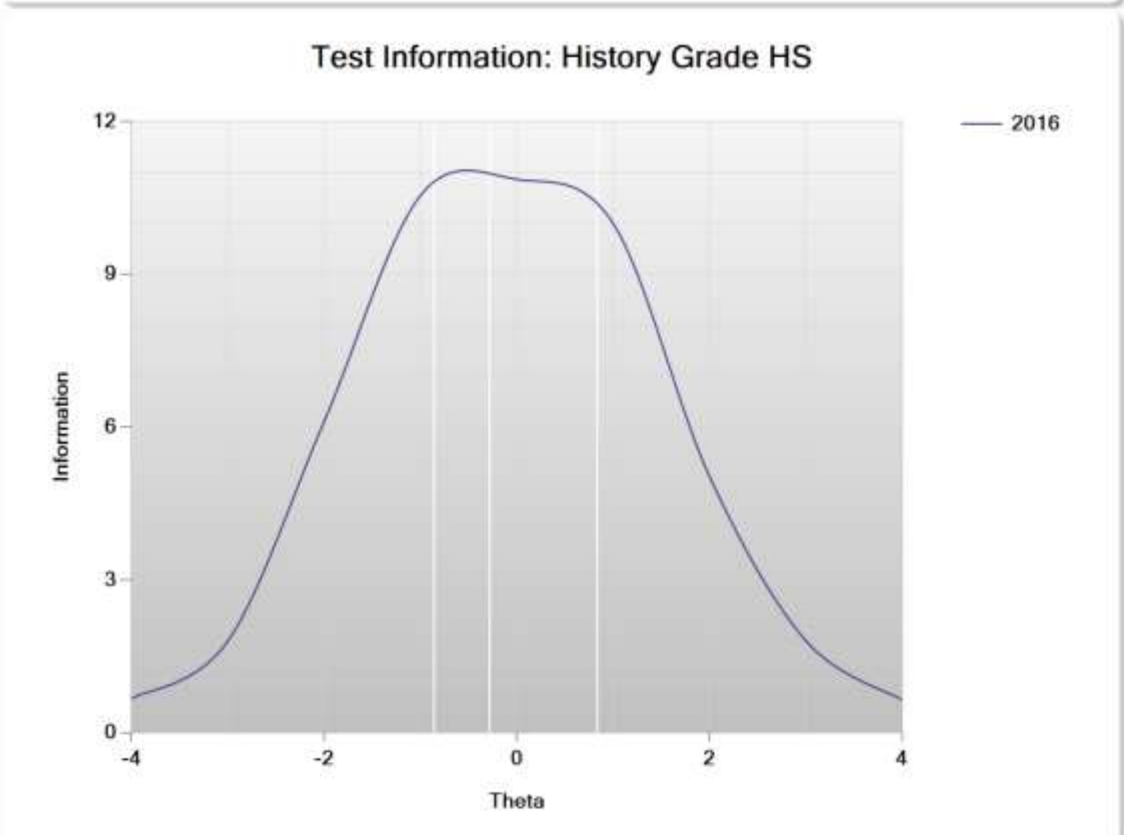
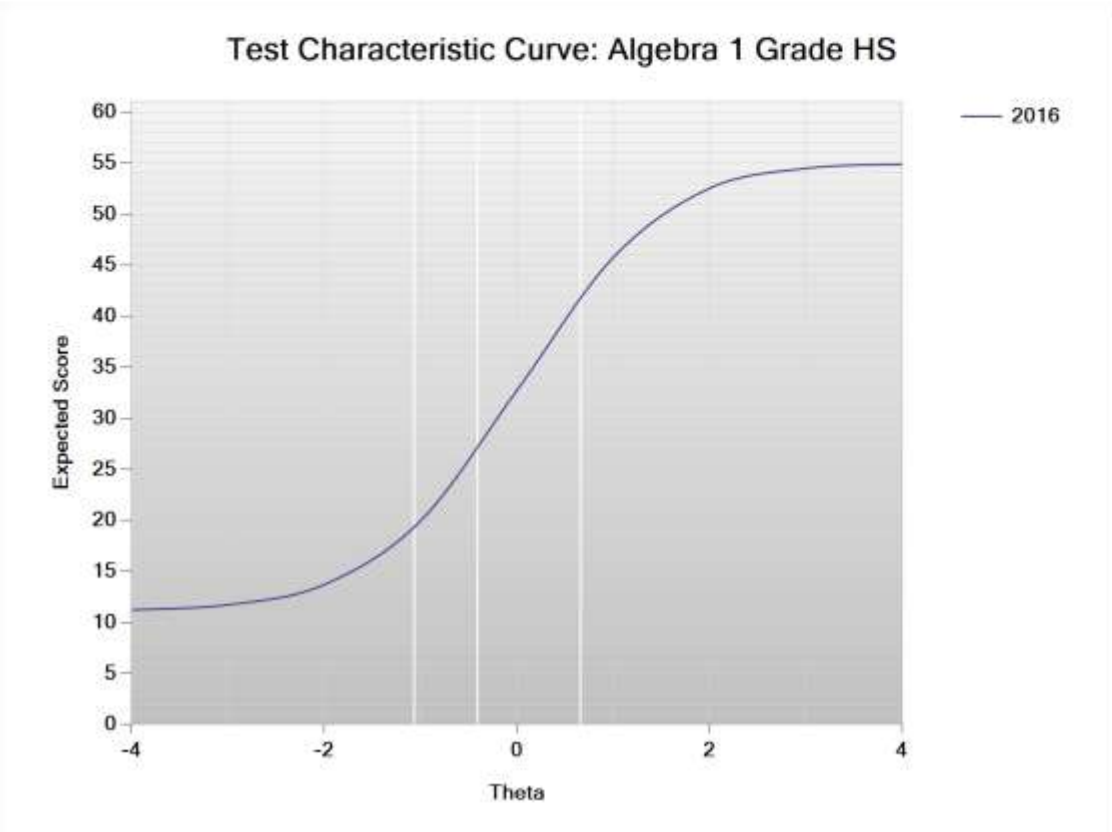


Figure L-3. 2015–16 OK EOI: Algebra I-Form A
Top: Test Characteristic Curve   Bottom: Test Information Function



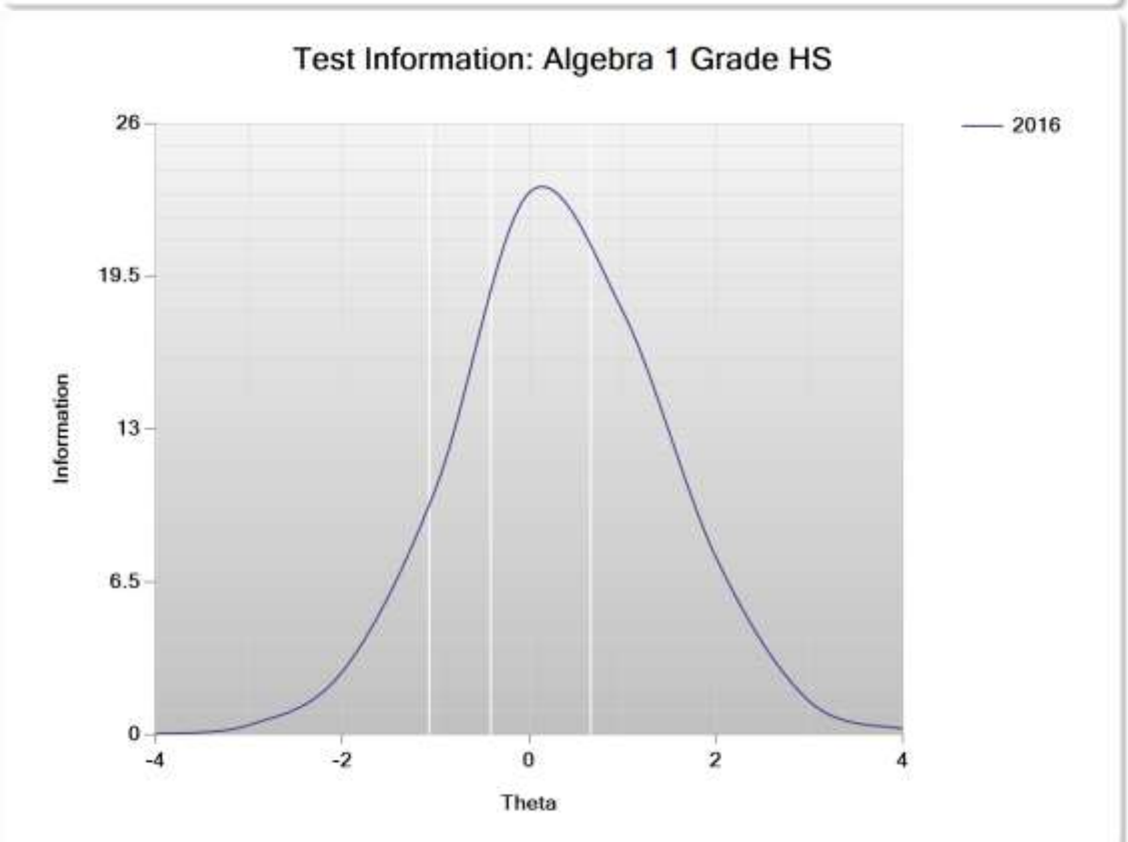
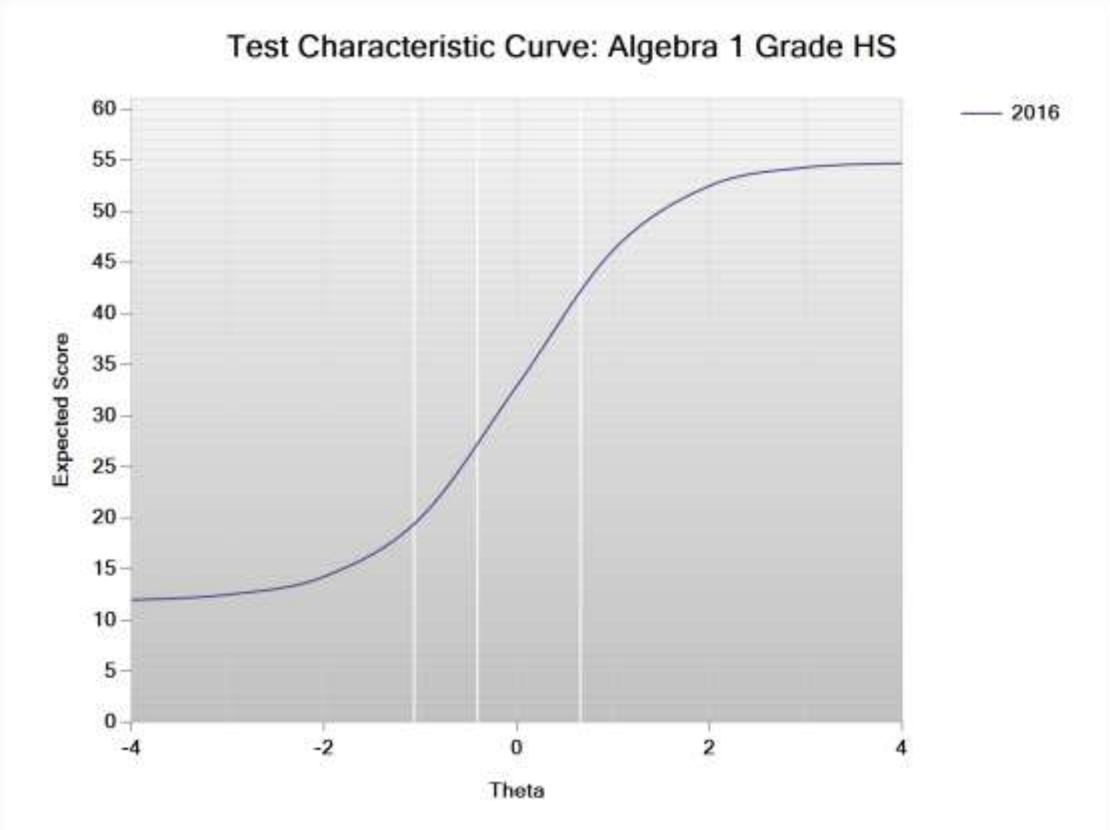


Figure L-4. 2015–16 OK EOI: Algebra I-Form B
Top: Test Characteristic Curve Bottom: Test Information Function



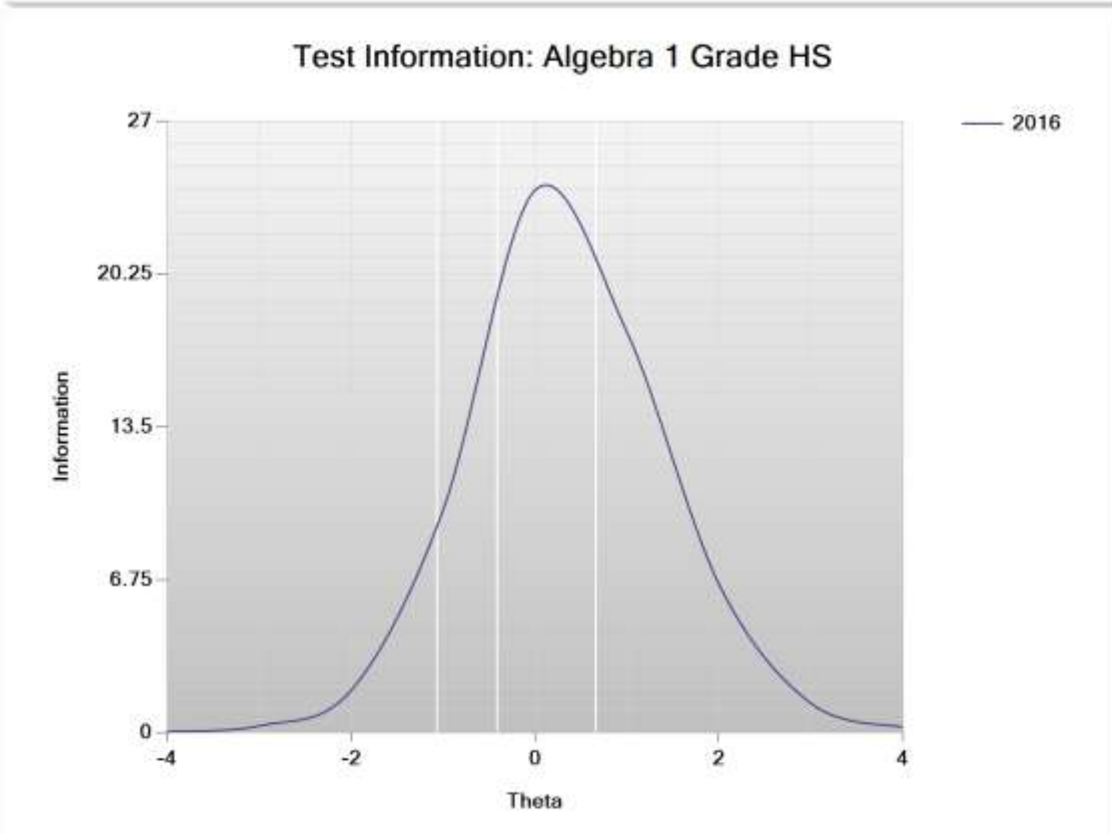
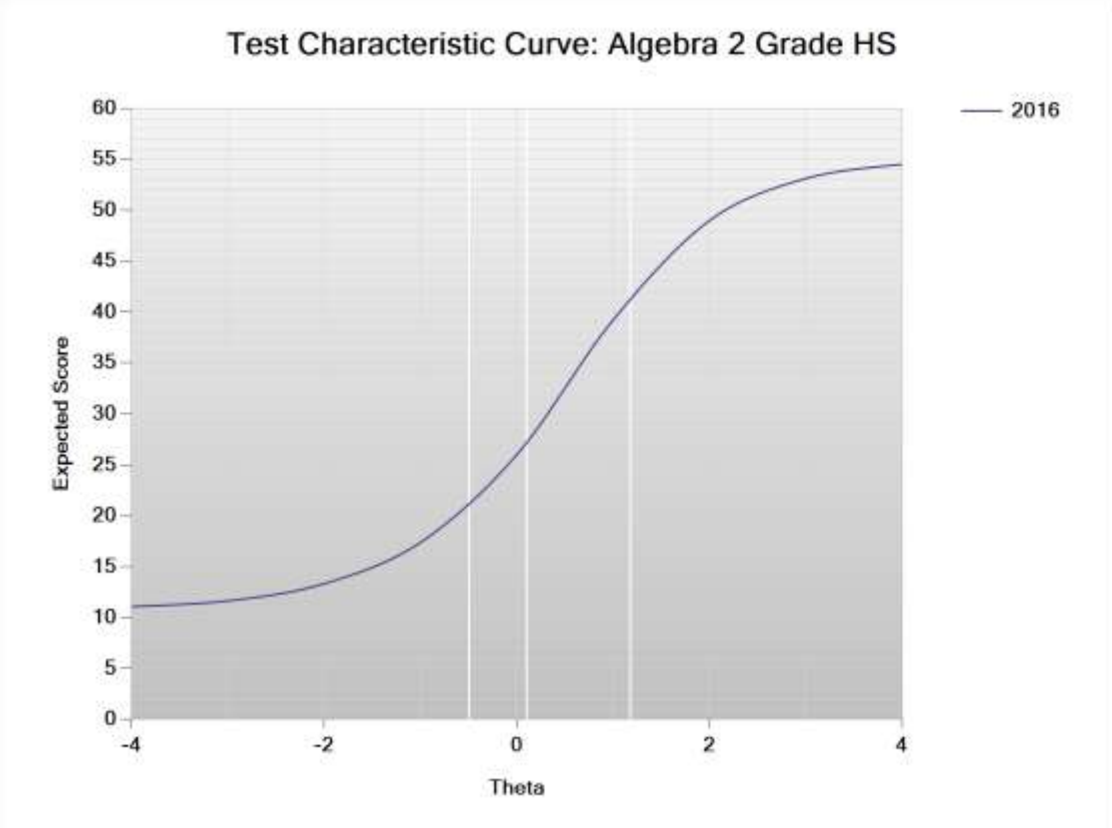


Figure L-5. 2015–16 OK EOI: Algebra II-Form A
Top: Test Characteristic Curve Bottom: Test Information Function



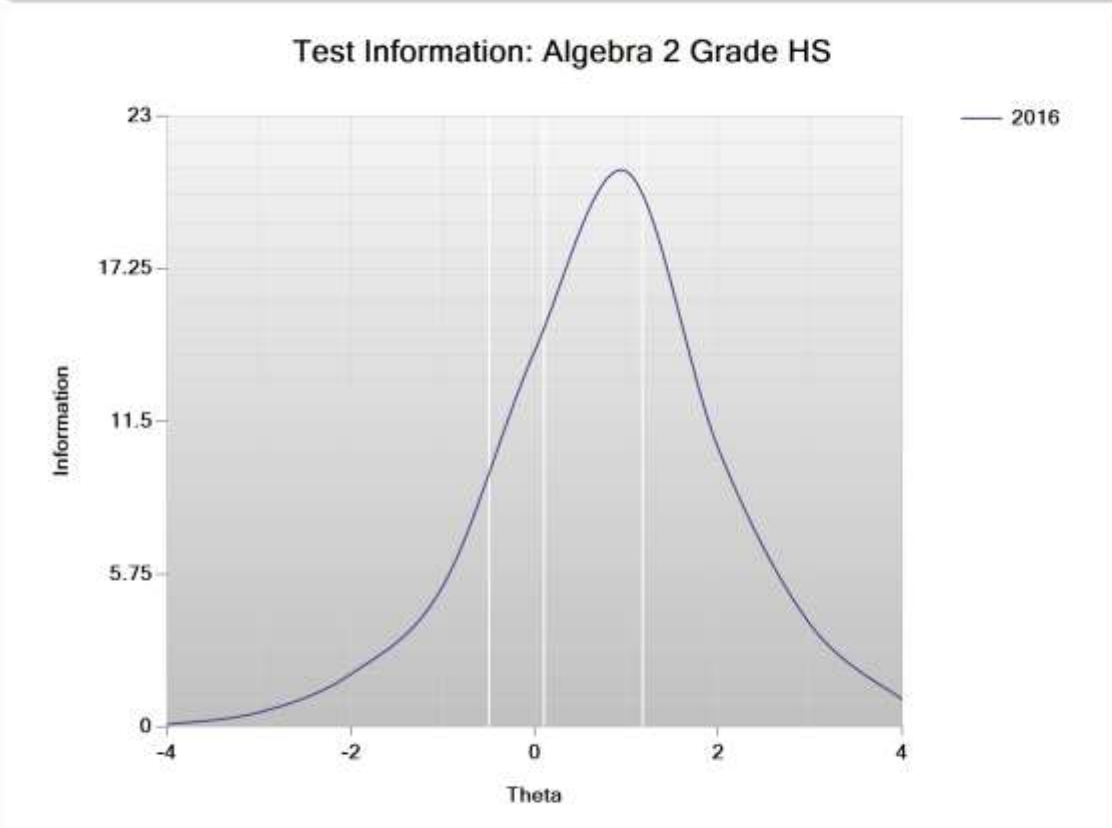
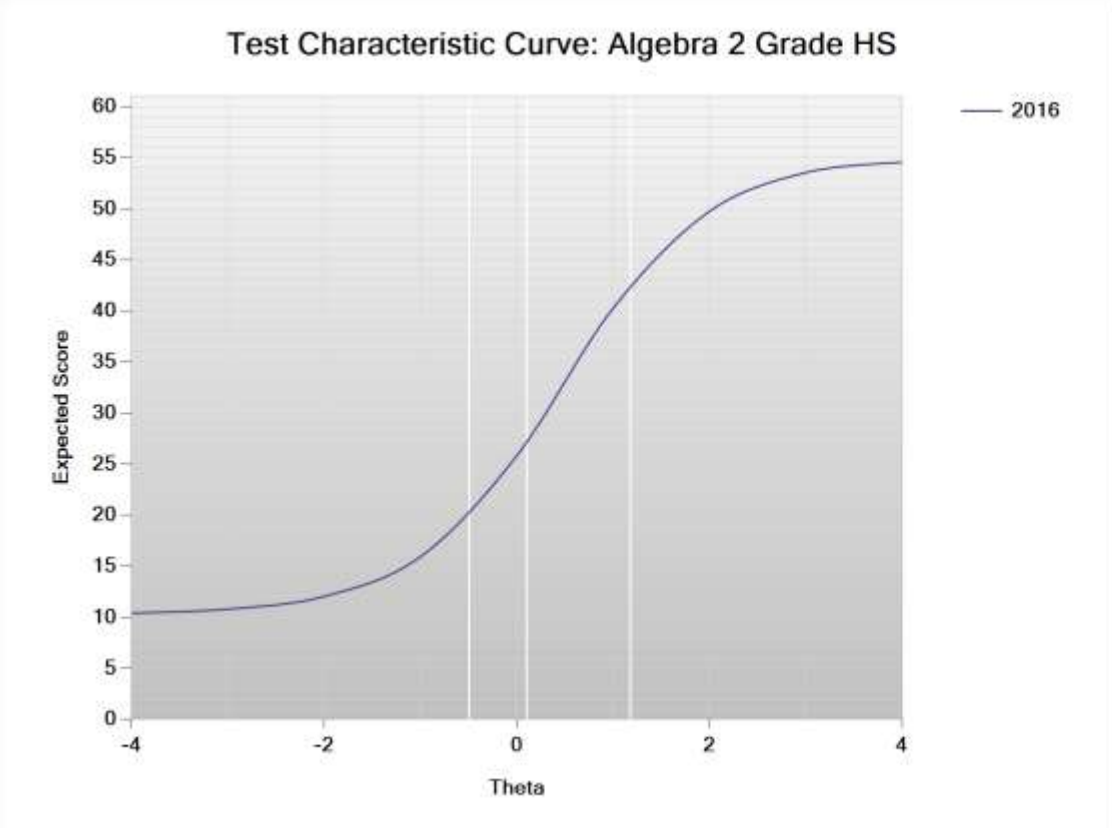


Figure L-6. 2015–16 OK EOI: Algebra II-Form B
Top: Test Characteristic Curve Bottom: Test Information Function



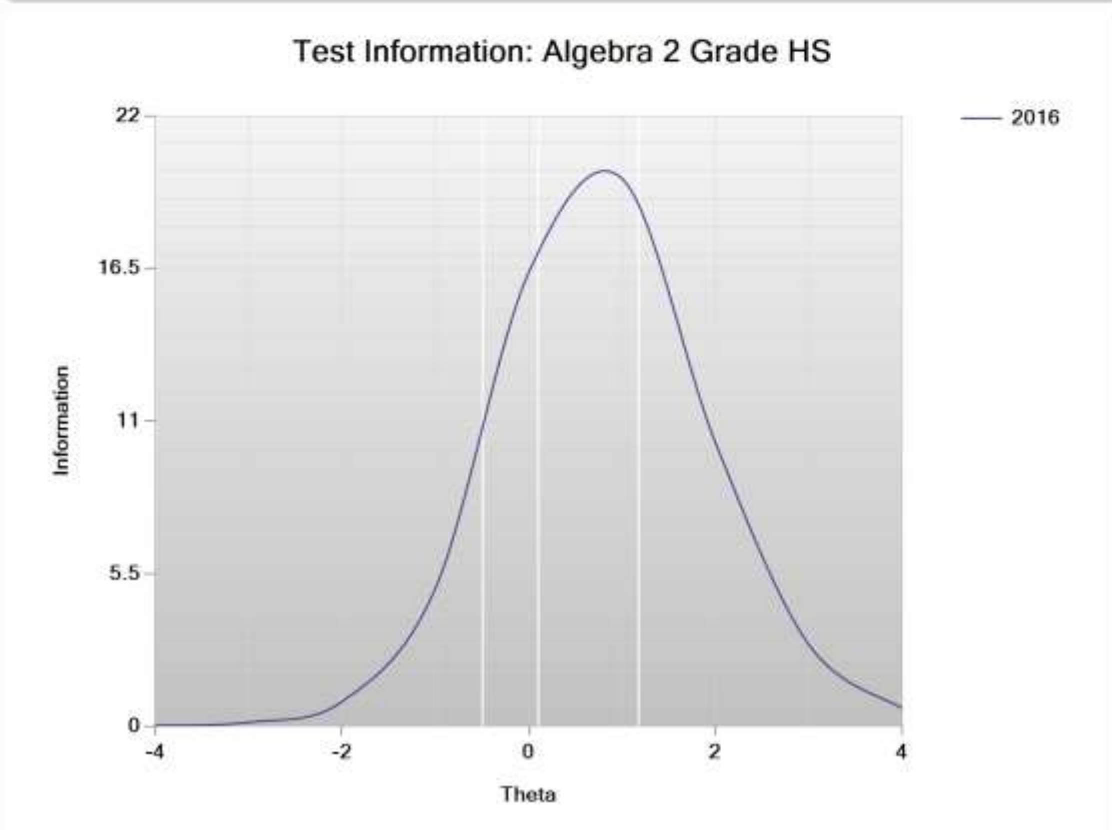
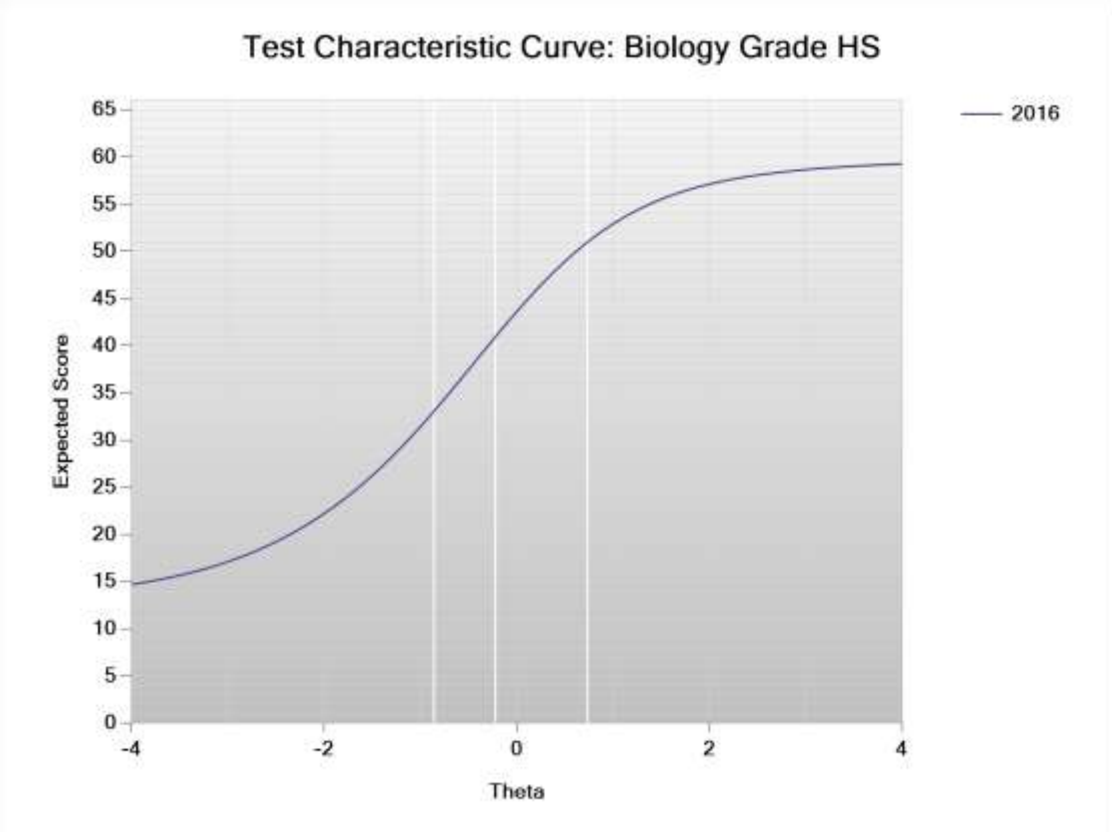


Figure L-7. 2015–16 OK EOI: Biology-Form A
Top: Test Characteristic Curve Bottom: Test Information Function



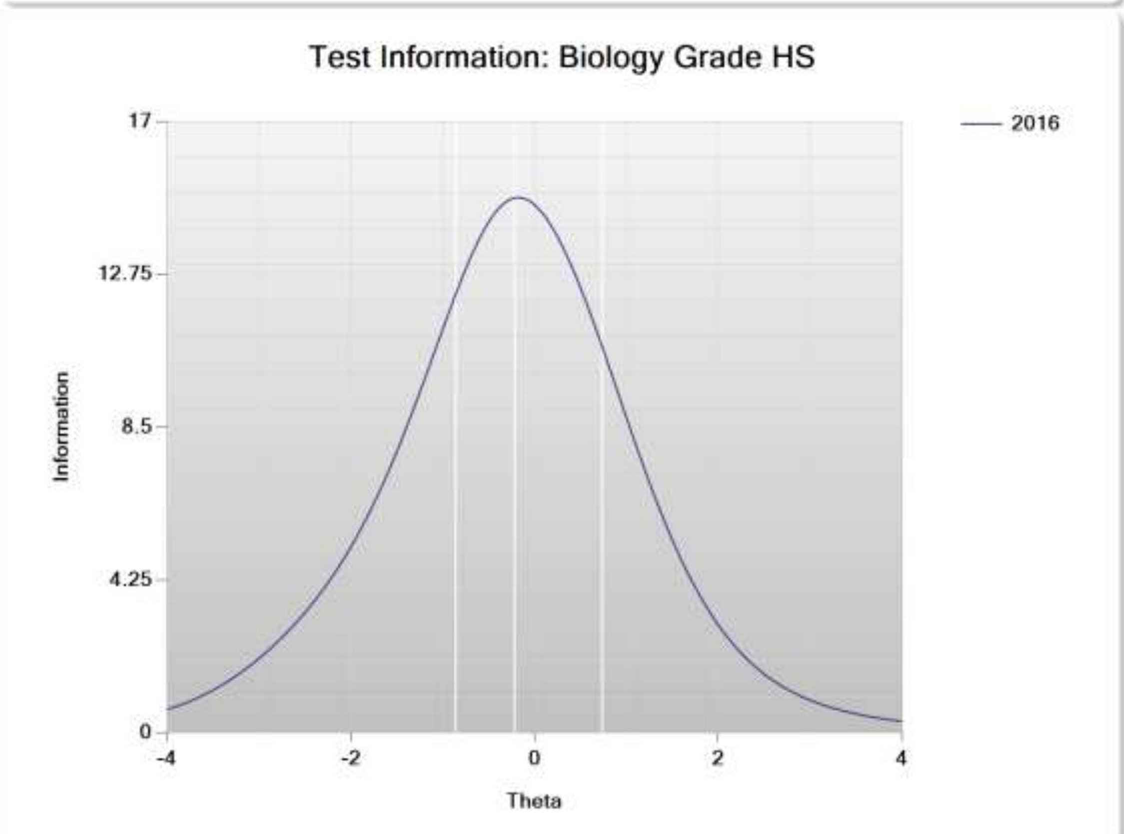
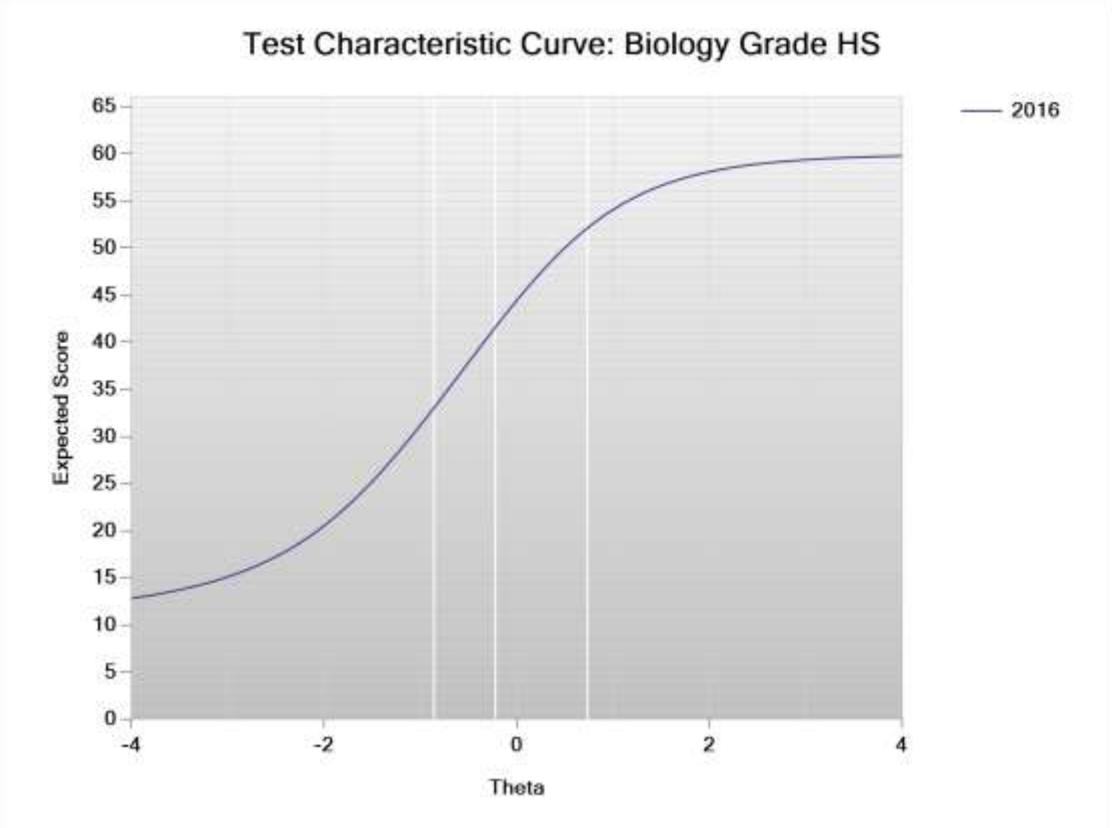


Figure L-8. 2015–16 OK EOI: Biology-Form B
Top: Test Characteristic Curve Bottom: Test Information Function



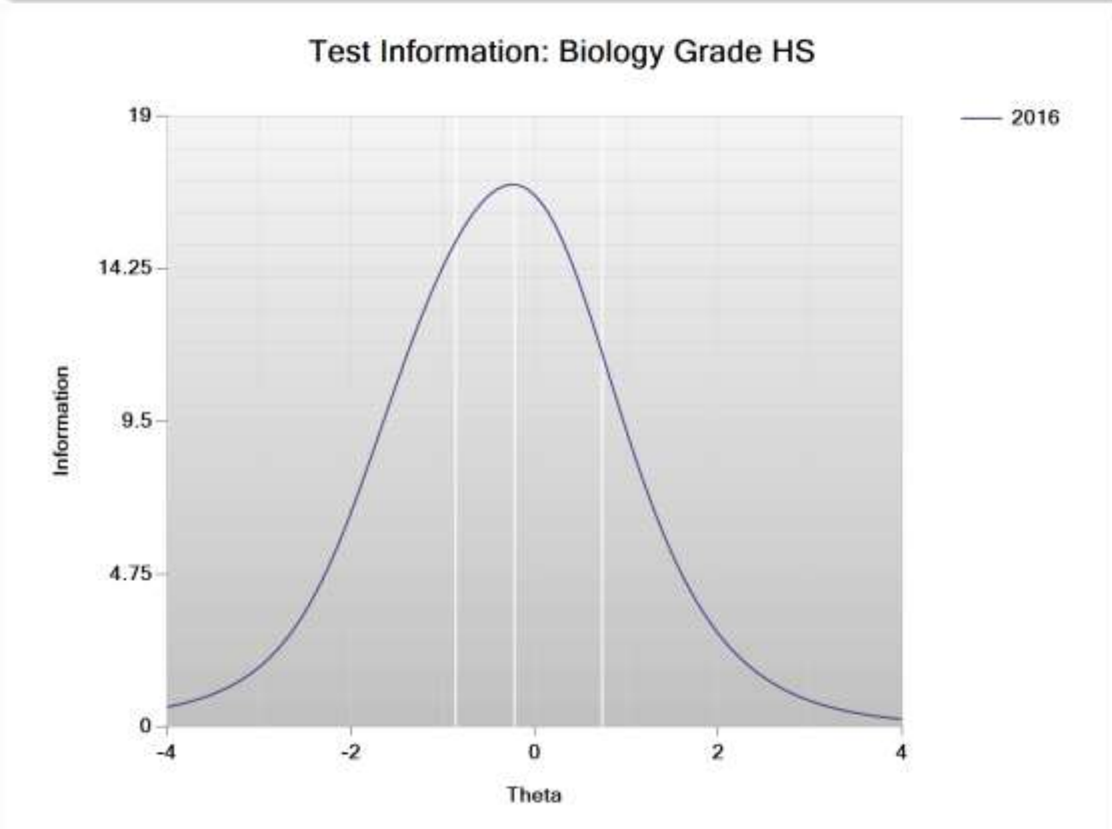
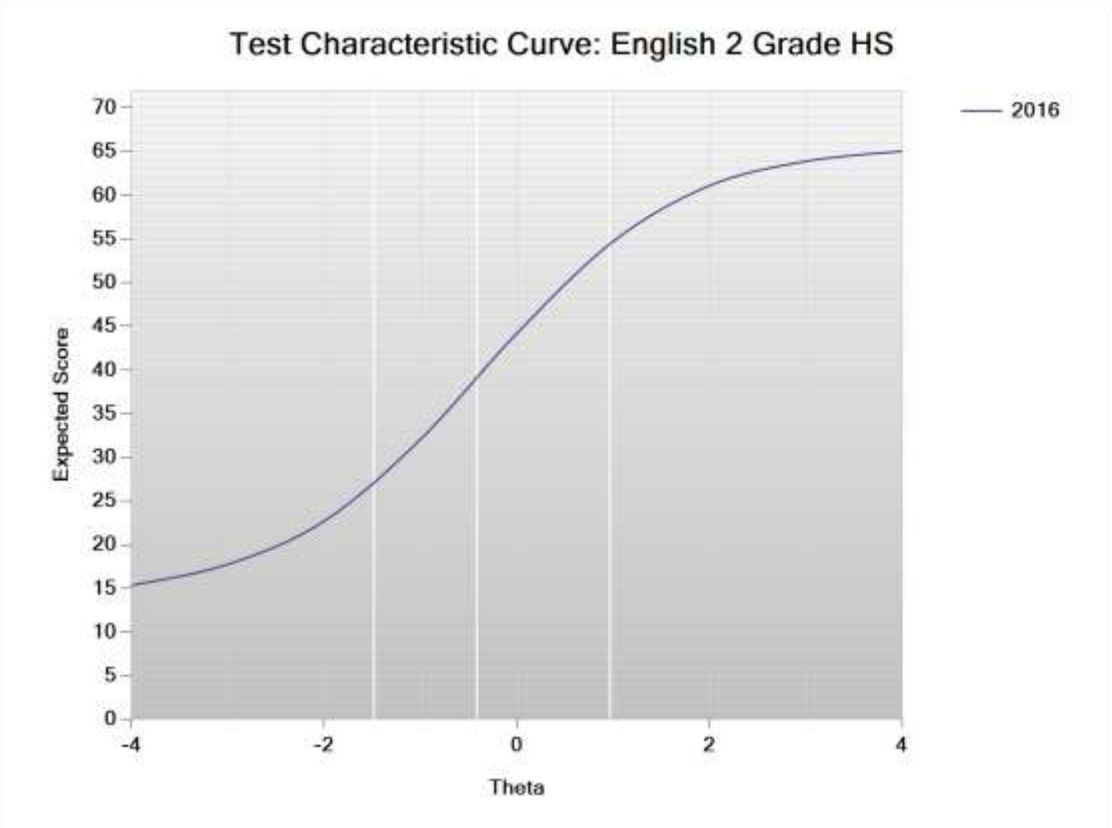


Figure L-9. 2015–16 OK EOI: English II-Form A
Top: Test Characteristic Curve Bottom: Test Information Function



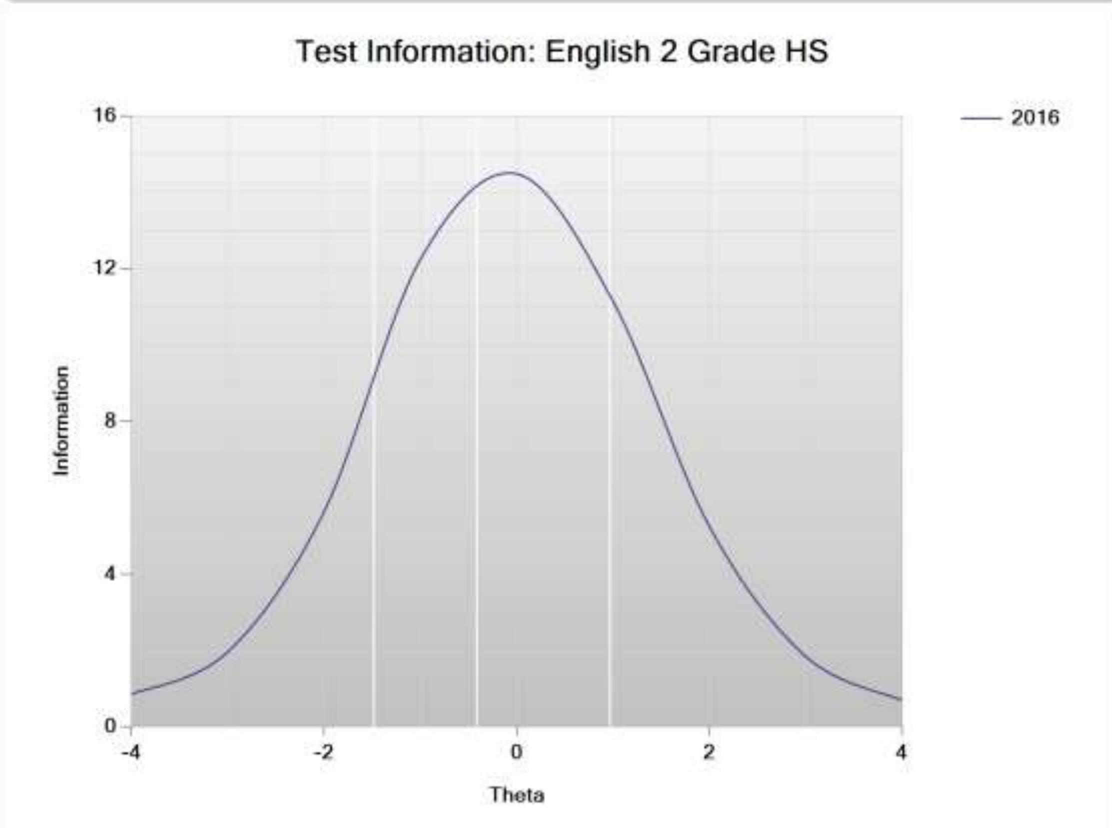
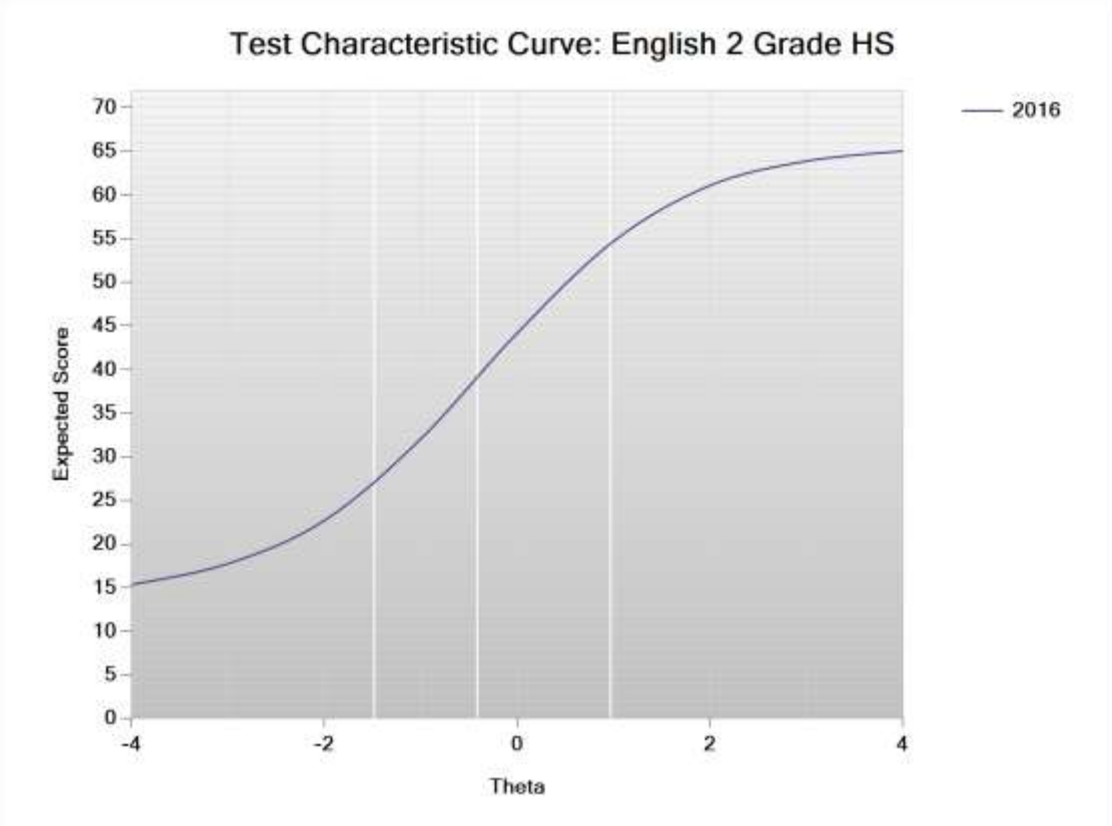


Figure L-10. 2015–16 OK EOI: English II-Form B
Top: Test Characteristic Curve Bottom: Test Information Function



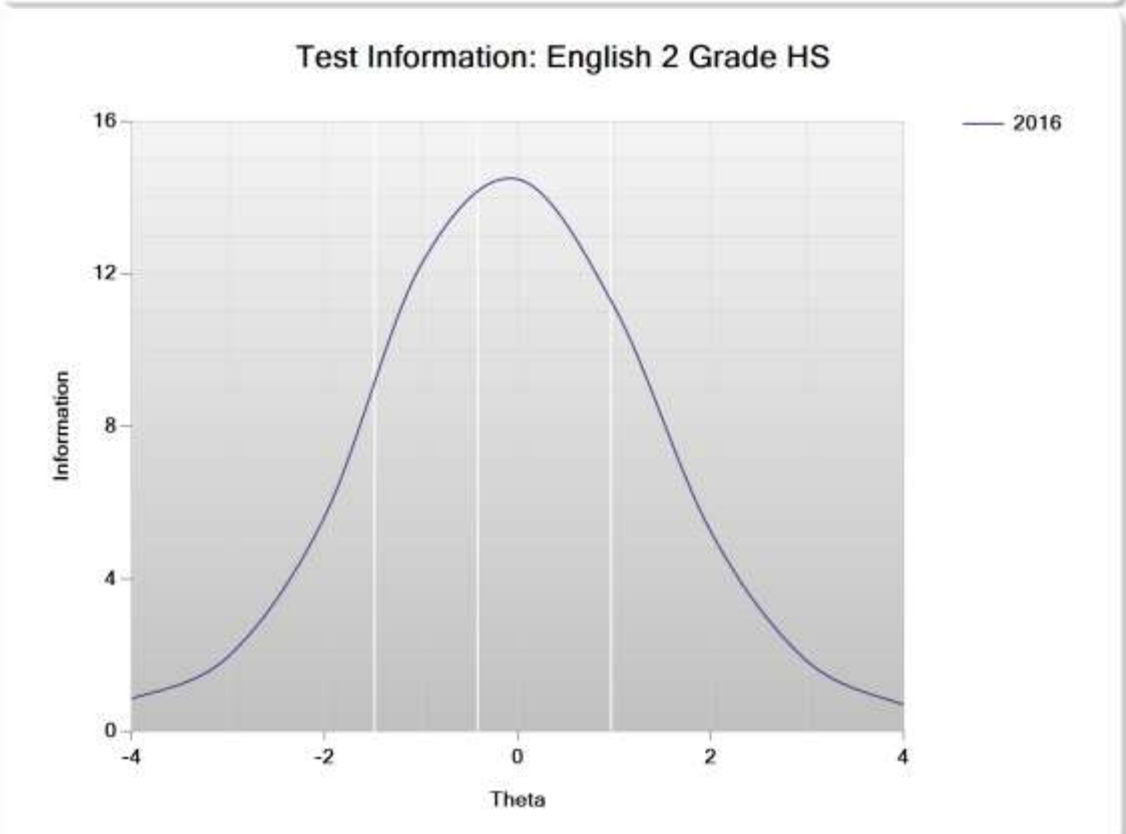
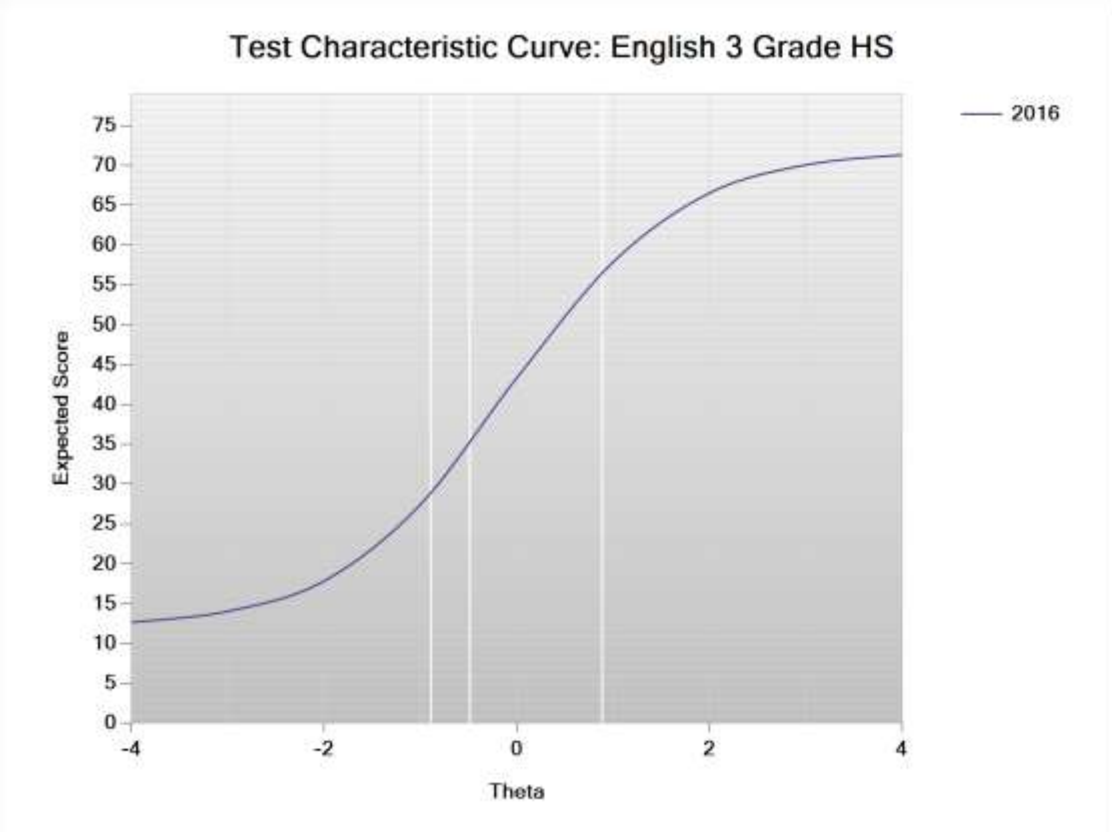


Figure L-11. 2015–16 OK EOI: English III-Form A
Top: Test Characteristic Curve Bottom: Test Information Function



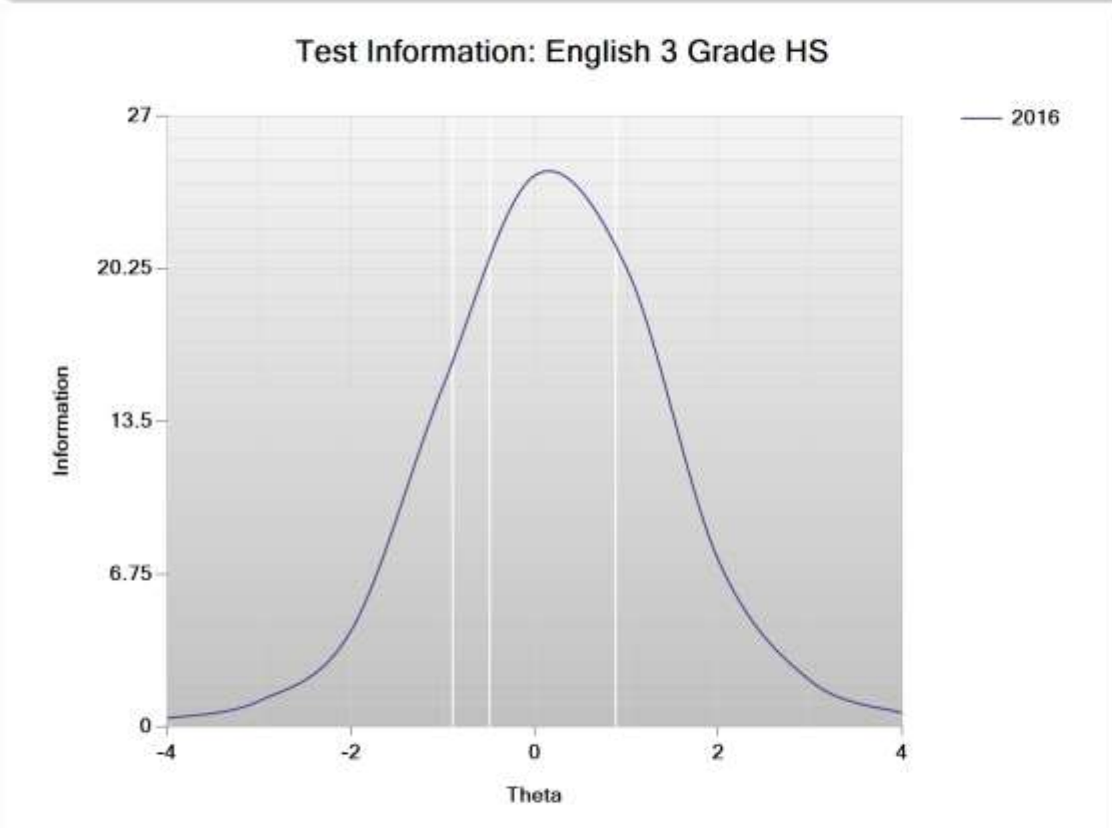
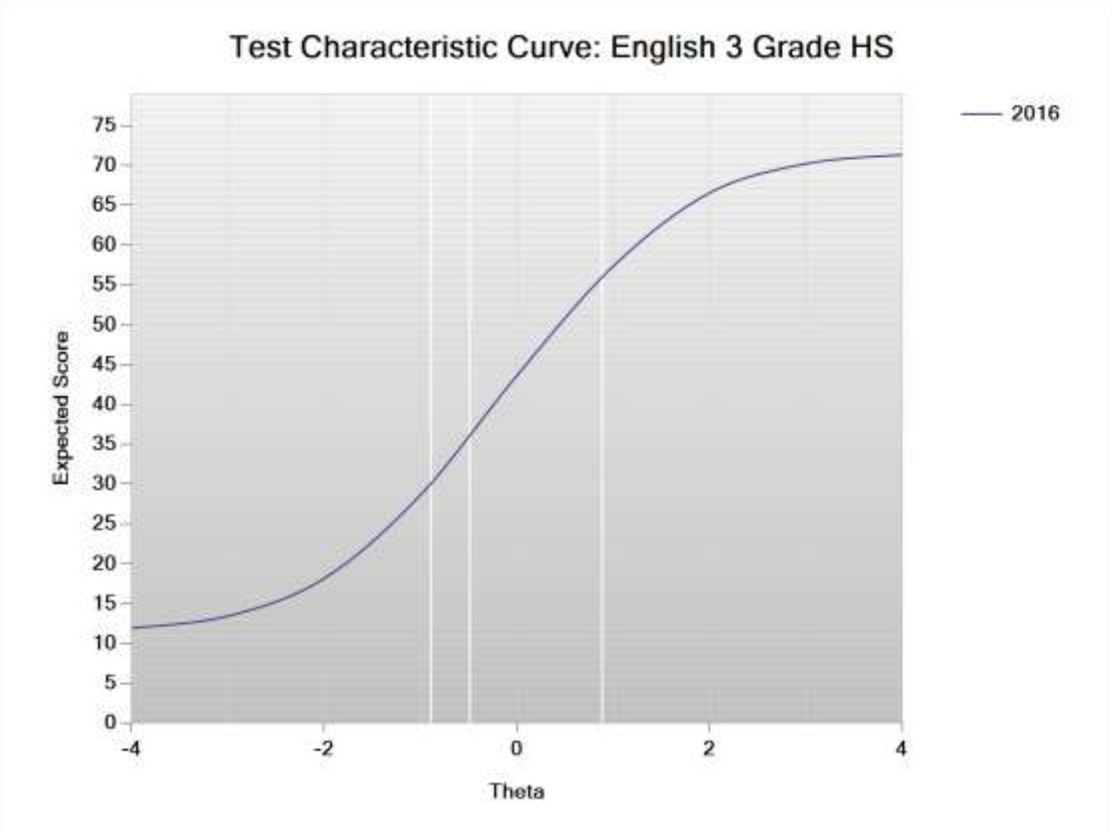


Figure L-12. 2015–16 OK EOI: English III-Form B
Top: Test Characteristic Curve Bottom: Test Information Function



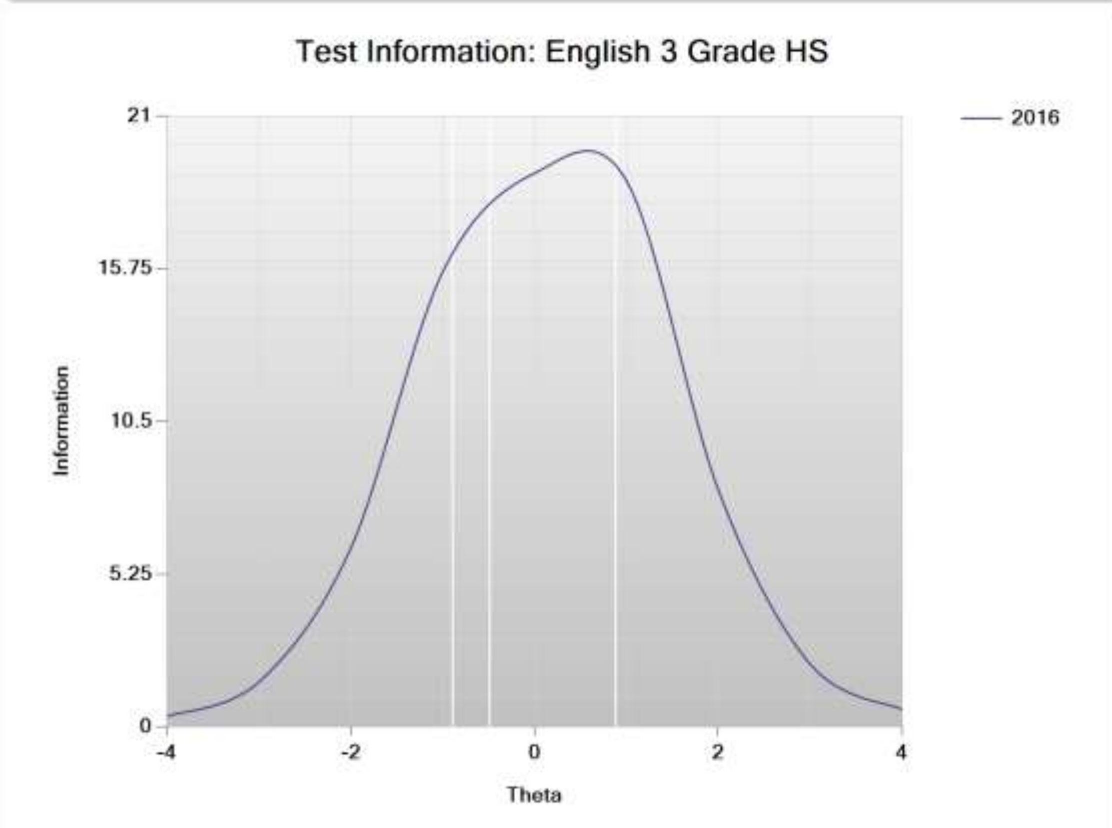
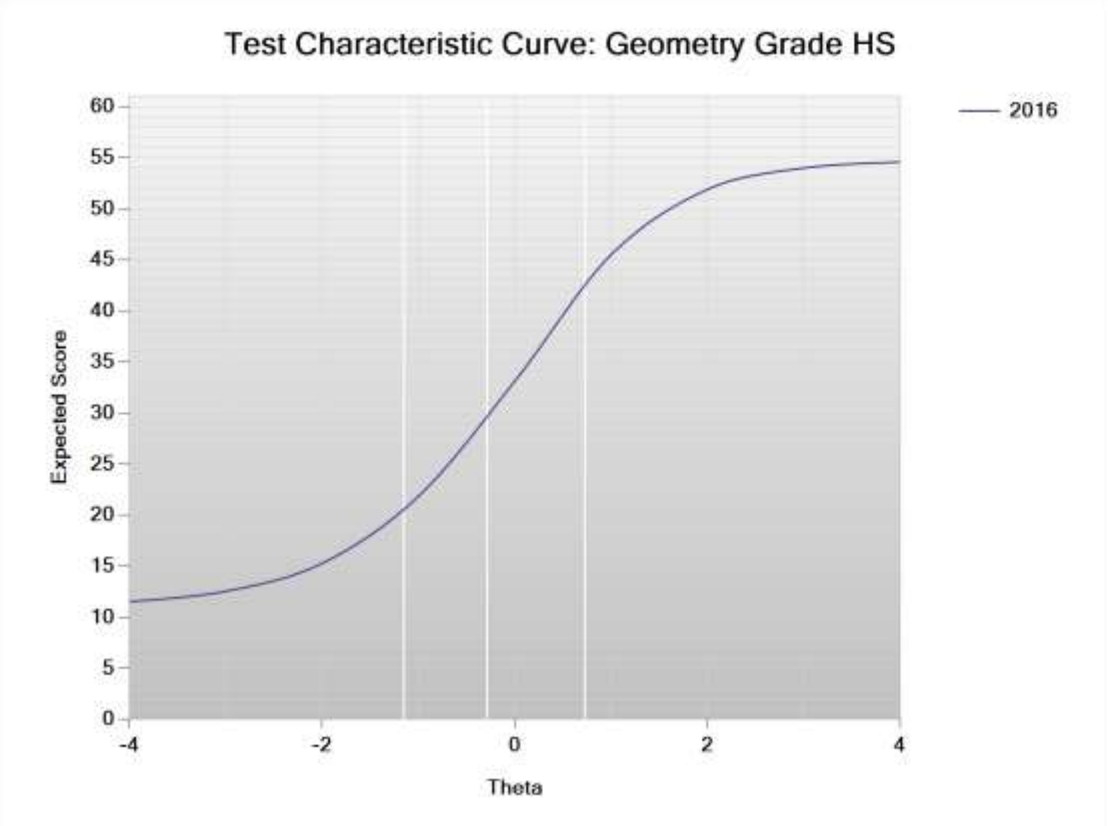


Figure L-13. 2015–16 OK EOI: Geometry-Form A
Top: Test Characteristic Curve Bottom: Test Information Function



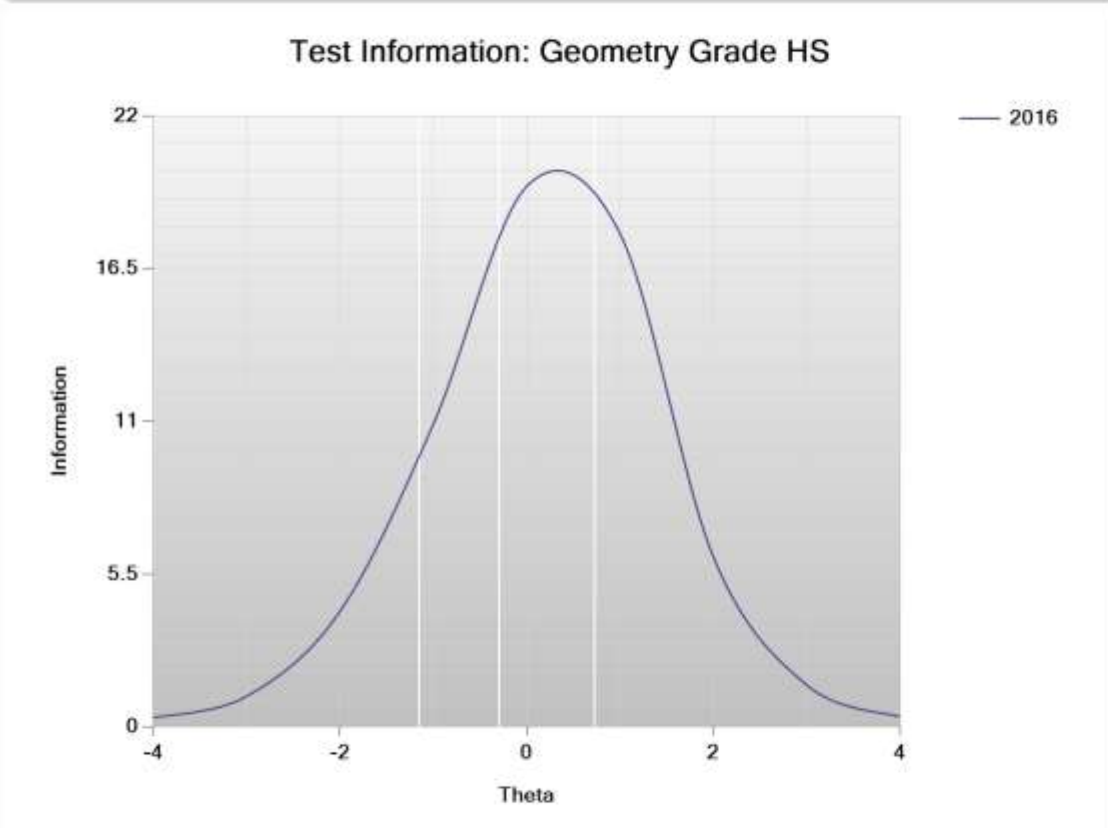
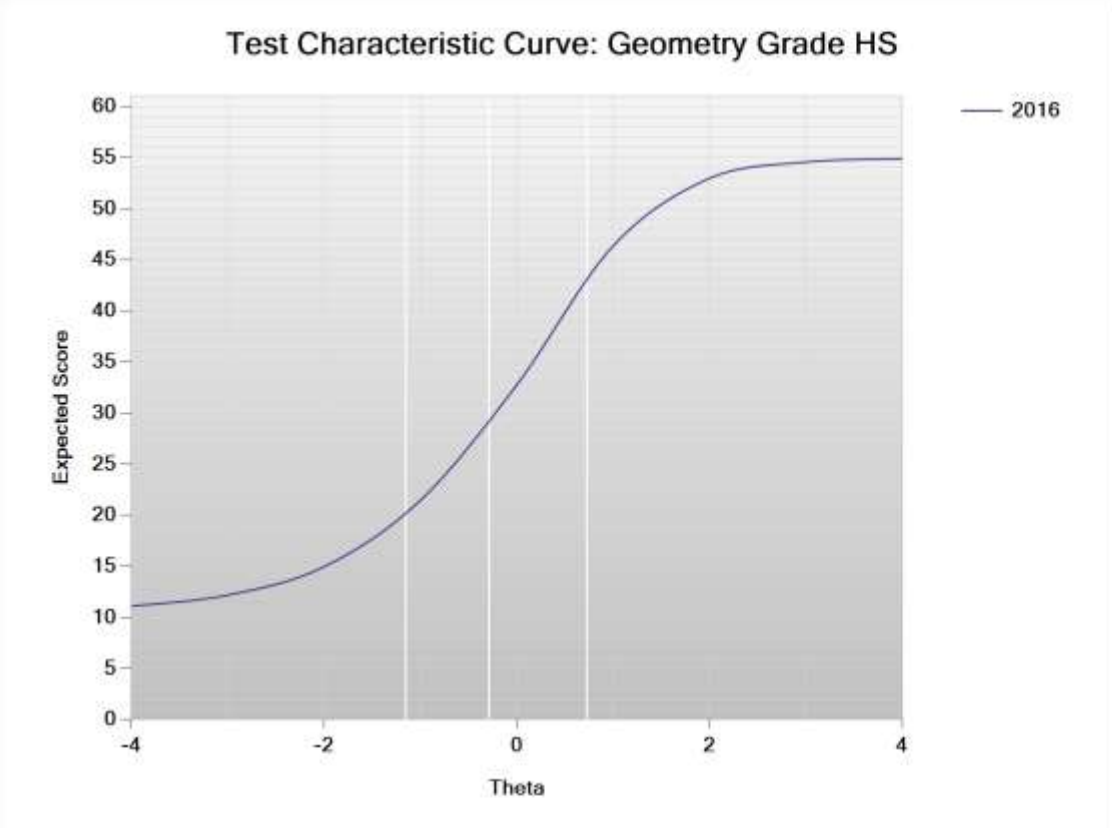
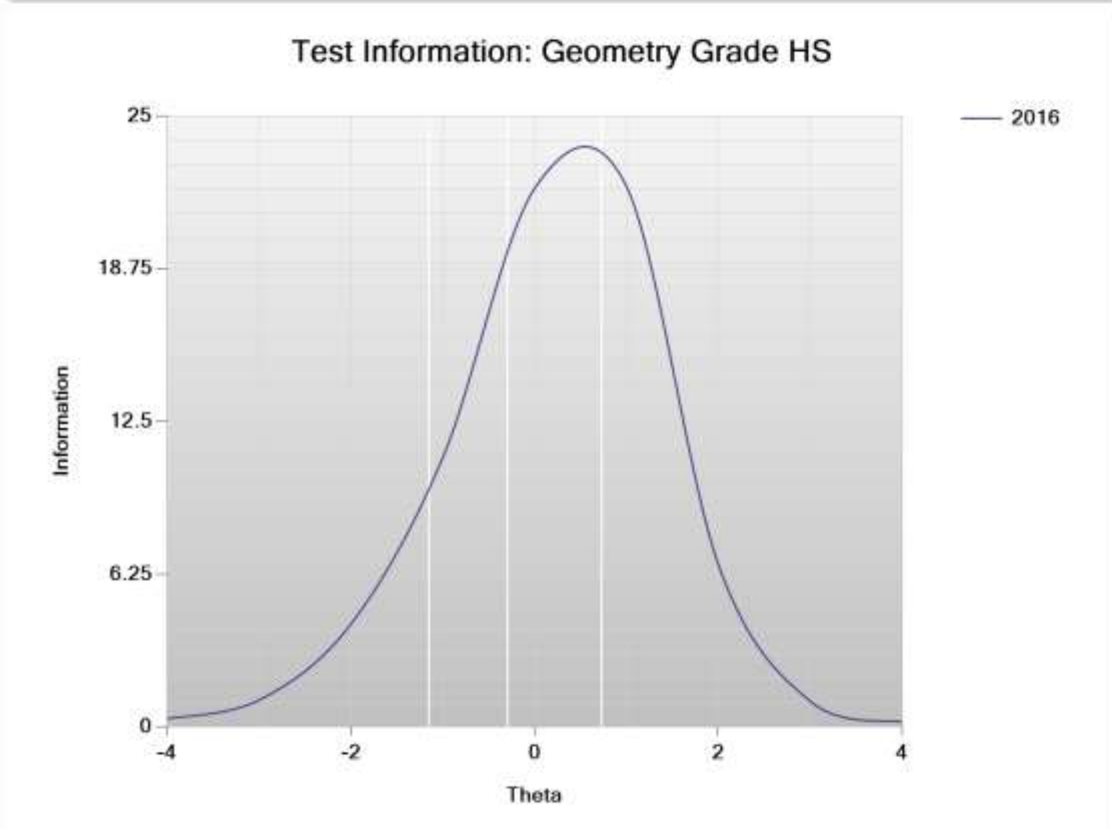


Figure L-14. 2015–16 OK EOI: Geometry-Form B
Top: Test Characteristic Curve Bottom: Test Information Function





APPENDIX M—RAW TO SCALED SCORE LOOK-UP TABLES

Table M-1. 2015–16 OK EOI: Raw to Scaled Score Correspondence
U.S. History

Raw Score	2016 - Form A			2016 - Form B		
	Scaled Score	*Standard Error*	*Performance Level*	*Scaled Score*	*Standard Error*	*Performance Level*
0	440	59.0	1	440	59.0	1
1	440	59.0	1	440	59.0	1
2	440	59.0	1	440	59.0	1
3	440	59.0	1	440	59.0	1
4	440	59.0	1	440	59.0	1
5	440	59.0	1	440	59.0	1
6	440	59.0	1	440	59.0	1
7	440	59.0	1	440	59.0	1
8	440	59.0	1	440	59.0	1
9	440	59.0	1	440	59.0	1
10	440	59.0	1	440	59.0	1
11	440	59.0	1	440	59.0	1
12	460	59.0	1	462	59.0	1
13	488	59.0	1	488	59.0	1
14	522	53.0	1	518	55.8	1
15	546	41.5	1	542	44.6	1
16	564	34.7	1	560	36.8	1
17	578	30.3	1	574	31.3	1
18	590	27.3	1	586	27.4	1
19	599	25.0	1	595	24.5	1
20	608	23.3	1	604	22.5	1
21	616	22.0	1	612	21.0	1
22	623	20.8	1	619	19.8	1
23	630	19.8	1	626	19.0	1
24	636	19.0	1	632	18.3	1
25	642	18.2	1	638	17.9	1
26	647	17.6	1	644	17.5	1
27	653	17.0	1	650	17.2	1
28	658	16.4	1	655	17.0	1
29	663	16.0	1	661	16.9	1
30	667	15.6	1	666	16.8	1
31	672	15.2	2	671	16.8	2
32	677	14.9	2	677	16.7	2
33	681	14.6	2	682	16.7	2
34	685	14.4	2	687	16.7	2
35	690	14.2	2	692	16.7	2
36	694	14.0	2	698	16.7	2
37	699	13.9	2	703	16.7	3
38	703	13.8	3	708	16.7	3
39	707	13.8	3	714	16.7	3
40	712	13.7	3	719	16.6	3
41	716	13.8	3	724	16.6	3
42	721	13.8	3	730	16.6	3
43	725	13.9	3	735	16.5	3
44	730	14.0	3	741	16.5	3

continued

Raw Score	2016 - Form A			2016 - Form B		
	Scaled Score	*Standard Error*	*Performance Level*	*Scaled Score*	*Standard Error*	*Performance Level*
45	735	14.2	3	747	16.6	3
46	740	14.5	3	752	16.7	3
47	745	14.8	3	758	16.8	3
48	751	15.3	3	765	17.1	4
49	757	15.9	3	771	17.4	4
50	764	16.7	4	778	17.9	4
51	771	17.7	4	786	18.5	4
52	779	19.1	4	794	19.4	4
53	789	20.9	4	803	20.5	4
54	800	23.3	4	813	22.1	4
55	813	26.6	4	825	24.4	4
56	830	31.2	4	839	27.8	4
57	852	38.2	4	858	33.2	4
58	885	49.9	4	886	43.3	4
59	935	59.0	4	935	59.0	4
60	999	59.0	4	999	59.0	4

Table M-2. 2015–16 OK EOI: Raw to Scaled Score Correspondence Algebra I

Raw Score	2016 - Form A			2016 - Form B		
	Scaled Score	*Standard Error*	*Performance Level*	*Scaled Score*	*Standard Error*	*Performance Level*
0	490	59.0	1	490	59.0	1
1	490	59.0	1	490	59.0	1
2	490	59.0	1	490	59.0	1
3	490	59.0	1	490	59.0	1
4	490	59.0	1	490	59.0	1
5	490	59.0	1	490	59.0	1
6	490	59.0	1	490	59.0	1
7	490	59.0	1	490	59.0	1
8	490	59.0	1	490	59.0	1
9	490	59.0	1	490	59.0	1
10	490	59.0	1	490	59.0	1
11	490	59.0	1	490	59.0	1
12	564	59.0	1	498	59.0	1
13	594	42.9	1	575	59.0	1
14	612	33.2	1	603	46.0	1
15	626	28.0	1	620	35.1	1
16	636	24.6	1	633	28.9	1
17	645	22.2	1	643	24.9	1
18	653	20.4	1	652	22.2	1
19	660	19.0	1	659	20.1	1
20	666	17.9	2	666	18.5	2
21	672	16.9	2	672	17.3	2
22	677	16.1	2	677	16.3	2
23	682	15.5	2	682	15.4	2
24	687	14.9	2	687	14.7	2

continued

Raw Score	2016 - Form A			2016 - Form B		
	Scaled Score	*Standard Error*	*Performance Level*	*Scaled Score*	*Standard Error*	*Performance Level*
25	692	14.4	2	692	14.1	2
26	696	13.9	2	696	13.6	2
27	701	13.5	3	701	13.2	3
28	705	13.2	3	705	12.9	3
29	709	12.9	3	709	12.6	3
30	713	12.6	3	713	12.3	3
31	717	12.4	3	716	12.1	3
32	721	12.2	3	720	12.0	3
33	725	12.0	3	724	11.8	3
34	729	11.9	3	728	11.8	3
35	733	11.9	3	732	11.7	3
36	737	11.8	3	736	11.7	3
37	741	11.8	3	739	11.7	3
38	745	11.9	3	743	11.7	3
39	749	12.0	3	747	11.8	3
40	753	12.1	3	752	11.9	3
41	758	12.3	3	756	12.0	3
42	762	12.6	4	760	12.2	3
43	767	12.8	4	765	12.5	4
44	772	13.1	4	770	12.8	4
45	778	13.4	4	775	13.2	4
46	783	13.7	4	781	13.7	4
47	789	14.0	4	787	14.3	4
48	796	14.4	4	793	14.9	4
49	803	14.9	4	801	15.7	4
50	811	15.7	4	810	16.7	4
51	821	17.1	4	820	18.2	4
52	832	19.3	4	832	20.7	4
53	848	23.4	4	849	25.7	4
54	873	33.6	4	880	39.4	4
55	999	59.0	4	999	59.0	4

Table M-3. 2015–16 OK EOI: Raw to Scaled Score Correspondence
Algebra II

Raw Score	2016 - Form A			2016 - Form B		
	Scaled Score	*Standard Error*	*Performance Level*	*Scaled Score*	*Standard Error*	*Performance Level*
0	440	59.0	1	440	59.0	1
1	440	59.0	1	440	59.0	1
2	440	59.0	1	440	59.0	1
3	440	59.0	1	440	59.0	1
4	440	59.0	1	440	59.0	1
5	440	59.0	1	440	59.0	1
6	440	59.0	1	440	59.0	1
7	440	59.0	1	440	59.0	1
8	440	59.0	1	440	59.0	1
9	440	59.0	1	440	59.0	1

continued

Raw Score	2016 - Form A			2016 - Form B		
	Scaled Score	*Standard Error*	*Performance Level*	*Scaled Score*	*Standard Error*	*Performance Level*
10	440	59.0	1	440	59.0	1
11	440	59.0	1	481	59.0	1
12	485	59.0	1	536	59.0	1
13	528	58.8	1	566	58.6	1
14	556	48.5	1	587	46.4	1
15	577	42.4	1	603	39.2	1
16	595	38.0	1	616	34.3	1
17	610	34.6	1	627	30.9	1
18	623	31.9	1	637	28.3	1
19	634	29.5	1	646	26.2	1
20	645	27.6	1	653	24.6	1
21	654	25.9	2	661	23.2	2
22	663	24.5	2	668	22.1	2
23	671	23.3	2	675	21.2	2
24	678	22.2	2	681	20.3	2
25	685	21.3	2	687	19.6	2
26	692	20.5	2	693	19.0	2
27	699	19.8	2	699	18.4	2
28	705	19.2	3	704	18.0	3
29	711	18.7	3	710	17.6	3
30	717	18.3	3	715	17.3	3
31	723	17.9	3	720	17.0	3
32	728	17.6	3	725	16.8	3
33	734	17.3	3	730	16.6	3
34	740	17.1	3	735	16.6	3
35	745	17.0	3	740	16.5	3
36	751	16.8	3	746	16.5	3
37	757	16.8	3	751	16.6	3
38	762	16.8	3	756	16.8	3
39	768	16.8	3	762	17.0	3
40	774	17.0	3	768	17.3	3
41	780	17.2	3	774	17.6	3
42	787	17.5	4	780	18.0	3
43	793	17.9	4	787	18.5	4
44	801	18.4	4	794	19.1	4
45	808	19.0	4	801	19.7	4
46	816	19.8	4	809	20.3	4
47	825	20.9	4	818	21.1	4
48	836	22.2	4	827	21.9	4
49	847	23.9	4	838	23.0	4
50	860	26.1	4	850	24.6	4
51	876	28.8	4	864	26.8	4
52	895	32.5	4	881	30.5	4
53	921	38.4	4	905	37.6	4
54	961	53.0	4	946	56.2	4
55	999	59.0	4	999	59.0	4

Table M-4. 2015–16 OK EOI: Raw to Scaled Score Correspondence Biology I

Raw Score	2016 - Form A			2016 - Form B		
	Scaled Score	*Standard Error*	*Performance Level*	*Scaled Score*	*Standard Error*	*Performance Level*
0	440	59.0	1	440	59.0	1
1	440	59.0	1	440	59.0	1
2	440	59.0	1	440	59.0	1
3	440	59.0	1	440	59.0	1
4	440	59.0	1	440	59.0	1
5	440	59.0	1	440	59.0	1
6	440	59.0	1	440	59.0	1
7	440	59.0	1	440	59.0	1
8	440	59.0	1	440	59.0	1
9	440	59.0	1	440	59.0	1
10	440	59.0	1	440	59.0	1
11	440	59.0	1	440	59.0	1
12	440	59.0	1	440	59.0	1
13	440	59.0	1	440	59.0	1
14	440	59.0	1	457	59.0	1
15	440	59.0	1	484	57.6	1
16	459	59.0	1	505	48.4	1
17	485	54.2	1	521	41.9	1
18	505	47.4	1	535	37.2	1
19	522	42.8	1	547	33.6	1
20	537	39.2	1	558	30.9	1
21	550	36.4	1	568	28.8	1
22	561	34.1	1	577	27.1	1
23	572	32.2	1	585	25.7	1
24	582	30.5	1	593	24.6	1
25	591	29.0	1	600	23.6	1
26	600	27.7	1	607	22.8	1
27	608	26.5	1	614	22.2	1
28	616	25.5	1	620	21.6	1
29	623	24.6	1	627	21.1	1
30	630	23.8	1	633	20.7	1
31	637	23.1	1	639	20.3	1
32	644	22.5	1	645	20.0	1
33	650	22.0	1	650	19.7	1
34	657	21.5	2	656	19.5	2
35	663	21.1	2	662	19.3	2
36	669	20.7	2	668	19.1	2
37	675	20.4	2	673	18.9	2
38	682	20.2	2	679	18.8	2
39	688	20.0	2	685	18.7	2
40	694	19.9	2	690	18.7	2
41	700	19.8	3	696	18.6	2
42	706	19.8	3	702	18.6	3
43	713	19.9	3	708	18.7	3
44	719	20.0	3	714	18.8	3
45	726	20.2	3	720	18.9	3

continued

Raw Score	2016 - Form A			2016 - Form B		
	Scaled Score	*Standard Error*	*Performance Level*	*Scaled Score*	*Standard Error*	*Performance Level*
46	733	20.5	3	726	19.1	3
47	740	20.8	3	733	19.3	3
48	747	21.2	3	740	19.7	3
49	755	21.8	3	747	20.1	3
50	764	22.5	3	755	20.7	3
51	772	23.3	3	763	21.4	3
52	783	24.5	4	772	22.3	3
53	794	26.0	4	781	23.5	4
54	807	28.0	4	792	25.0	4
55	822	30.9	4	805	27.2	4
56	841	35.3	4	820	30.3	4
57	866	42.8	4	839	35.1	4
58	903	57.8	4	866	43.6	4
59	980	59.0	4	913	59.0	4
60	999	59.0	4	999	59.0	4

Table M-5. 2015–16 OK EOI: Raw to Scaled Score Correspondence English II

Raw Score	2016 - Form A			2016 - Form B		
	Scaled Score	*Standard Error*	*Performance Level*	*Scaled Score*	*Standard Error*	*Performance Level*
0	440	59.0	1	440	59.0	1
1	440	59.0	1	440	59.0	1
2	440	59.0	1	440	59.0	1
3	440	59.0	1	440	59.0	1
4	440	59.0	1	440	59.0	1
5	440	59.0	1	440	59.0	1
6	440	59.0	1	440	59.0	1
7	440	59.0	1	440	59.0	1
8	440	59.0	1	440	59.0	1
9	440	59.0	1	440	59.0	1
10	440	59.0	1	440	59.0	1
11	440	59.0	1	440	59.0	1
12	440	59.0	1	440	59.0	1
13	440	59.0	1	440	59.0	1
14	440	59.0	1	440	59.0	1
15	440	59.0	1	440	59.0	1
16	448	59.0	1	440	59.0	1
17	485	59.0	1	460	59.0	1
18	512	57.9	1	487	58.6	1
19	533	48.3	1	508	51.9	1
20	550	41.6	1	527	46.4	1
21	565	36.7	1	542	41.8	1
22	577	33.2	1	556	37.9	1
23	588	30.6	1	569	34.9	1
24	598	28.7	1	580	32.4	1
25	608	27.1	1	590	30.4	1

Raw Score	2016 - Form A			2016 - Form B		
	Scaled Score	*Standard Error*	*Performance Level*	*Scaled Score*	*Standard Error*	*Performance Level*
						continued
26	616	26.0	2	600	28.9	1
27	625	25.0	2	609	27.7	2
28	632	24.2	2	618	26.7	2
29	640	23.5	2	626	25.9	2
30	647	23.0	2	634	25.3	2
31	654	22.5	2	642	24.7	2
32	661	22.1	2	650	24.3	2
33	668	21.7	2	657	23.8	2
34	674	21.4	2	664	23.5	2
35	681	21.2	2	671	23.1	2
36	687	21.0	2	678	22.8	2
37	694	20.8	2	685	22.6	2
38	700	20.7	3	692	22.4	2
39	706	20.5	3	699	22.3	2
40	713	20.5	3	706	22.2	3
41	719	20.4	3	713	22.2	3
42	725	20.4	3	720	22.2	3
43	732	20.5	3	726	22.2	3
44	738	20.5	3	734	22.3	3
45	745	20.6	3	741	22.4	3
46	751	20.8	3	748	22.5	3
47	758	21.0	3	755	22.6	3
48	765	21.2	3	763	22.8	3
49	772	21.5	3	770	23.0	3
50	780	21.8	3	778	23.3	3
51	787	22.3	3	786	23.6	3
52	795	22.8	3	795	24.0	3
53	804	23.3	3	804	24.4	3
54	812	24.0	3	813	25.0	3
55	822	24.9	4	822	25.6	4
56	832	25.9	4	833	26.4	4
57	843	27.2	4	844	27.5	4
58	855	28.9	4	856	28.8	4
59	869	31.1	4	869	30.6	4
60	885	34.0	4	885	33.1	4
61	903	38.0	4	903	36.6	4
62	926	43.6	4	925	41.8	4
63	955	52.1	4	953	50.0	4
64	996	59.0	4	995	59.0	4
65	999	59.0	4	999	59.0	4
66	999	59.0	4	999	59.0	4

Table M-6. 2015–16 OK EOI: Raw to Scaled Score Correspondence
English III

Raw Score	2016 - Form A			2016 - Form B		
	Scaled Score	*Standard Error*	*Performance Level*	*Scaled Score*	*Standard Error*	*Performance Level*
0	440	59.0	1	440	59.0	1
1	440	59.0	1	440	59.0	1
2	440	59.0	1	440	59.0	1
3	440	59.0	1	440	59.0	1
4	440	59.0	1	440	59.0	1
5	440	59.0	1	440	59.0	1
6	440	59.0	1	440	59.0	1
7	440	59.0	1	440	59.0	1
8	440	59.0	1	440	59.0	1
9	440	59.0	1	440	59.0	1
10	440	59.0	1	440	59.0	1
11	440	59.0	1	440	59.0	1
12	440	59.0	1	445	59.0	1
13	465	59.0	1	499	59.0	1
14	511	59.0	1	527	51.5	1
15	540	55.9	1	547	42.3	1
16	560	46.7	1	562	36.8	1
17	576	40.3	1	575	33.1	1
18	589	35.5	1	586	30.4	1
19	600	32.0	1	595	28.3	1
20	610	29.1	1	604	26.6	1
21	619	26.9	1	613	25.1	1
22	627	25.1	1	620	23.8	1
23	634	23.6	1	627	22.8	1
24	641	22.3	1	634	21.8	1
25	647	21.2	1	641	21.0	1
26	653	20.3	1	647	20.2	1
27	659	19.5	1	653	19.6	1
28	665	18.8	1	658	19.1	1
29	670	18.2	2	664	18.7	1
30	675	17.7	2	669	18.3	1
31	680	17.2	2	674	18.0	2
32	685	16.8	2	679	17.7	2
33	690	16.5	2	684	17.5	2
34	694	16.2	2	689	17.3	2
35	699	15.9	2	694	17.2	2
36	703	15.7	3	699	17.1	2
37	708	15.6	3	704	17.0	3
38	712	15.4	3	709	17.0	3
39	717	15.3	3	714	17.0	3
40	721	15.2	3	718	17.0	3
41	726	15.1	3	723	17.0	3
42	730	15.1	3	728	17.0	3
43	735	15.1	3	733	17.0	3
44	739	15.1	3	738	17.1	3

continued

Raw Score	2016 - Form A			2016 - Form B		
	Scaled Score	*Standard Error*	*Performance Level*	*Scaled Score*	*Standard Error*	*Performance Level*
45	744	15.1	3	743	17.1	3
46	748	15.1	3	748	17.1	3
47	753	15.1	3	753	17.2	3
48	758	15.2	3	758	17.2	3
49	762	15.3	3	764	17.3	3
50	767	15.4	3	769	17.3	3
51	772	15.5	3	774	17.3	3
52	777	15.7	3	780	17.3	3
53	783	15.8	3	785	17.3	3
54	788	16.0	3	791	17.3	3
55	793	16.1	3	797	17.2	3
56	799	16.3	3	802	17.2	4
57	805	16.4	4	808	17.2	4
58	811	16.5	4	815	17.2	4
59	818	16.8	4	821	17.4	4
60	824	17.1	4	827	17.6	4
61	831	17.7	4	834	18.1	4
62	839	18.6	4	842	18.8	4
63	847	19.7	4	849	19.7	4
64	856	21.3	4	858	21.0	4
65	866	23.2	4	868	22.6	4
66	878	25.8	4	878	24.7	4
67	892	29.1	4	891	27.4	4
68	908	33.6	4	906	31.2	4
69	929	40.3	4	925	37.0	4
70	958	51.3	4	952	47.5	4
71	999	59.0	4	999	59.0	4
72	999	59.0	4	999	59.0	4

Table M-7. 2015–16 OK EOI: Raw to Scaled Score Correspondence Geometry

Raw Score	2016 - Form A			2016 - Form B		
	Scaled Score	*Standard Error*	*Performance Level*	*Scaled Score*	*Standard Error*	*Performance Level*
0	440	59.0	1	440	59.0	1
1	440	59.0	1	440	59.0	1
2	440	59.0	1	440	59.0	1
3	440	59.0	1	440	59.0	1
4	440	59.0	1	440	59.0	1
5	440	59.0	1	440	59.0	1
6	440	59.0	1	440	59.0	1
7	440	59.0	1	440	59.0	1
8	440	59.0	1	440	59.0	1
9	440	59.0	1	440	59.0	1
10	440	59.0	1	440	59.0	1
11	440	59.0	1	440	59.0	1
12	464	59.0	1	487	59.0	1

continued

Raw Score	2016 - Form A			2016 - Form B		
	Scaled Score	*Standard Error*	*Performance Level*	*Scaled Score*	*Standard Error*	*Performance Level*
13	514	59.0	1	526	55.7	1
14	544	47.0	1	552	43.9	1
15	566	38.8	1	572	36.6	1
16	583	33.6	1	588	31.9	1
17	597	30.0	1	601	28.8	1
18	609	27.6	1	613	26.6	1
19	620	25.9	1	623	25.1	1
20	630	24.6	1	633	24.0	1
21	639	23.6	2	642	23.1	2
22	648	22.8	2	651	22.4	2
23	656	22.1	2	659	21.7	2
24	663	21.4	2	667	21.1	2
25	671	20.8	2	674	20.5	2
26	678	20.3	2	681	20.0	2
27	685	19.7	2	688	19.4	2
28	691	19.2	2	694	18.8	2
29	698	18.7	2	700	18.2	3
30	704	18.3	3	706	17.6	3
31	710	17.9	3	712	17.0	3
32	715	17.5	3	718	16.5	3
33	721	17.2	3	723	16.0	3
34	727	16.9	3	729	15.5	3
35	733	16.6	3	734	15.2	3
36	738	16.4	3	739	14.9	3
37	744	16.3	3	744	14.6	3
38	749	16.1	3	749	14.5	3
39	755	16.1	3	754	14.4	3
40	761	16.1	3	760	14.3	3
41	767	16.2	3	765	14.4	3
42	773	16.4	3	770	14.5	3
43	780	16.7	4	776	14.7	3
44	787	17.1	4	782	15.0	4
45	794	17.6	4	788	15.4	4
46	801	18.3	4	795	15.9	4
47	810	19.2	4	802	16.5	4
48	819	20.3	4	810	17.3	4
49	830	21.8	4	819	18.3	4
50	842	23.8	4	829	19.6	4
51	857	26.6	4	840	21.4	4
52	875	31.2	4	854	24.2	4
53	902	39.5	4	874	29.6	4
54	949	59.0	4	907	44.1	4
55	999	59.0	4	999	59.0	4

APPENDIX N—DELTA ANALYSES

Figure N-1. 2015–16 OK EOI: Delta Plot
HS U.S. History

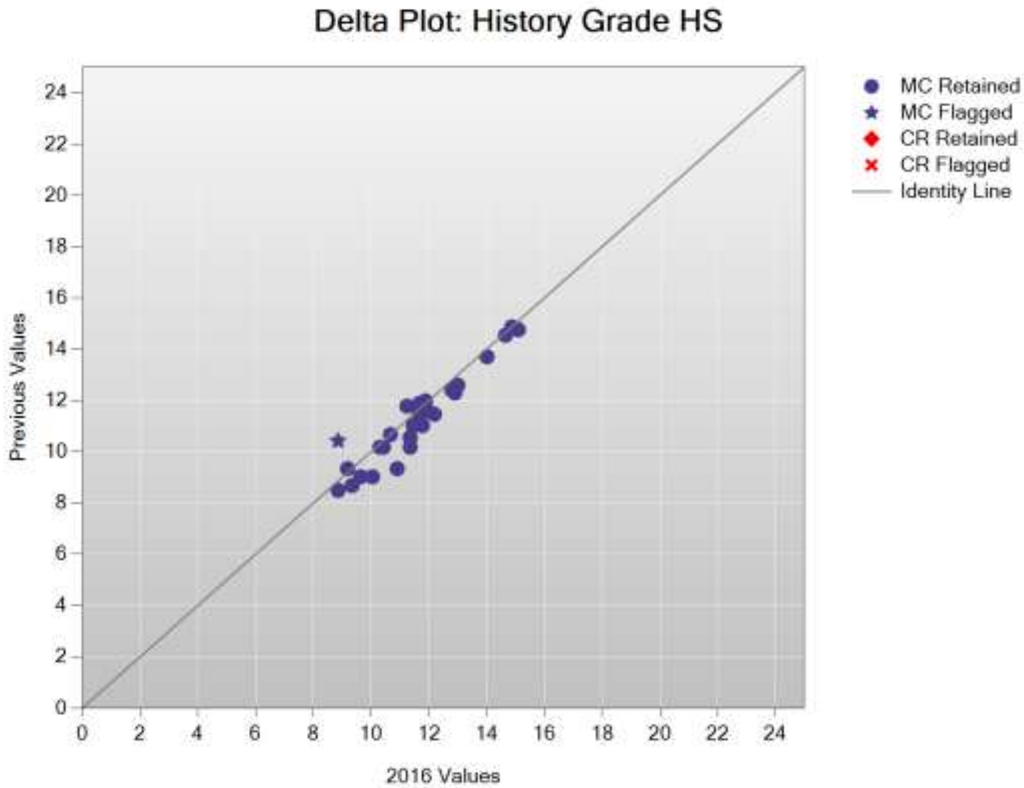


Table N-1. 2015–16 OK EOI: Delta Analysis
HS U.S. History

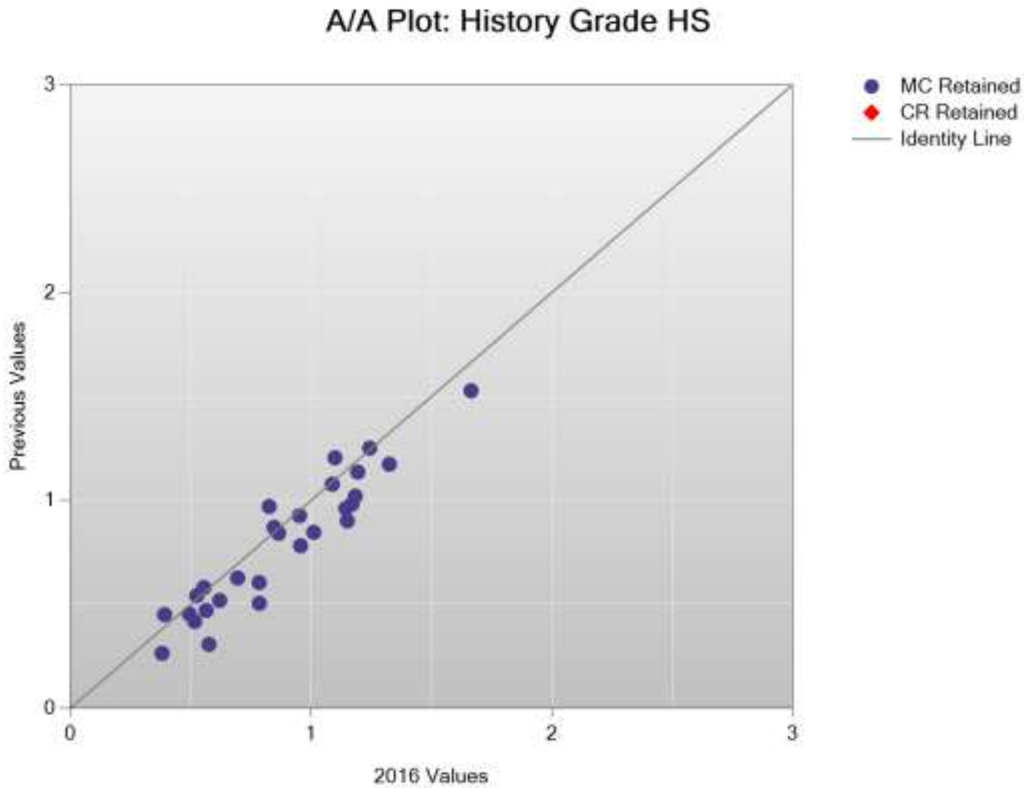
IREF	P		Delta		Discard	Std
	Old	*New*	*Old*	*New*		
143286A	0.69	0.65	11.01660	11.45872	False	-0.73705
143287A	0.62	0.67	11.77808	11.24035	False	1.14122
143292A	0.76	0.75	10.17479	10.30204	False	-0.39010
143337A	0.87	0.85	8.49444	8.85427	False	-0.85835
143344A	0.73	0.66	10.54875	11.35015	False	0.11425
143349A	0.82	0.70	9.33854	10.90240	False	1.90781
143416A	0.86	0.82	8.67872	9.33854	False	-0.34477
143526A	0.57	0.51	12.29450	12.89972	False	-0.26096
143528A	0.73	0.66	10.54875	11.35015	False	0.11425
156304A	0.32	0.32	14.87080	14.87080	False	-0.36102
156378A	0.60	0.61	11.98661	11.88272	False	0.06673
156382A	0.54	0.50	12.59827	13.00000	False	-0.74079
156444A	0.82	0.83	9.33854	9.18334	False	0.35158
156451A	0.84	0.77	9.02217	10.04461	False	0.56352
156452A	0.65	0.58	11.45872	12.19243	False	0.00328
156460A	0.76	0.74	10.17479	10.42662	False	-0.69504
156469A	0.43	0.40	13.70550	14.01339	False	-0.90391

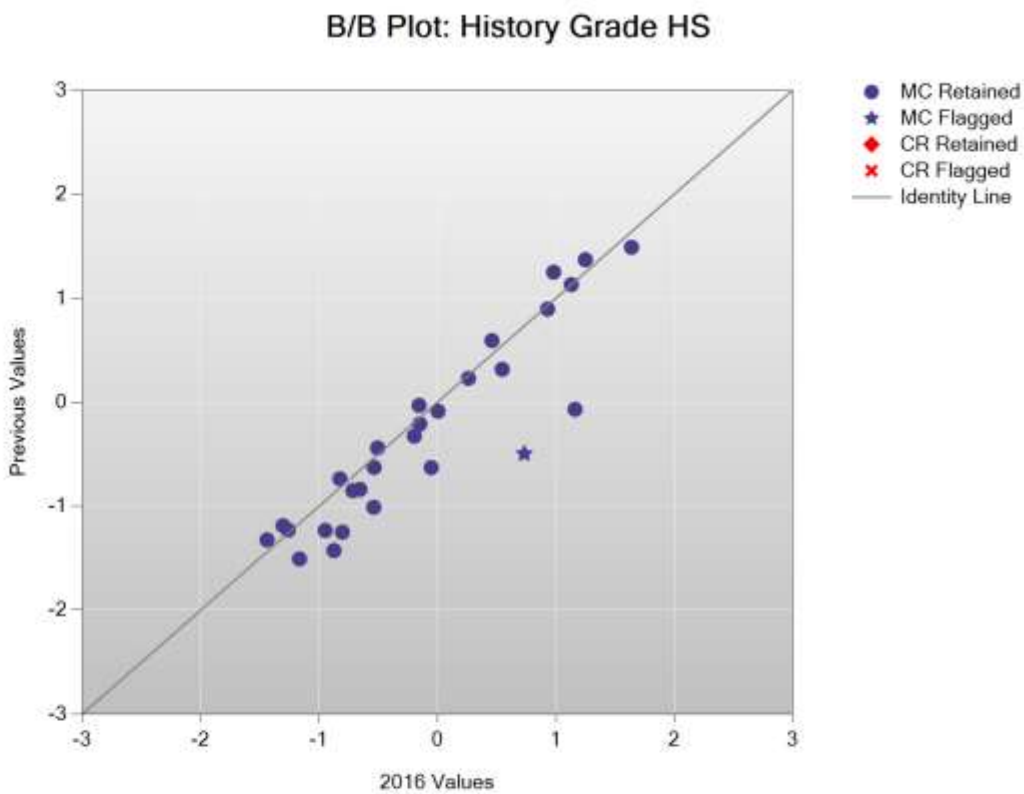
continued

IREF	P		Delta		Discard	Std
	Old	*New*	*Old*	*New*		
156490A	0.61	0.63	11.88272	11.67259	False	0.33305
156491A	0.65	0.63	11.45872	11.67259	False	-0.67933
156528A	0.76	0.66	10.17479	11.35015	False	1.00714
156531A	0.69	0.62	11.01660	11.77808	False	0.04467
156540A	0.35	0.34	14.54128	14.64985	False	-0.60696
157470A	0.64	0.60	11.56616	11.98661	False	-0.75705
157496A	0.33	0.30	14.75965	15.09760	False	-0.76694
158336A	0.72	0.72	10.66863	10.66863	False	-0.10831
158448A	0.74	0.85	10.42662	8.85427	True	3.75503
158596A	0.56	0.52	12.39612	12.79939	False	-0.74920
158654A	0.84	0.80	9.02217	9.63352	False	-0.44276

APPENDIX O— *α*-PLOTS AND *b*-PLOTS

Figure O-1. 2015–16 OK EOI: U.S. History HS
Top: *α*-Plot   Bottom: *b*-Plot





APPENDIX P—SCORE DISTRIBUTIONS

Table P-1. 2015–16 OK EOI: Performance Level Distributions by Subject

Subject	Grade	Performance Level	Percent in Level	
			2015-16	*2014-2015*
Algebra I	HS	4	29.07	28.00
		3	44.78	48.39
		2	14.46	13.95
		1	11.69	9.66
Algebra II	HS	4	23.57	23.21
		3	47.69	50.54
		2	16.68	15.23
		1	12.07	11.02
Biology	HS	4	14.04	14.37
		3	32.93	33.43
		2	19.55	22.63
		1	33.48	29.57
English II	HS	4	15.90	21.65
		3	59.97	59.43
		2	16.88	13.47
		1	7.25	5.44
English III	HS	4	18.22	18.14
		3	63.35	68.90
		2	8.54	5.97
		1	9.89	6.99
Geometry	HS	4	33.95	32.52
		3	44.36	45.53
		2	15.01	16.42
		1	6.68	5.53
U.S. History	HS	4	20.48	29.84
		3	41.23	42.25
		2	16.52	13.31
		1	21.78	14.60

APPENDIX Q—CUMULATIVE SCORE DISTRIBUTIONS

Table Q-1. 2015–16 OK EOI: Scaled Score Distributions
Algebra I

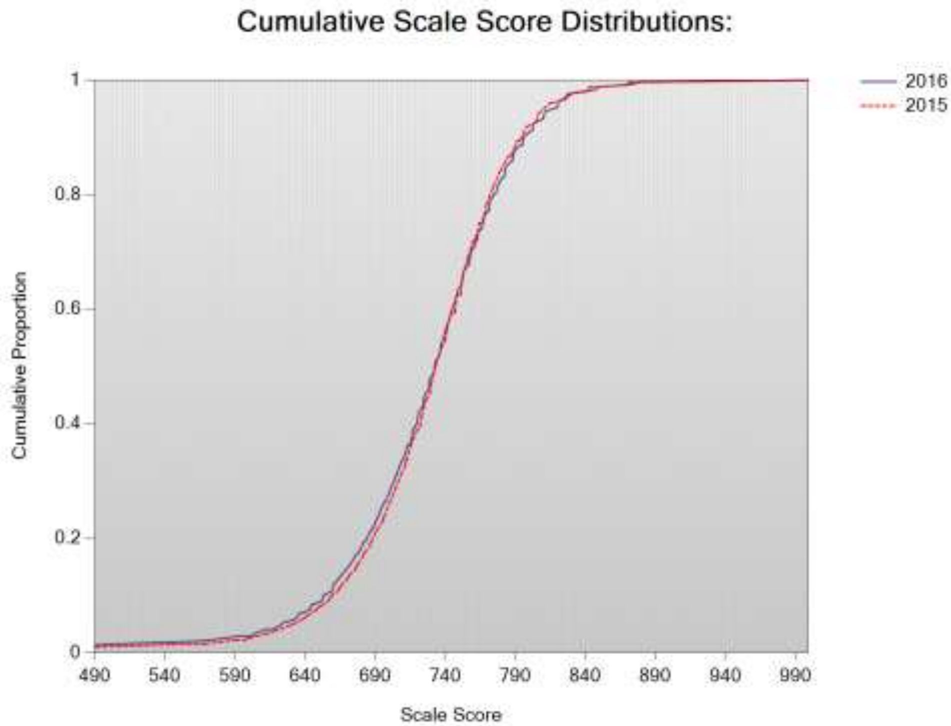


Table Q-2. 2015–16 OK EOI: Scaled Score Distributions
Algebra II

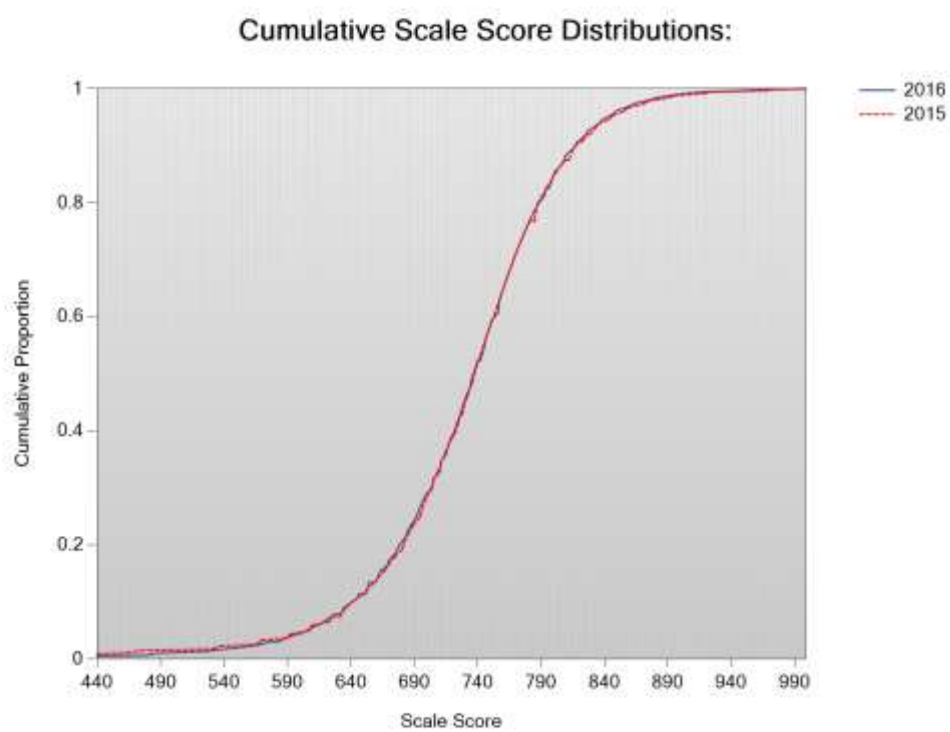


Table Q-3. 2015–16 OK EOI: Scaled Score Distributions
Biology

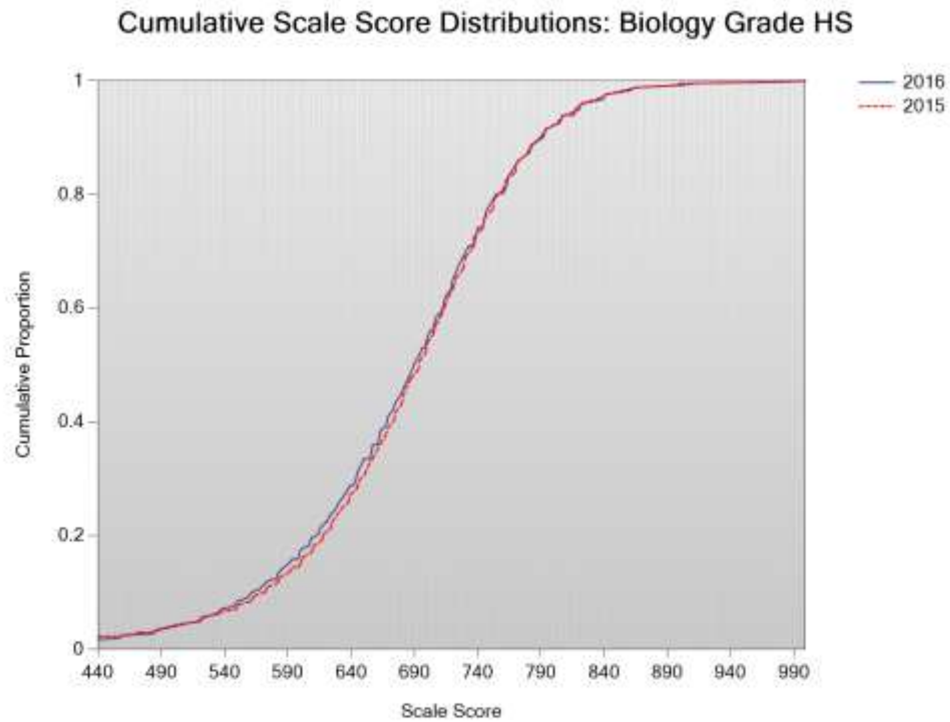


Table Q-4. 2015–16 OK EOI: Scaled Score Distributions
English II

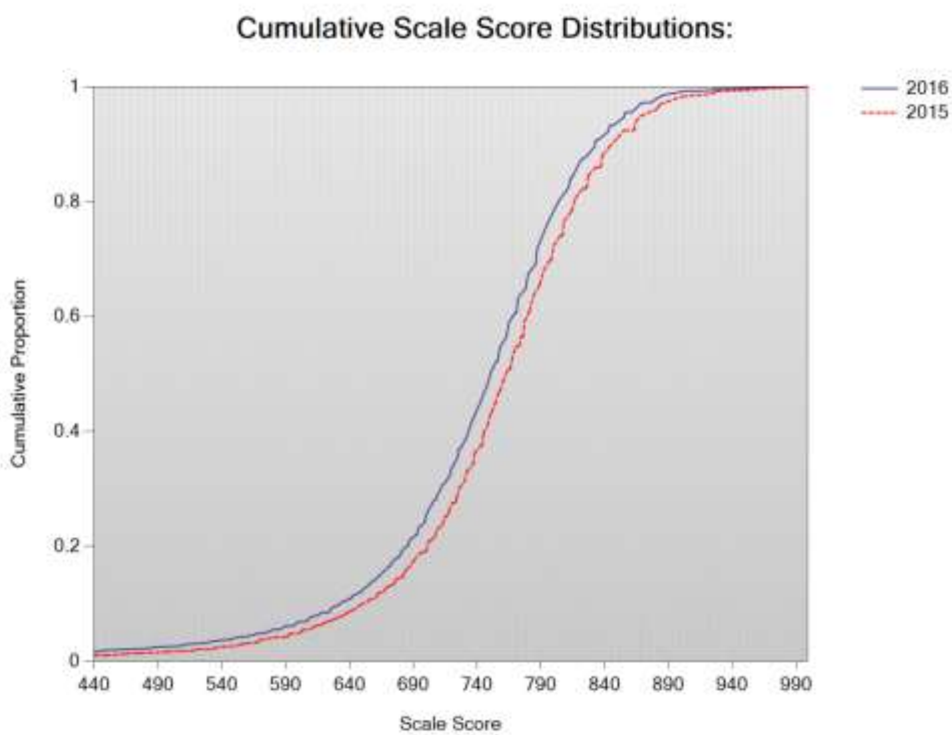


Table Q-5. 2015–16 OK EOI: Scaled Score Distributions
English III

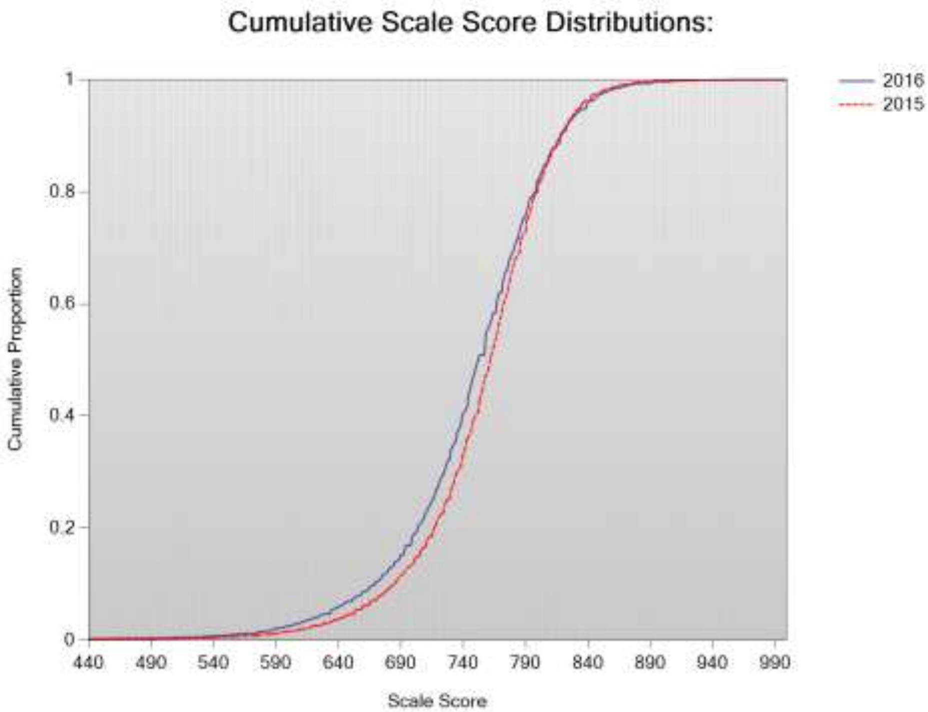


Table Q-6. 2015–16 OK EOI: Scaled Score Distributions
Geometry

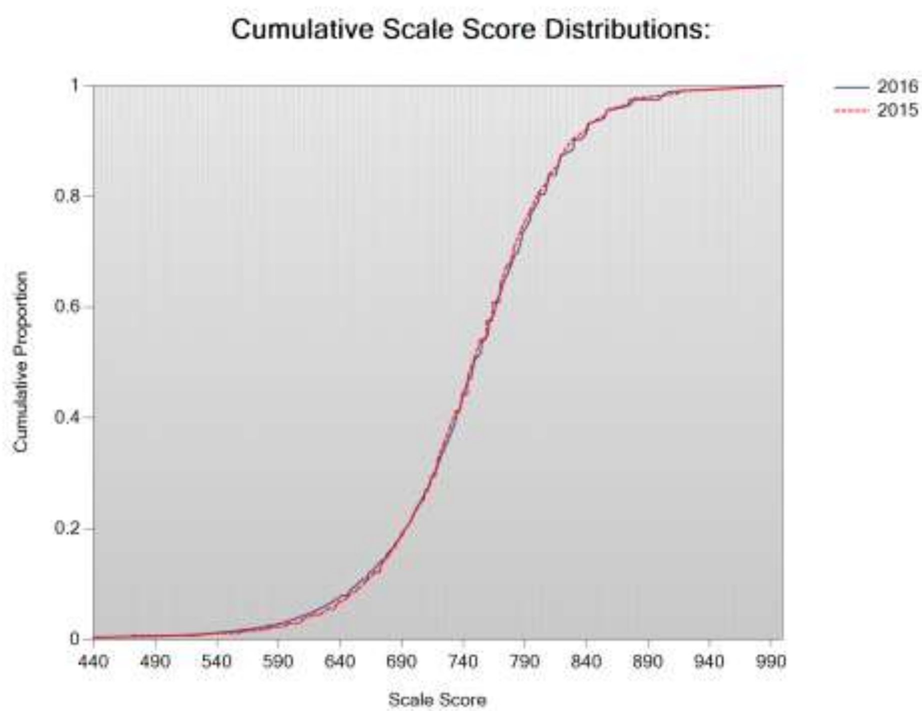
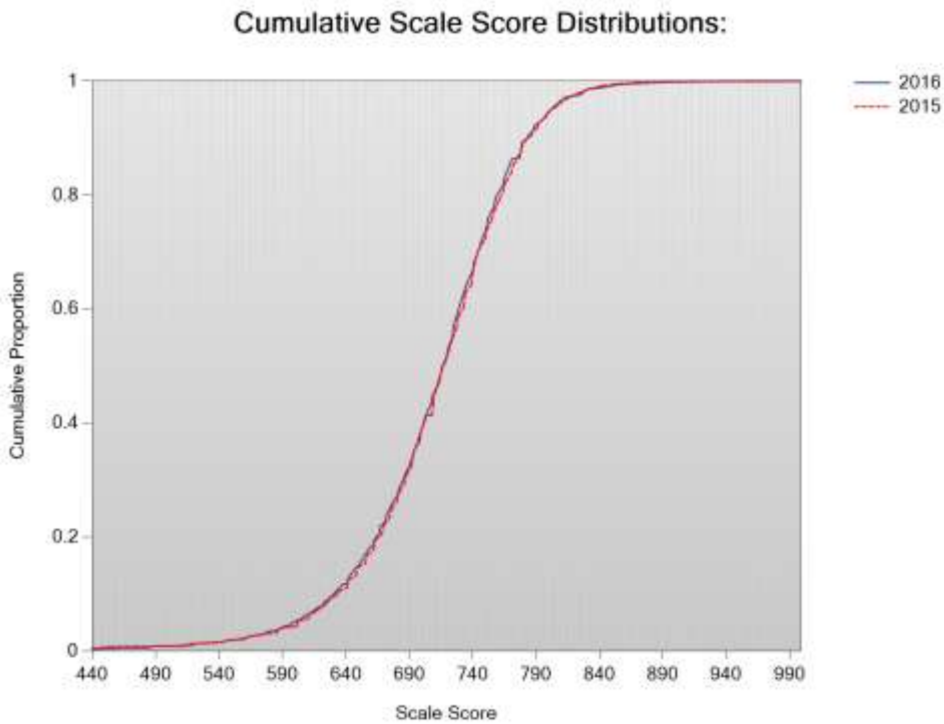


Table Q-7. 2015–16 OK EOI: Scaled Score Distributions
U.S. History



APPENDIX R—CLASSICAL RELIABILTY

Table R-1. 2015–16 OK EOI: Subgroup Reliabilities
Algebra I: Form A

Grade	Description	Number of Students	Raw Score *Maximum*	Raw Score *Mean*	Raw Score *Standard Deviation*	Alpha	Standard Error
HS	All Students	29,513	55	33.54	11.09	0.92	3.09
	Male	15,110	55	32.76	11.51	0.93	3.10
	Female	14,403	55	34.35	10.58	0.92	3.07
	Black/African American	2,620	55	28.89	10.36	0.90	3.23
	American Indian/Alaskan Native	4,439	55	32.00	10.81	0.92	3.15
	Hispanic or Latino	4,680	55	31.38	10.64	0.91	3.18
	Asian	667	55	40.85	10.00	0.93	2.71
	Pacific Islander	85	55	30.11	10.21	0.90	3.19
	White/Caucasian	14,839	55	35.16	11.00	0.92	3.03
	Two or More Races	2,183	55	33.71	11.02	0.92	3.08
	English Language Learners (ELL)	1,594	55	27.00	9.99	0.89	3.28
	Individual Education Program (IEP)	5,097	55	23.09	9.34	0.87	3.30
	Economically Disadvantaged	16,852	55	30.76	10.75	0.91	3.19
	Plan 504	414	55	33.18	10.47	0.91	3.13

Table R-2. 2015–16 OK EOI: Subgroup Reliabilities
Algebra I: Form B

Grade	Description	Number of Students	Raw Score *Maximum*	Raw Score *Mean*	Raw Score *Standard Deviation*	Alpha	Standard Error
HS	All Students	17,543	55	35.70	10.70	0.92	3.04
	Male	8,654	55	35.30	11.03	0.92	3.06
	Female	8,889	55	36.08	10.35	0.92	3.02
	Black/African American	1,619	55	30.29	10.53	0.91	3.21
	American Indian/Alaskan Native	2,551	55	34.11	10.43	0.91	3.12
	Hispanic or Latino	2,636	55	33.84	10.43	0.91	3.13
	Asian	373	55	43.61	9.25	0.92	2.55
	Pacific Islander	46	55	32.59	11.04	0.92	3.10
	White/Caucasian	9,016	55	37.30	10.39	0.92	2.98
	Two or More Races	1,302	55	36.00	10.56	0.92	3.04
	English Language Learners (ELL)	650	55	27.78	10.37	0.90	3.29
	Individual Education Program (IEP)	1,615	55	24.76	10.14	0.89	3.32
	Economically Disadvantaged	9,638	55	32.92	10.50	0.91	3.16
	Plan 504	226	55	33.13	10.90	0.92	3.15

Table R-3. 2015–16 OK EOI: Subgroup Reliabilities
Algebra II: Form A

Grade	Description	Number of Students	Raw Score			Alpha	Standard Error
			Maximum	*Mean*	*Standard Deviation*		
HS	All Students	18,212	55	33.55	9.84	0.90	3.12
	Male	8,680	55	32.98	10.17	0.90	3.14
	Female	9,532	55	34.07	9.50	0.89	3.11
	Black/African American	1,612	55	30.24	9.27	0.88	3.23
	American Indian/Alaskan Native	2,830	55	32.42	9.64	0.89	3.17
	Hispanic or Latino	2,799	55	32.23	9.63	0.89	3.17
	Asian	452	55	40.80	9.73	0.92	2.76
	Pacific Islander	42	55	32.38	11.62	0.93	3.07
	White/Caucasian	9,291	55	34.41	9.76	0.90	3.09
	Two or More Races	1,186	55	34.46	9.69	0.90	3.09
	English Language Learners (ELL)	385	55	28.06	9.68	0.89	3.27
	Individual Education Program (IEP)	1,777	55	24.97	8.96	0.86	3.30
	Economically Disadvantaged	8,956	55	31.68	9.68	0.89	3.19
	Plan 504	256	55	32.34	9.19	0.88	3.18

Table R-4. 2015–16 OK EOI: Subgroup Reliabilities
Algebra II: Form B

Grade	Description	Number of Students	Raw Score			Alpha	Standard Error
			Maximum	*Mean*	*Standard Deviation*		
HS	All Students	11,519	55	33.74	10.40	0.90	3.23
	Male	5,412	55	33.50	10.60	0.91	3.23
	Female	6,107	55	33.95	10.22	0.90	3.23
	Black/African American	1,056	55	30.30	10.07	0.89	3.33
	American Indian/Alaskan Native	1,760	55	32.04	10.32	0.90	3.29
	Hispanic or Latino	1,752	55	32.67	10.11	0.90	3.27
	Asian	258	55	41.65	9.75	0.92	2.77
	Pacific Islander	24	55	32.92	9.54	0.88	3.32
	White/Caucasian	5,950	55	34.74	10.30	0.90	3.20
	Two or More Races	719	55	34.38	10.11	0.90	3.23
	English Language Learners (ELL)	180	55	26.66	9.82	0.88	3.37
	Individual Education Program (IEP)	683	55	26.06	10.02	0.89	3.38
	Economically Disadvantaged	5,564	55	31.78	10.29	0.90	3.30
	Plan 504	160	55	33.28	9.87	0.89	3.26

Table R-5. 2015–16 OK EOI: Subgroup Reliabilities
Biology: Form A

Grade	Description	Number of Students	Raw Score Maximum	Raw Score Mean	Raw Score Standard Deviation	Alpha	Standard Error
HS	All Students	22,758	60	37.77	11.62	0.92	3.33
	Male	11,655	60	37.44	12.15	0.93	3.32
	Female	11,103	60	38.11	11.02	0.91	3.34
	Black/African American	2,045	60	31.66	11.13	0.90	3.50
	American Indian/Alaskan Native	3,452	60	36.58	11.33	0.91	3.38
	Hispanic or Latino	3,570	60	34.21	10.99	0.90	3.46
	Asian	512	60	42.79	11.59	0.93	3.08
	Pacific Islander	61	60	33.43	11.84	0.92	3.45
	White/Caucasian	11,559	60	39.98	11.26	0.92	3.25
	Two or More Races	1,559	60	38.72	11.40	0.92	3.30
	English Language Learners (ELL)	1,005	60	26.94	9.33	0.85	3.58
	Individual Education Program (IEP)	4,072	60	27.13	9.91	0.87	3.56
	Economically Disadvantaged	12,418	60	34.80	11.33	0.91	3.43
	Plan 504	330	60	38.06	11.37	0.92	3.31

Table R-6. 2015–16 OK EOI: Subgroup Reliabilities
Biology: Form B

Grade	Description	Number of Students	Raw Score Maximum	Raw Score Mean	Raw Score Standard Deviation	Alpha	Standard Error
HS	All Students	19,948	60	39.70	11.69	0.92	3.21
	Male	9,884	60	40.20	11.88	0.93	3.17
	Female	10,064	60	39.21	11.49	0.92	3.23
	Black/African American	1,828	60	32.30	11.68	0.91	3.43
	American Indian/Alaskan Native	2,838	60	38.85	11.07	0.91	3.26
	Hispanic or Latino	2,948	60	36.07	11.61	0.92	3.35
	Asian	480	60	45.46	11.00	0.93	2.91
	Pacific Islander	53	60	33.91	13.55	0.94	3.31
	White/Caucasian	10,440	60	42.03	11.03	0.92	3.12
	Two or More Races	1,361	60	39.67	11.51	0.92	3.21
	English Language Learners (ELL)	531	60	26.78	10.31	0.88	3.52
	Individual Education Program (IEP)	1,674	60	28.02	11.66	0.91	3.46
	Economically Disadvantaged	10,435	60	36.69	11.69	0.92	3.32
	Plan 504	290	60	39.68	11.34	0.92	3.22

Table R-7. 2015–16 OK EOI: Subgroup Reliabilities
English II: Form A

Grade	Description	Number of Students	Raw Score			Alpha	Standard Error
			Maximum	*Mean*	*Standard Deviation*		
HS	All Students	26,161	66	44.39	10.88	0.92	3.03
	Male	13,403	66	42.83	11.37	0.93	3.07
	Female	12,758	66	46.02	10.07	0.91	2.98
	Black/African American	2,351	66	39.39	11.41	0.92	3.15
	American Indian/Alaskan Native	4,071	66	43.31	10.78	0.92	3.07
	Hispanic or Latino	3,706	66	42.23	10.71	0.92	3.10
	Asian	554	66	47.90	10.30	0.92	2.85
	Pacific Islander	79	66	42.76	11.59	0.93	3.12
	White/Caucasian	13,570	66	45.99	10.47	0.92	2.96
	Two or More Races	1,830	66	44.68	10.73	0.92	3.05
	English Language Learners (ELL)	743	66	30.93	10.27	0.90	3.31
	Individual Education Program (IEP)	3,805	66	31.00	11.76	0.92	3.37
	Economically Disadvantaged	13,965	66	41.71	11.11	0.92	3.12
	Plan 504	397	66	45.03	10.78	0.92	3.14

Table R-8. 2015–16 OK EOI: Subgroup Reliabilities
English II: Form B

Grade	Description	Number of Students	Raw Score			Alpha	Standard Error
			Maximum	*Mean*	*Standard Deviation*		
HS	All Students	17,187	66	44.47	10.19	0.91	2.97
	Male	8,517	66	42.98	10.54	0.92	3.02
	Female	8,670	66	45.93	9.60	0.91	2.93
	Black/African American	1,579	66	40.41	10.93	0.92	3.07
	American Indian/Alaskan Native	2,599	66	43.58	10.10	0.91	3.00
	Hispanic or Latino	2,533	66	41.84	10.41	0.91	3.07
	Asian	371	66	47.86	10.23	0.93	2.76
	Pacific Islander	39	66	39.85	11.63	0.93	3.10
	White/Caucasian	8,862	66	46.00	9.62	0.91	2.92
	Two or More Races	1,204	66	45.10	9.95	0.91	2.96
	English Language Learners (ELL)	507	66	30.50	9.65	0.88	3.28
	Individual Education Program (IEP)	2,346	66	32.43	10.54	0.90	3.27
	Economically Disadvantaged	9,150	66	41.92	10.51	0.92	3.06
	Plan 504	253	66	45.64	8.65	0.88	2.98

Table R-9. 2015–16 OK EOI: Subgroup Reliabilities
English III: Form A

Grade	Description	Number of Students	Raw Score			Alpha	Standard Error
			Maximum	*Mean*	*Standard Deviation*		
HS	All Students	19,401	72	45.83	11.72	0.92	3.31
	Male	10,035	72	44.48	12.20	0.92	3.36
	Female	9,366	72	47.28	11.00	0.91	3.24
	Black/African American	1,826	72	41.22	11.61	0.91	3.43
	American Indian/Alaskan Native	3,273	72	45.02	11.75	0.92	3.32
	Hispanic or Latino	2,833	72	43.28	11.27	0.91	3.37
	Asian	306	72	47.08	11.69	0.92	3.27
	Pacific Islander	75	72	40.53	11.18	0.91	3.43
	White/Caucasian	9,898	72	47.59	11.51	0.92	3.25
	Two or More Races	1,190	72	46.58	11.31	0.92	3.27
	English Language Learners (ELL)	489	72	32.00	10.47	0.89	3.54
	Individual Education Program (IEP)	3,041	72	32.39	11.55	0.90	3.60
	Economically Disadvantaged	10,507	72	43.44	11.83	0.92	3.38
	Plan 504	242	72	45.97	10.96	0.91	3.37

Table R-10. 2015–16 OK EOI: Subgroup Reliabilities
English III: Form B

Grade	Description	Number of Students	Raw Score			Alpha	Standard Error
			Maximum	*Mean*	*Standard Deviation*		
HS	All Students	12,743	72	45.78	10.71	0.90	3.30
	Male	6,615	72	44.41	11.03	0.91	3.33
	Female	6,128	72	47.25	10.15	0.90	3.26
	Black/African American	1,203	72	41.26	10.93	0.90	3.41
	American Indian/Alaskan Native	2,131	72	45.41	10.25	0.90	3.32
	Hispanic or Latino	1,756	72	43.03	10.44	0.90	3.37
	Asian	218	72	45.75	12.04	0.92	3.30
	Pacific Islander	37	72	40.68	10.79	0.90	3.33
	White/Caucasian	6,595	72	47.40	10.44	0.90	3.25
	Two or More Races	803	72	46.46	10.72	0.91	3.27
	English Language Learners (ELL)	330	72	31.49	10.16	0.88	3.54
	Individual Education Program (IEP)	1,850	72	33.83	10.83	0.89	3.57
	Economically Disadvantaged	6,786	72	43.53	10.92	0.90	3.37
	Plan 504	172	72	45.35	9.37	0.87	3.37

Table R-11. 2015–16 OK EOI: Subgroup Reliabilities
Geometry: Form A

Grade	Description	Number of Students	Raw Score			Alpha	Standard Error
			Maximum	*Mean*	*Standard Deviation*		
HS	All Students	24,287	55	37.03	9.97	0.91	3.00
	Male	12,076	55	36.77	10.22	0.91	3.01
	Female	12,211	55	37.29	9.70	0.91	2.98
	Black/African American	2,133	55	32.01	9.73	0.89	3.21
	American Indian/Alaskan Native	3,651	55	35.79	9.83	0.90	3.06
	Hispanic or Latino	3,796	55	35.18	9.80	0.90	3.08
	Asian	532	55	43.65	8.67	0.91	2.59
	Pacific Islander	84	55	34.17	10.51	0.91	3.09
	White/Caucasian	12,438	55	38.54	9.67	0.91	2.93
	Two or More Races	1,653	55	37.20	9.74	0.90	3.01
	English Language Learners (ELL)	819	55	28.88	9.97	0.89	3.27
	Individual Education Program (IEP)	3,489	55	26.96	9.53	0.88	3.31
	Economically Disadvantaged	12,853	55	34.65	9.95	0.90	3.10
	Plan 504	328	55	36.87	8.95	0.88	3.06

Table R-12. 2015–16 OK EOI: Subgroup Reliabilities
Geometry: Form B

Grade	Description	Number of Students	Raw Score			Alpha	Standard Error
			Maximum	*Mean*	*Standard Deviation*		
HS	All Students	14,787	55	37.78	10.03	0.91	2.94
	Male	7,301	55	37.63	10.28	0.92	2.95
	Female	7,486	55	37.93	9.78	0.91	2.93
	Black/African American	1,342	55	32.15	10.00	0.90	3.15
	American Indian/Alaskan Native	2,176	55	36.61	9.48	0.90	3.01
	Hispanic or Latino	2,199	55	35.54	9.69	0.90	3.05
	Asian	343	55	45.19	8.51	0.92	2.46
	Pacific Islander	50	55	34.74	12.28	0.94	2.96
	White/Caucasian	7,666	55	39.43	9.72	0.91	2.87
	Two or More Races	1,011	55	37.80	9.80	0.91	2.96
	English Language Learners (ELL)	340	55	29.64	10.56	0.91	3.21
	Individual Education Program (IEP)	1,162	55	27.59	10.01	0.89	3.27
	Economically Disadvantaged	7,572	55	35.32	9.91	0.91	3.06
	Plan 504	211	55	37.50	9.56	0.90	2.97

Table R-13. 2015–16 OK EOI: Subgroup Reliabilities
U.S. History: Form A

Grade	Description	Number of Students	Raw Score			Alpha	Standard Error
			Maximum	*Mean*	*Standard Deviation*		
HS	All Students	24,797	60	39.49	11.00	0.91	3.25
	Male	12,612	60	40.55	11.28	0.92	3.19
	Female	12,185	60	38.40	10.59	0.90	3.31
	Black/African American	2,270	60	34.99	11.07	0.91	3.41
	American Indian/Alaskan Native	3,861	60	38.29	10.75	0.91	3.31
	Hispanic or Latino	3,474	60	36.98	11.00	0.91	3.35
	Asian	549	60	41.99	10.83	0.92	3.13
	Pacific Islander	79	60	34.96	11.93	0.92	3.39
	White/Caucasian	12,893	60	41.20	10.66	0.91	3.17
	Two or More Races	1,671	60	39.77	10.93	0.91	3.24
	English Language Learners (ELL)	645	60	27.05	9.68	0.86	3.57
	Individual Education Program (IEP)	3,912	60	29.45	11.14	0.90	3.52
	Economically Disadvantaged	12,614	60	36.64	11.13	0.91	3.36
	Plan 504	364	60	40.47	10.66	0.91	3.22

Table R-14. 2015–16 OK EOI: Subgroup Reliabilities
U.S. History: Form B

Grade	Description	Number of Students	Raw Score			Alpha	Standard Error
			Maximum	*Mean*	*Standard Deviation*		
HS	All Students	15,099	60	38.70	9.91	0.89	3.28
	Male	7,552	60	39.91	10.18	0.90	3.23
	Female	7,547	60	37.49	9.49	0.88	3.32
	Black/African American	1,332	60	34.28	10.26	0.89	3.40
	American Indian/Alaskan Native	2,191	60	37.81	9.69	0.88	3.32
	Hispanic or Latino	2,111	60	36.21	9.88	0.88	3.37
	Asian	359	60	40.76	11.03	0.92	3.18
	Pacific Islander	51	60	34.16	9.35	0.86	3.46
	White/Caucasian	8,058	60	40.15	9.49	0.88	3.22
	Two or More Races	997	60	39.58	9.84	0.89	3.24
	English Language Learners (ELL)	329	60	27.29	9.63	0.87	3.53
	Individual Education Program (IEP)	1,314	60	29.29	10.91	0.90	3.48
	Economically Disadvantaged	7,303	60	36.15	10.05	0.89	3.36
	Plan 504	212	60	39.45	9.85	0.89	3.25

Table R-15. 2015–16 OK EOI: Reliabilities by Reporting Category: Form A

Subject	Reporting Category	Number of Items	Raw Score			Alpha	Standard Error
			Maximum	*Mean*	*Standard Deviation*		
Algebra I	1	15	15	8.49	3.49	0.78	1.63
	2	6	6	3.04	1.45	0.49	1.04
	3	9	9	5.45	2.48	0.76	1.23
	4	31	31	20.95	6.62	0.88	2.27
	5	6	6	4.13	1.50	0.56	1.00
	6	15	15	10.38	3.42	0.80	1.54
	7	6	6	3.80	1.68	0.64	1.00
	8	4	4	2.64	1.20	0.51	0.84
	9	9	9	4.10	2.00	0.58	1.30
	10	5	5	1.93	1.31	0.44	0.99
	11	4	4	2.17	1.08	0.38	0.85
Algebra II	1	15	15	9.02	3.48	0.78	1.65
	2	5	5	3.57	1.33	0.54	0.90
	3	6	6	3.27	1.70	0.60	1.08
	4	4	4	2.19	1.26	0.59	0.81
	5	31	31	17.19	5.89	0.83	2.42
	6	5	5	2.66	1.43	0.50	1.01
	7	5	5	2.59	1.35	0.49	0.96
	8	5	5	2.38	1.19	0.28	1.01
	9	4	4	2.01	1.19	0.47	0.87
	10	4	4	1.89	1.03	0.24	0.90
	11	4	4	2.98	1.06	0.47	0.77
	12	4	4	2.69	1.15	0.49	0.82
	13	9	9	7.34	1.64	0.61	1.02
	14	5	5	4.31	0.89	0.41	0.68
	15	4	4	3.03	1.09	0.56	0.73
Biology	1	6	6	3.68	1.48	0.47	1.08
	2	4	4	2.39	1.20	0.46	0.89
	3	2	2	1.29	0.63	0.07	0.61
	4	7	7	4.45	1.64	0.52	1.13
	5	4	4	2.73	1.09	0.43	0.82
	6	3	3	1.72	0.91	0.28	0.78
	7	18	18	11.60	3.57	0.74	1.83
	8	5	5	3.39	1.28	0.50	0.91
	9	5	5	2.95	1.33	0.45	0.99
	10	5	5	3.04	1.37	0.47	0.99
	11	3	3	2.22	0.81	0.18	0.73
	12	21	21	13.14	4.65	0.82	1.96
	13	5	5	3.20	1.21	0.38	0.95
	14	4	4	2.51	1.19	0.49	0.85
	15	4	4	2.52	1.28	0.59	0.82
	16	4	4	2.47	1.14	0.38	0.90
	17	4	4	2.44	1.25	0.55	0.84
	18	8	8	4.91	2.03	0.65	1.21
	19	4	4	2.29	1.21	0.48	0.87

continued

Subject	Reporting Category	Number of Items	Raw Score			Alpha	Standard Error
			Maximum	*Mean*	*Standard Deviation*		
Biology	20	4	4	2.62	1.15	0.47	0.84
	21	12	12	7.45	2.69	0.69	1.49
	22	4	4	2.47	1.10	0.37	0.87
	23	4	4	2.76	1.12	0.47	0.81
	24	4	4	2.23	1.17	0.42	0.90
	25	13	13	7.60	3.02	0.73	1.58
	26	6	6	3.58	1.62	0.58	1.05
	27	7	7	4.01	1.84	0.60	1.17
	28	12	12	7.93	2.69	0.71	1.45
	29	4	4	2.58	1.13	0.43	0.85
	30	4	4	2.45	1.13	0.40	0.88
	31	4	4	2.90	1.15	0.53	0.79
	32	8	8	5.18	2.10	0.68	1.18
	33	4	4	2.67	1.17	0.49	0.84
	34	4	4	2.51	1.24	0.54	0.84
	35	12	12	7.39	2.62	0.67	1.50
	36	4	4	2.16	1.17	0.39	0.91
	37	4	4	2.43	1.15	0.39	0.90
	38	4	4	2.80	1.04	0.44	0.78
English II	1	6	6	4.83	1.27	0.55	0.85
	2	17	17	11.47	3.40	0.75	1.71
	3	4	4	2.51	1.16	0.42	0.88
	4	5	5	3.39	1.23	0.45	0.91
	5	4	4	3.08	0.99	0.45	0.73
	6	4	4	2.48	1.12	0.37	0.89
	7	19	19	12.66	3.61	0.73	1.86
	8	5	5	3.34	1.17	0.32	0.96
	9	6	6	4.06	1.49	0.55	1.01
	10	4	4	2.87	1.09	0.44	0.82
	11	4	4	2.39	1.12	0.36	0.90
	12	6	6	4.27	1.36	0.44	1.02
	13	12	12	7.67	2.57	0.71	1.38
	14	4	4	2.58	1.01	0.40	0.78
	15	4	4	2.96	1.07	0.53	0.74
	16	4	4	2.13	1.18	0.49	0.84
	17	5	6	3.48	1.01	0.98	0.13
	18	1	4	2.67	0.63		
	19	1	4	2.67	0.63		
	20	1	4	2.69	0.62		
	21	1	4	2.65	0.64		
	22	1	4	2.65	0.63		
English III	1	6	6	3.90	1.53	0.53	1.05
	2	17	17	10.90	3.37	0.72	1.78
	3	4	4	2.65	1.08	0.35	0.87
	4	4	4	2.71	1.06	0.35	0.86
	5	5	5	3.34	1.26	0.46	0.93
	6	4	4	2.20	1.17	0.39	0.91
	7	18	18	11.94	3.28	0.71	1.77

continued

Subject	Reporting Category	Number of Items	Raw Score			Alpha	Standard Error
			Maximum	*Mean*	*Standard Deviation*		
English III	8	5	5	3.44	1.17	0.41	0.90
	9	5	5	3.45	1.28	0.48	0.93
	10	4	4	3.00	1.05	0.45	0.78
	11	4	4	2.04	1.07	0.30	0.90
	12	7	7	4.78	1.66	0.58	1.08
	13	14	14	7.94	2.55	0.63	1.54
	14	5	5	3.36	1.18	0.43	0.89
	15	1	1	0.86	0.34		
	16	4	4	1.85	1.06	0.34	0.86
	17	4	4	1.87	1.11	0.45	0.82
	18	5	10	6.36	2.14	0.99	0.17
	19	1	4	2.78	0.79		
	20	1	4	2.77	0.79		
	21	1	4	2.78	0.79		
	22	1	4	2.77	0.79		
	23	1	4	2.77	0.79		
Geometry	1	6	6	3.65	1.39	0.45	1.03
	2	4	4	2.77	0.98	0.34	0.80
	3	2	2	0.89	0.75	0.27	0.64
	4	20	20	12.63	3.89	0.79	1.79
	5	4	4	2.27	1.10	0.41	0.84
	6	4	4	2.26	1.01	0.30	0.85
	7	4	4	2.18	1.21	0.48	0.87
	8	4	4	2.92	0.87	0.42	0.67
	9	4	4	3.00	1.12	0.56	0.74
	10	12	12	8.10	2.87	0.75	1.44
	11	4	4	2.89	1.20	0.62	0.74
	12	4	4	2.65	1.13	0.41	0.87
	13	4	4	2.56	1.25	0.55	0.84
	14	10	10	7.46	1.96	0.61	1.22
	15	6	6	4.40	1.42	0.55	0.95
	16	2	2	1.25	0.70	0.09	0.67
	17	2	2	1.81	0.46	0.36	0.37
	18	7	7	5.18	1.79	0.68	1.01
	19	4	4	2.95	1.23	0.65	0.73
	20	3	3	2.24	0.88	0.44	0.66
U.S. History	1	8	8	5.03	1.75	0.50	1.23
	2	3	3	1.94	0.83	0.21	0.74
	3	3	3	1.80	0.94	0.30	0.79
	4	2	2	1.29	0.67	0.25	0.58
	5	6	6	3.17	1.59	0.51	1.11
	6	8	8	4.69	1.78	0.50	1.26
	7	4	4	2.06	1.20	0.47	0.87
	8	4	4	2.62	1.02	0.23	0.90
	9	8	8	5.90	1.85	0.64	1.10
	10	4	4	2.81	1.12	0.47	0.81
	11	4	4	3.08	1.04	0.48	0.75
	12	18	18	12.91	3.82	0.80	1.69

continued

Subject	Reporting Category	Number of Items	Raw Score			Alpha	Standard Error
			Maximum	*Mean*	*Standard Deviation*		
U.S. History	13	5	5	3.48	1.33	0.51	0.93
	14	5	5	3.44	1.31	0.51	0.92
	15	4	4	3.21	1.01	0.52	0.70
	16	4	4	2.78	1.14	0.50	0.81
	17	12	12	7.80	2.52	0.67	1.44
	18	5	5	3.31	1.28	0.46	0.94
	19	7	7	4.48	1.61	0.54	1.10

Table R-16. 2015–16 OK EOI: Reliabilities by Reporting Category: Form B

Subject	Reporting Category	Number of Items	Raw Score			Alpha	Standard Error
			Maximum	*Mean*	*Standard Deviation*		
Algebra I	1	15	15	10.15	3.32	0.78	1.57
	2	6	6	3.99	1.50	0.54	1.01
	3	9	9	6.16	2.21	0.71	1.19
	4	31	31	21.40	6.10	0.86	2.26
	5	6	6	4.52	1.41	0.55	0.95
	6	15	15	10.66	3.48	0.81	1.51
	7	6	6	4.04	1.47	0.49	1.05
	8	4	4	2.17	1.05	0.30	0.88
	9	9	9	4.15	2.25	0.68	1.27
	10	5	5	2.08	1.31	0.51	0.91
	11	4	4	2.06	1.32	0.59	0.85
Algebra II	1	15	15	9.55	3.53	0.78	1.65
	2	6	6	3.68	1.62	0.57	1.06
	3	5	5	3.04	1.48	0.58	0.96
	4	4	4	2.83	1.23	0.61	0.77
	5	31	31	18.53	5.89	0.83	2.45
	6	5	5	2.78	1.35	0.44	1.01
	7	5	5	3.28	1.41	0.55	0.94
	8	5	5	2.97	1.36	0.45	1.01
	9	4	4	1.69	1.10	0.31	0.91
	10	4	4	2.40	1.05	0.32	0.86
	11	4	4	2.87	1.05	0.39	0.82
	12	4	4	2.54	1.23	0.51	0.85
	13	9	9	5.65	2.07	0.62	1.27
	14	5	5	3.02	1.43	0.55	0.96
	15	4	4	2.63	1.02	0.34	0.83
Biology	1	6	6	4.10	1.50	0.58	0.97
	2	4	4	2.89	1.08	0.47	0.79
	3	2	2	1.21	0.68	0.30	0.57
	4	8	8	5.73	1.98	0.68	1.11
	5	4	4	2.99	1.12	0.56	0.74
	6	4	4	2.75	1.15	0.48	0.83
	7	17	17	10.76	3.43	0.74	1.76
	8	5	5	2.86	1.43	0.51	1.00

continued

Subject	Reporting Category	Number of Items	Raw Score			Alpha	Standard Error
			Maximum	*Mean*	*Standard Deviation*		
Biology	9	5	5	3.11	1.39	0.55	0.94
	10	4	4	2.31	1.10	0.36	0.88
	11	3	3	2.48	0.72	0.27	0.62
	12	21	21	13.53	4.66	0.83	1.91
	13	4	4	2.63	1.15	0.50	0.81
	14	4	4	2.81	1.15	0.53	0.78
	15	4	4	2.43	1.24	0.53	0.84
	16	5	5	3.06	1.32	0.46	0.97
	17	4	4	2.59	1.17	0.48	0.85
	18	8	8	5.58	1.75	0.57	1.15
	19	4	4	2.95	1.02	0.40	0.80
	20	4	4	2.63	1.04	0.36	0.84
	21	13	13	8.51	2.90	0.73	1.50
	22	5	5	2.91	1.42	0.54	0.97
	23	4	4	2.85	1.12	0.49	0.80
	24	4	4	2.75	1.08	0.46	0.79
	25	12	12	7.45	2.84	0.74	1.46
	26	6	6	3.51	1.60	0.54	1.08
	27	6	6	3.94	1.62	0.65	0.96
	28	12	12	7.94	2.71	0.71	1.45
	29	4	4	2.68	1.12	0.44	0.84
	30	4	4	2.68	1.14	0.48	0.82
	31	4	4	2.58	1.15	0.46	0.85
	32	8	8	5.54	1.97	0.67	1.13
	33	4	4	3.00	1.11	0.55	0.74
	34	4	4	2.54	1.18	0.48	0.85
	35	12	12	7.79	2.68	0.71	1.43
	36	4	4	2.30	1.20	0.50	0.85
	37	4	4	2.74	1.06	0.41	0.81
	38	4	4	2.74	1.10	0.45	0.82
English II	1	6	6	4.73	1.29	0.50	0.91
	2	18	18	11.95	3.22	0.71	1.72
	3	4	4	2.18	1.00	0.30	0.84
	4	5	5	3.35	1.16	0.37	0.92
	5	4	4	2.43	1.10	0.38	0.87
	6	5	5	3.98	1.16	0.52	0.80
	7	18	18	12.89	3.30	0.73	1.73
	8	4	4	2.89	1.02	0.32	0.84
	9	5	5	3.42	1.16	0.31	0.97
	10	5	5	3.84	1.25	0.57	0.82
	11	4	4	2.73	1.06	0.42	0.80
	12	6	6	4.30	1.39	0.50	0.98
	13	12	12	7.17	2.34	0.60	1.48
	14	4	4	2.43	1.05	0.33	0.86
	15	4	4	2.71	0.92	0.25	0.80
	16	4	4	2.03	1.15	0.40	0.90
	17	5	6	3.43	0.99	0.98	0.14
	18	1	4	2.62	0.62		

continued

Subject	Reporting Category	Number of Items	Raw Score			Alpha	Standard Error
			Maximum	*Mean*	*Standard Deviation*		
English II	19	1	4	2.65	0.61		
	20	1	4	2.67	0.61		
	21	1	4	2.62	0.61		
	22	1	4	2.61	0.61		
English III	1	6	6	4.06	1.45	0.51	1.01
	2	17	17	11.22	2.95	0.67	1.71
	3	5	5	3.17	1.18	0.31	0.98
	4	4	4	2.70	0.99	0.31	0.82
	5	4	4	2.47	0.98	0.38	0.77
	6	4	4	2.87	0.99	0.30	0.83
	7	18	18	11.77	3.31	0.72	1.76
	8	4	4	2.65	1.07	0.37	0.85
	9	5	5	3.09	1.29	0.43	0.98
	10	5	5	3.44	1.25	0.50	0.88
	11	4	4	2.59	0.93	0.29	0.79
	12	7	7	4.48	1.61	0.47	1.17
	13	14	14	8.06	2.61	0.59	1.68
	14	4	4	2.40	1.09	0.29	0.92
	15	2	2	1.05	0.75	0.29	0.64
	16	4	4	2.70	1.08	0.41	0.83
	17	4	4	1.90	1.06	0.28	0.90
	18	5	10	6.19	1.70	0.99	0.18
	19	1	4	2.72	0.62		
	20	1	4	2.71	0.62		
	21	1	4	2.72	0.62		
	22	1	4	2.68	0.63		
	23	1	4	2.69	0.63		
Geometry	1	6	6	4.21	1.34	0.46	0.98
	2	4	4	3.05	0.98	0.40	0.76
	3	2	2	1.16	0.67	0.11	0.64
	4	20	20	14.30	4.08	0.83	1.70
	5	4	4	3.17	1.01	0.48	0.73
	6	4	4	2.91	1.16	0.56	0.77
	7	4	4	2.92	1.01	0.49	0.72
	8	4	4	2.94	1.00	0.49	0.72
	9	4	4	2.36	1.15	0.47	0.84
	10	12	12	7.19	2.94	0.75	1.48
	11	4	4	2.13	1.23	0.52	0.86
	12	4	4	2.61	1.19	0.52	0.82
	13	4	4	2.45	1.21	0.48	0.87
	14	10	10	7.03	1.95	0.61	1.22
	15	6	6	4.31	1.31	0.47	0.95
	16	2	2	1.09	0.71	0.31	0.59
	17	2	2	1.63	0.52	0.12	0.49
	18	7	7	5.05	1.55	0.59	1.00
	19	4	4	2.69	1.03	0.46	0.76
	20	3	3	2.36	0.84	0.45	0.62

continued

Subject	Reporting Category	Number of Items	Raw Score			Alpha	Standard Error
			Maximum	*Mean*	*Standard Deviation*		
U.S. History	1	8	8	5.87	1.74	0.63	1.07
	2	3	3	2.33	0.85	0.43	0.64
	3	3	3	2.35	0.84	0.41	0.64
	4	2	2	1.20	0.63	0.22	0.56
	5	6	6	3.08	1.46	0.40	1.13
	6	8	8	4.58	1.75	0.49	1.25
	7	4	4	2.73	1.06	0.35	0.85
	8	4	4	1.85	1.11	0.34	0.90
	9	8	8	5.92	1.68	0.57	1.10
	10	4	4	2.65	1.09	0.37	0.86
	11	4	4	3.27	0.92	0.43	0.69
	12	18	18	11.72	3.42	0.73	1.78
	13	4	4	2.30	1.13	0.37	0.90
	14	4	4	2.38	1.04	0.34	0.84
	15	6	6	3.87	1.49	0.49	1.06
	16	4	4	3.17	0.93	0.40	0.72
	17	12	12	7.53	2.35	0.58	1.53
	18	6	6	3.55	1.42	0.43	1.07
	19	6	6	3.98	1.39	0.38	1.09

APPENDIX S—DECISION ACCURACY AND CONSISTENCY RESULTS

Table S-1. 2015–16 OK EOI: Summary of Decision Accuracy (and Consistency) Results by Content Area and Grade—Conditional on Cutpoint

Content Area	Grade	Unsatisfactory / Limited Knowledge			Limited Knowledge / Proficient			Proficient / Advanced		
		Accuracy (consistency)	*False*		*Accuracy (consistency)*	*False*		*Accuracy (consistency)*	*False*	
			Positive	*Negative*		*Positive*	*Negative*		*Positive*	*Negative*
Algebra I	HS	0.95 (0.93)	0.02	0.03	0.92 (0.88)	0.04	0.04	0.92 (0.89)	0.04	0.04
Algebra II	HS	0.94 (0.92)	0.02	0.04	0.91 (0.87)	0.04	0.05	0.92 (0.88)	0.05	0.04
Biology I	HS	0.91 (0.88)	0.04	0.05	0.91 (0.88)	0.05	0.04	0.94 (0.92)	0.03	0.02
English II	HS	0.97 (0.96)	0.01	0.02	0.92 (0.89)	0.04	0.04	0.93 (0.91)	0.04	0.03
English III	HS	0.96 (0.94)	0.02	0.03	0.93 (0.90)	0.03	0.04	0.93 (0.90)	0.04	0.03
Geometry	HS	0.97 (0.95)	0.01	0.02	0.92 (0.89)	0.03	0.04	0.91 (0.87)	0.05	0.04
U.S. History	HS	0.92 (0.89)	0.03	0.05	0.90 (0.86)	0.05	0.05	0.92 (0.89)	0.04	0.03

Appendix T—Sample Reports

STUDENT REPORT

Oklahoma Core Curriculum Tests (OCCT)
End-of-Instruction Spring Retest 2016

For the family of:
FNAME38 LNAME38
State Student ID: DHS0000038
Birth Date: 09/23/1997

Demonstration School 1
Demonstration District A
Code: DEMONA-DE1

FNAME38'S performance on the OCCT ACE Algebra I End-of-Instruction test

OKLAHOMA STATE DEPARTMENT OF EDUCATION — CHAMPION EXCELLENCE

This report provides specific information about your student's performance on the OCCT ACE Algebra I End-of-Instruction test. Students are tested throughout our state to ensure that they meet high standards based on the Oklahoma Academic Standards. These tests provide information for you to make informed decisions about your student's education. To learn more about your student's performance in school, talk to your student's teacher. Your student's success in school depends on your ongoing involvement.

OCCT ACE Algebra I

	Level	Score range	Score
Meets State Goal	ADVANCED	999 – 762	
Meets State Goal	PROFICIENT	761 – 700	756
Below State Goal	LIMITED KNOWLEDGE	699 – 662	
Below State Goal	UNSATISFACTORY	661 – 490	

(Standard Met = 700 or above)

FNAME38'S overall performance on the test is PROFICIENT.
Your student's performance level is based on the Oklahoma Performance Index.

The performance level attained by your student indicates that your student can perform the majority of the skills described for that level and even more of what is described for the levels below. Your student may also be capable of performing some of the competencies described in the next higher level, but not enough to have reached that level of performance.

Confirm your student's performance by reviewing classroom work, other standards-based assessments, and your student's progress reports during the year.

A single exam can provide only limited information. A student taking the same test more than once might score higher or lower in each subject within a small range. If tested again, your student would likely score in this range: 744-768.

Performance Levels & OPI Score Ranges

☐ **ADVANCED: OPI score range: 762-999**

Students demonstrate a superior performance of the challenging subject matter knowledge and skills of the measured objectives included in the Algebra I Oklahoma Academic Standards framework. Students performing at the Advanced performance level can thoroughly demonstrate understanding of number sense and algebraic operations; relations and functions; and data analysis, probability, and statistics. Students use a wide range of strategies to solve real-world, non-routine problems; regularly use various types of reasoning effectively; consistently connect one area or idea of mathematics to another; and communicate mathematical ideas clearly through a variety of representations.

☑ **PROFICIENT: OPI score range: 700-761**

Students demonstrate a mastery of Algebra I concepts expected of all measured objectives included in the Algebra I Oklahoma Academic Standards framework, and the ability to demonstrate mathematics knowledge, skills, and processes. Students at the Proficient level can translate word phrases and sentences into expressions and equations; use formulas and mathematics concepts to solve multi-step problems; simplify and factor polynomials; calculate slope; use and interpret slope and intercepts; distinguish between parallel, perpendicular, horizontal, or vertical lines; develop the equation of a line and graph linear relationships; match simple equations or inequalities to a graph, table, or situation; make valid predictions and/or arguments based on collected data; use a line-of-best-fit model to represent collected data; use mathematics to solve problems encountered in daily life; use a variety of mathematical representations to model real world situations.

☐ **LIMITED KNOWLEDGE: OPI score range: 662-699**

Students demonstrate partial mastery of the essential knowledge and skills expected of all measured objectives included in the Algebra I Oklahoma Academic Standards framework. Students are inconsistent in applying the general knowledge and mathematical process skills necessary to solve problems effectively and reason mathematically. These students may need interventions as part of a comprehensive mathematics instructional program.

☐ **UNSATISFACTORY: OPI score range: 490-661**

Students who do not perform at least at the Limited Knowledge level and who will likely require remediation.

Additional Resources and Information
Office of Assessment - 405-521-3341
Bilingual Education/Migrant Education - 405-521-2846
Special Education Services - 405-521-3351
Office of Instruction - 405-522-3521
Office of Accountability - 405-522-5169

Visit the Oklahoma Department of Education online
Go to the Oklahoma Department of Education's Web site at **http://www.ok.gov/sde**.
Click on the Services tab and then on Assessment to access sample test questions, study materials, and practice test items. Report cards for your student's school can be accessed from the Department of Education's home page.

STUDENT REPORT

Oklahoma Core Curriculum Tests (OCCT)
End-of-Instruction Spring Retest 2016

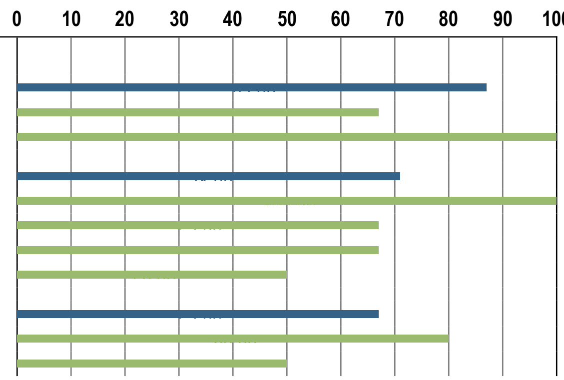
FNAME38 LNAME38
State Student ID: DHS0000038
Birth Date: 09/23/1997

Demonstration School 1
Demonstration District A
Code: DEMONA-DE1

FNAME38'S OPI Score & Performance Level in OCCT ACE Algebra I: 756 / Proficient

Performance in each skill area

Standards and Objectives	Points Possible	Number Correct	Percent Correct
Algebra I			
1.0 Number Sense and Algebraic Operations	**15**	**13**	**87**
1.1 Equations and Formulas	6	4	67
1.2 Expressions	9	9	100
2.0 Relations and Functions	**31**	**22**	**71**
2.1 Relations/Functions	6	6	100
2.2 Linear Equations and Graphs	15	10	67
2.3 Linear Inequalities and Graphs	6	4	67
2.4 Systems of Equations	4	2	50
3.0 Data Analysis, Probability, and Statistics	**9**	**6**	**67**
3.1 Data Analysis	5	4	80
3.2 Line of Best Fit	4	2	50



NR = Not reported. Not enough items in the Standard or Objective to report.

HOW TO HELP YOUR STUDENT PREPARE FOR SUCCESS
Help your student get ahead with AP classes: *Go to* ***http://www.ok.gov/sde****. Enter Advanced Placement in the Search Site field to access a list of AP classes and course descriptions available to high school students.*
Help your student think about the future: *Go to* ***www.okcareertech.org*** *and click on the Students tab to find out about available careers in Oklahoma.*
Help your student get into college: *Go to* ***www.okcollegestart.org*** *and* ***www.okhighered.org/students/*** *for information about getting into an Oklahoma college or university. You will find information about financial aid, college entrance exams, and colleges and universities across the country.*

GLOSSARY OF TERMS
OPI Score: The Oklahoma Performance Index (OPI) is a scaled score used to place students into one of the four performance levels.
Performance Level: Different ranges of OPI scores define the four levels of performance — Advanced, Proficient, Limited Knowledge, and Unsatisfactory.
Percent Correct: A percent of the items in the standard or objective that were answered correctly by the students. This is calculated by dividing the number of items correct by the number possible in the standard or objective.
Standard Met: The Proficient level and the Advanced level are considered "meeting the standard".

STUDENT REPORT

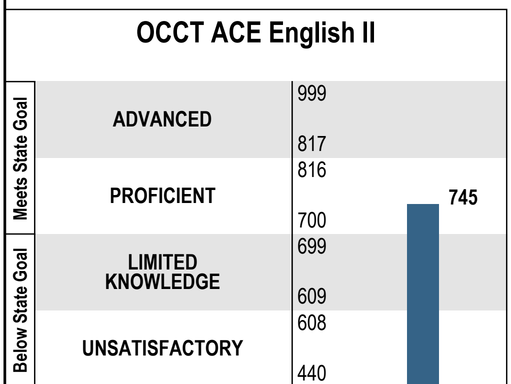
Oklahoma Core Curriculum Tests (OCCT)
End-of-Instruction Spring Retest 2016

For the family of:
FNAME38 LNAME38
State Student ID: DHS0000038
Birth Date: 09/23/1997

Demonstration School 1
Demonstration District A
Code: DEMONA-DE1

FNAME38'S performance on the OCCT ACE English II (Writing Included) End-of-Instruction test

This report provides specific information about your student's performance on the OCCT ACE English II End-of-Instruction test. Students are tested throughout our state to ensure that they meet high standards based on the Oklahoma Academic Standards. These tests provide information for you to make informed decisions about your student's education. To learn more about your student's performance in school, talk to your student's teacher. Your student's success in school depends on your ongoing involvement.



(Standard Met = 700 or above)

FNAME38'S overall performance on the test is PROFICIENT.
Your student's performance level is based on the Oklahoma Performance Index.

The performance level attained by your student indicates that your student can perform the majority of the skills described for that level and even more of what is described for the levels below. Your student may also be capable of performing some of the competencies described in the next higher level, but not enough to have reached that level of performance.

Confirm your student's performance by reviewing classroom work, other standards-based assessments, and your student's progress reports during the year.

A single exam can provide only limited information. A student taking the same test more than once might score higher or lower in each subject within a small range. If tested again, your student would likely score in this range: 724-766.

Performance Levels & OPI Score Ranges

☐ **ADVANCED: OPI score range: 817-999**

Students demonstrate superior performance on challenging subject matter of all measured standards and objectives included in the English II Oklahoma Academic Standards framework. Students performing at the Advanced performance level consistently demonstrate an ability to analyze, evaluate, and interpret abstract text. They demonstrate an in-depth understanding of a broad variety of literary forms and a thorough understanding of correct Standard English usage. Students consistently display a sophisticated comprehension of literary elements and techniques and recognize their effects on the development of the various literary forms. Students apply a wide variety of research strategies for organizing and interpreting factual information. Written responses demonstrate superior levels of focused topic support, advanced organization and planning, varied word choice and sentence structure, and few grammar, usage, or mechanical errors. Students demonstrate adept understanding of strategies and skills for reading and comprehending literature and for writing. Students use strategic thinking to analyze literature, generate ideas, make inferences and predictions, and restructure information. Students use extended thinking to synthesize elements, integrate ideas, establish criteria, and judge outcomes.

☑ **PROFICIENT: OPI score range: 700-816**

Students demonstrate mastery over appropriate subject matter of all measured standards and objectives included in the English II Oklahoma Academic Standards framework. Proficient students are ready for the next course or level of education, as applicable. Students scoring Proficient use a wide range of strategies to comprehend, interpret, and evaluate secondary-level reading material (both fiction and nonfiction) through literal understanding, inferences, interpretation, generalization, analysis, and evaluation. Students demonstrate an understanding of various literary forms and regularly apply basic research strategies to organize and interpret factual information. They demonstrate a general understanding of how literary elements and techniques affect the development of various literary forms. Students at this level demonstrate an adequate understanding of correct Standard English usage. Written responses demonstrate focused support of the topic, adequate organization and planning, appropriate word choice, varied sentence structures, and limited grammar,usage, or mechanical errors. Students demonstrate competent strategies and skills for reading and comprehending literature and for writing.

☐ **LIMITED KNOWLEDGE: OPI score range: 609-699**

Students demonstrate partial mastery of the essential knowledge and skills expected of all measured standards and objectives included in the English II Oklahoma Academic Standards framework. Students scoring Limited Knowledge demonstrate inconsistent strategies in comprehension, interpretation, and evaluation of secondary-level reading material (both fiction and nonfiction) and demonstrate some understanding of the various literary forms. They demonstrate an understanding of some basic literary elements and techniques and their effect on a limited number of literary forms. Students at this level demonstrate only a partial understanding of correct use of Standard English, and they inconsistently apply simple research strategies when organizing and interpreting factual information. Written responses indicate minimal focus, limited support of the topic, little or no organization and/or planning, vague and/or inappropriate word choice, and frequent errors in basic sentence structure and grammar, usage, and mechanics that limit readability.

☐ **UNSATISFACTORY: OPI score range: 440-608**

Students have not performed at least at the Limited Knowledge level and will need comprehensive remedial instruction in English II.

Additional Resources and Information
Office of Assessment - 405-521-3341
Bilingual Education/Migrant Education - 405-521-2846
Special Education Services - 405-521-3351
Office of Instruction - 405-522-3521
Office of Accountability - 405-522-5169

Visit the Oklahoma Department of Education online
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Click on the Services tab and then on Assessment to access sample test questions, study materials, and practice test items. Report cards for your student's school can be accessed from the Department of Education's home page.

STUDENT REPORT

Oklahoma Core Curriculum Tests (OCCT)
End-of-Instruction Spring Retest 2016

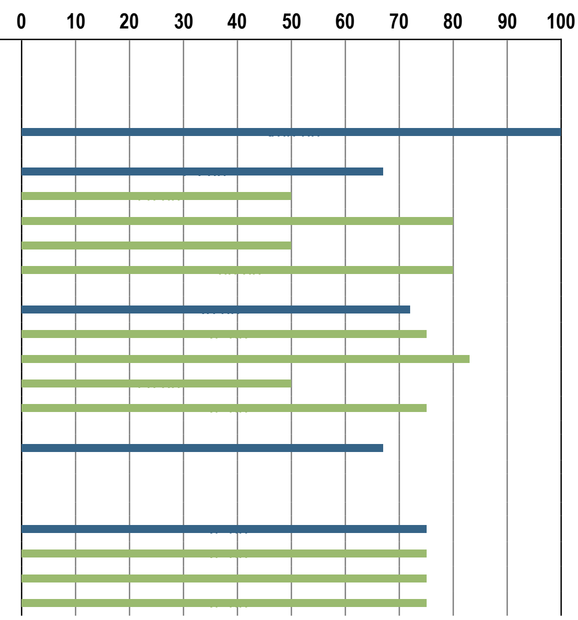
FNAME38 LNAME38
State Student ID: DHS0000038
Birth Date: 09/23/1997

Demonstration School 1
Demonstration District A
Code: DEMONA-DE1

FNAME38'S OPI Score & Performance Level in OCCT ACE English II: 745 / Proficient

Performance in each skill area

Standards and Objectives	Points Possible	Number Correct	Percent Correct
English II			
Reading/Literature			
1.0 Vocabulary	**6**	**6**	**100**
2.0 Comprehension	**18**	**12**	**67**
2.1 Literal Understanding	4	2	50
2.2 Inferences and Interpretation	5	4	80
2.3 Summary and Generalization	4	2	50
2.4 Analysis and Evaluation	5	4	80
3.0 Literature	**18**	**13**	**72**
3.1 Literary Genres	4	3	75
3.2 Literary Elements	6	5	83
3.3 Figurative Language	4	2	50
3.4 Literary Works	4	3	75
4.0 Research and Information	**6**	**4**	**67**
Writing/Grammar/Usage and Mechanics			
3.0 Grammar, Usage, and Mechanics	**12**	**9**	**75**
3.1 Standard English Usage	4	3	75
3.2 Mechanics and Spelling	4	3	75
3.3 Sentence Structure	4	3	75



NR = Not reported. Not enough items in the Standard or Objective to report.

Writing Composite Score

	Analytic Trait Scores: Maximum Score	Analytic Trait Scores: Obtained Score
1.0/2.0 Writing Composite Score	6	2.0
Analytic Traits		
1. Ideas and Development	4	2.0
2. Organizations, Unity, and Coherence	4	2.0
3. Word Choice	4	2.0
4. Sentences and Paragraphs	4	2.0
5. Grammar, Usage and Mechanics	4	2.0

Condition Codes for Writing: These are some conditions in which a writing sample is **Unscorable**.
I = Illegible/Incomprehensible
L = Language Other than English
N = No Response or Refusal to Answer
O = Off-Topic

Note: A student will not be categorized in performance levels for Writing.

HOW TO HELP YOUR STUDENT PREPARE FOR SUCCESS
Help your student get ahead with AP classes: *Go to* ***http://www.ok.gov/sde****. Enter Advanced Placement in the Search Site field to access a list of AP classes and course descriptions available to high school students.*
Help your student think about the future: *Go to* ***www.okcareertech.org*** *and click on the Students tab to find out about available careers in Oklahoma.*
Help your student get into college: *Go to* ***www.okcollegestart.org*** *and* ***www.okhighered.org/students/*** *for information about getting into an Oklahoma college or university. You will find information about financial aid, college entrance exams, and colleges and universities across the country.*

GLOSSARY OF TERMS
OPI Score: The Oklahoma Performance Index (OPI) is a scaled score used to place students into one of the four performance levels.
Performance Level: Different ranges of OPI scores define the four levels of performance — Advanced, Proficient, Limited Knowledge, and Unsatisfactory.
Percent Correct: A percent of the items in the standard or objective that were answered correctly by the students. This is calculated by dividing the number of items correct by the number possible in the standard or objective.
Standard Met: The Proficient level and the Advanced level are considered "meeting the standard".
Analytic Writing Traits and Composite Score: The Writing Composite Score is derived using a formula incorporating the weights of the five analytic trait scores for the writing prompt. The OPI Score for the test incorporates the Writing Composite Score. The Analytic Trait Scores provide information about your student's specific Writing Skills.

STUDENT REPORT

Oklahoma Core Curriculum Tests (OCCT)
End-of-Instruction Spring Retest 2016

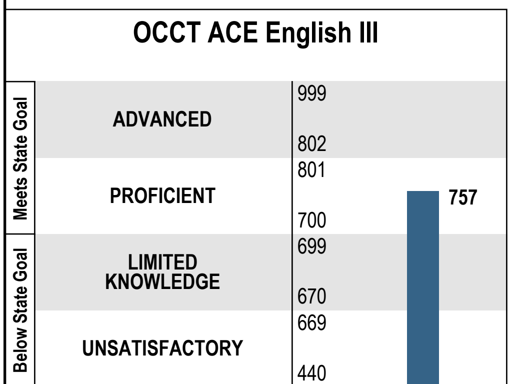
For the family of:
FNAME38 LNAME38
State Student ID: DHS0000038
Birth Date: 09/23/1997

Demonstration School 1
Demonstration District A
Code: DEMONA-DE1

FNAME38'S performance on the OCCT ACE English III (Writing Included) End-of-Instruction test

OKLAHOMA STATE DEPARTMENT OF EDUCATION — CHAMPION EXCELLENCE

This report provides specific information about your student's performance on the OCCT ACE English III End-of-Instruction test. Students are tested throughout our state to ensure that they meet high standards based on the Oklahoma Academic Standards. These tests provide information for you to make informed decisions about your student's education. To learn more about your student's performance in school, talk to your student's teacher. Your student's success in school depends on your ongoing involvement.



(Standard Met = 700 or above)

FNAME38'S overall performance on the test is PROFICIENT.
Your student's performance level is based on the Oklahoma Performance Index.

The performance level attained by your student indicates that your student can perform the majority of the skills described for that level and even more of what is described for the levels below. Your student may also be capable of performing some of the competencies described in the next higher level, but not enough to have reached that level of performance.

Confirm your student's performance by reviewing classroom work, other standards-based assessments, and your student's progress reports during the year.

A single exam can provide only limited information. A student taking the same test more than once might score higher or lower in each subject within a small range. If tested again, your student would likely score in this range: 740-774.

Performance Levels & OPI Score Ranges

☐ **ADVANCED: OPI score range: 802-999**

Students demonstrate full and complete understanding of all measured standards and objectives included in the English III Oklahoma Academic Standards framework. In addition to having this advanced level of English III skills and the ability to independently apply these skills, students at the Advanced level are consistently effective in conducting analysis of organizational patterns and authors' positions in complex literature. Students at this level demonstrate the ability to utilize MLA document or similar parenthetical style for organization of research and demonstrate the ability to synthesize information from a variety of sources. Students write responses that demonstrate thorough support, successfully address the prompt in the mode requested, use appropriate word choice, use variety in sentence structure, and have few errors in grammar and mechanics. Students at this level are clearly prepared to excel in higher level English classes and in job functions that require application of English III knowledge and skills.

☑ **PROFICIENT: OPI score range: 700-801**

Students demonstrate mastery of the language arts knowledge, skills, and processes expected of all students at the End-of-Instruction in English III as follows: students typically demonstrate adequate ability in applying knowledge of word origins for determining meanings of new words encountered and correct usage of those words; use a wide range of strategies to comprehend, interpret, and evaluate secondary-level reading material (both fiction and nonfiction) including analysis of organizational patterns and authors' positions; demonstrate a general understanding of a wide variety of literary forms and elements; demonstrate a general understanding of how literary elements and techniques affect the development of, and the connections between, a variety of literary forms; use basic research strategies to organize and interpret factual information; demonstrate a general understanding of correct use of Standard English. Students write responses that demonstrate adequate support, address the prompt somewhat successfully, use acceptable word choice, use some variety in sentence structure, and have few errors in grammar and mechanics. Students at this level regularly and independently apply a wide variety of research strategies for organizing and interpreting factual information and research. Students demonstrate a thorough understanding of correct Standard English usage and apply correct Standard English to writing. Students at this level are prepared to succeed in higher level English classes and in job functions that require application of English III knowledge and skills.

☐ **LIMITED KNOWLEDGE: OPI score range: 670-699**

Students typically demonstrate a partial mastery/understanding of the knowledge and skills expected of all students at the End-of-Instruction in English III. Students are inconsistent in demonstrating the Proficient level competencies. They typically use a limited number of strategies to comprehend, interpret, and evaluate secondary-level reading material; demonstrate some understanding of the various literary forms; use simple research strategies to organize and interpret factual information; display partial understanding of correct Standard English usage; demonstrate an understanding of some basic literary elements and techniques and their effect on a limited number of literary forms when explicitly stated; write responses with minimal focus, limited support, little or insufficient organization and planning, vague or inappropriate word choice, and frequent errors in basic sentence structure.

☐ **UNSATISFACTORY: OPI score range: 440-669**

Students do not demonstrate even a Limited Knowledge level of the skills of English III. Students scoring at the Unsatisfactory level need comprehensive remedial instruction in English III.

Additional Resources and Information
Office of Assessment - 405-521-3341
Bilingual Education/Migrant Education - 405-521-2846
Special Education Services - 405-521-3351
Office of Instruction - 405-522-3521
Office of Accountability - 405-522-5169

Visit the Oklahoma Department of Education online
Go to the Oklahoma Department of Education's Web site at **http://www.ok.gov/sde**.
Click on the Services tab and then on Assessment to access sample test questions, study materials, and practice test items. Report cards for your student's school can be accessed from the Department of Education's home page.

STUDENT REPORT

Oklahoma Core Curriculum Tests (OCCT)
End-of-Instruction Spring Retest 2016

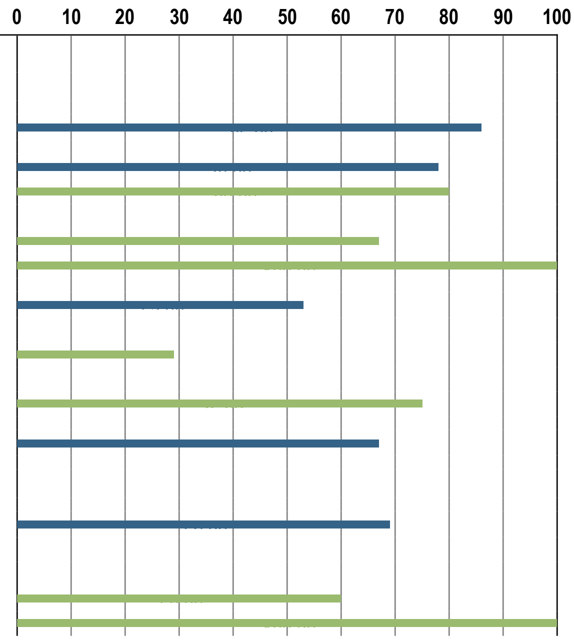
FNAME38 LNAME38
State Student ID: DHS0000038
Birth Date: 09/23/1997

Demonstration School 1
Demonstration District A
Code: DEMONA-DE1

FNAME38'S OPI Score & Performance Level in OCCT ACE English III: 757 / Proficient

Performance in each skill area

Standards and Objectives	Points Possible	Number Correct	Percent Correct
English III			
Reading/Literature			
1.0 Vocabulary	**7**	**6**	**86**
2.0 Comprehension	**18**	**14**	**78**
2.1 Literal Understanding	5	4	80
2.2 Inferences and Interpretation	3	NR	
2.3 Summary and Generalization	6	4	67
2.4 Analysis and Evaluation	4	4	100
3.0 Literature	**17**	**9**	**53**
3.1 Literary Genres	3	NR	
3.2 Literary Elements	7	2	29
3.3 Figurative Language	3	NR	
3.4 Literary Works	4	3	75
4.0 Research and Information	**6**	**4**	**67**
Writing/Grammar/Usage and Mechanics			
3.0 Grammar, Usage, and Mechanics	**13**	**9**	**69**
3.1 Standard English Usage	3	NR	
3.2 Mechanics and Spelling	1	NR	
3.3 Sentence Structure	5	3	60
3.4 Manuscript Conventions	4	4	100



NR = Not reported. Not enough items in the Standard or Objective to report.

Writing Composite Score

	Analytic Trait Scores	
	Maximum Score	Obtained Score
1.0/2.0 Writing Composite Score	10	3.0
Analytic Traits		
1. Ideas and Development	4	1.5
2. Organizations, Unity, and Coherence	4	1.5
3. Word Choice	4	1.5
4. Sentences and Paragraphs	4	1.5
5. Grammar, Usage and Mechanics	4	1.5

Condition Codes for Writing: These are some conditions in which a writing sample is **Unscorable**.
I = Illegible/Incomprehensible
L = Language Other than English
N = No Response or Refusal to Answer
O = Off-Topic

Note: A student will not be categorized in performance levels for Writing.

HOW TO HELP YOUR STUDENT PREPARE FOR SUCCESS
Help your student get ahead with AP classes: *Go to* ***http://www.ok.gov/sde****. Enter Advanced Placement in the Search Site field to access a list of AP classes and course descriptions available to high school students.*
Help your student think about the future: *Go to* ***www.okcareertech.org*** *and click on the Students tab to find out about available careers in Oklahoma.*
Help your student get into college: *Go to* ***www.okcollegestart.org*** *and* ***www.okhighered.org/students/*** *for information about getting into an Oklahoma college or university. You will find information about financial aid, college entrance exams, and colleges and universities across the country.*

GLOSSARY OF TERMS
OPI Score: The Oklahoma Performance Index (OPI) is a scaled score used to place students into one of the four performance levels.
Performance Level: Different ranges of OPI scores define the four levels of performance — Advanced, Proficient, Limited Knowledge, and Unsatisfactory.
Percent Correct: A percent of the items in the standard or objective that were answered correctly by the students. This is calculated by dividing the number of items correct by the number possible in the standard or objective.
Standard Met: The Proficient level and the Advanced level are considered "meeting the standard".
Analytic Writing Traits and Composite Score: The Writing Composite Score is derived using a formula incorporating the weights of the five analytic trait scores for the writing prompt. The OPI Score for the test incorporates the Writing Composite Score. The Analytic Trait Scores provide information about your student's specific Writing Skills.

STUDENT REPORT

Oklahoma Core Curriculum Tests (OCCT)

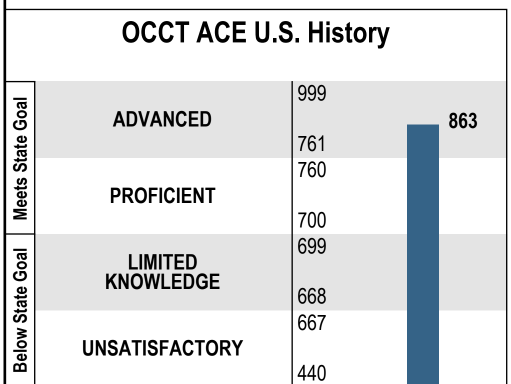
End-of-Instruction Spring Retest 2016

For the family of:
FNAME38 LNAME38
State Student ID: DHS0000038
Birth Date: 09/23/1997

Demonstration School 1
Demonstration District A
Code: DEMONA-DE1

FNAME38'S performance on the OCCT ACE U.S. History End-of-Instruction test

This report provides specific information about your student's performance on the OCCT ACE U.S. History End-of-Instruction test. Students are tested throughout our state to ensure that they meet high standards based on the Oklahoma Academic Standards. These tests provide information for you to make informed decisions about your student's education. To learn more about your student's performance in school, talk to your student's teacher. Your student's success in school depends on your ongoing involvement.



(Standard Met = 700 or above)

FNAME38'S overall performance on the test is ADVANCED.
Your student's performance level is based on the Oklahoma Performance Index.

The performance level attained by your student indicates that your student can perform the majority of the skills described for that level and even more of what is described for the levels below. Your student may also be capable of performing some of the competencies described in the next higher level, but not enough to have reached that level of performance.

Confirm your student's performance by reviewing classroom work, other standards-based assessments, and your student's progress reports during the year.

A single exam can provide only limited information. A student taking the same test more than once might score higher or lower in each subject within a small range. If tested again, your student would likely score in this range: 835-891.

Performance Levels & OPI Score Ranges

☑ **ADVANCED: OPI score range: 761-999**

Students demonstrate superior performance on challenging subject matter. In addition to demonstrating a broad and in-depth understanding and application of all skills at the Proficient level, students scoring at the Advanced level will integrate and link social, political, and economic concepts. Students will:

- Analyze and evaluate complex historical points-of-view of major events and issues related to U.S. history.
- Analyze and evaluate the United States' social, political, and economic development over time.
- Apply concepts to solve problems as related to U.S. history.
- Apply content knowledge in multiple contexts to make historical connections and evaluate changes over time.
- Critique and differentiate between social, political, and economic concepts that transformed the United States, 1865-2001.
- Integrate newly developed concepts with previous historical misconceptions.
- Evaluate historical justifications and interpretations through the examination of multiple and varied sources.

☐ **PROFICIENT: OPI score range: 700-760**

Students demonstrate appropriate course-level knowledge and skills in subject matter and readiness for the next course or level of education. Students scoring at the Proficient level perform above the Limited Knowledge level and will consistently be able to:

- Analyze the transformation of the United States from the Post-Reconstruction period through the Progressive Era.
- Explain the impact of the cycles of boom and bust of the 1920s and 1930s on the transformation of the United States' government, economy, and society.
- Describe and interpret the role of the United States in significant foreign and domestic affairs during the Cold War period, 1946-1975.
- Explain the expanding role of the United States in international affairs as the nation transformed into a world power in the late 19th and early 20th centuries.
- Evaluate the major causes, events, and effects of the United States' involvement in World War II, 1933-1946, both foreign and domestic.
- Interpret the impact of the United States' significant foreign and domestic policies, 1976-2001.

☐ **LIMITED KNOWLEDGE: OPI score range: 668-699**

Students demonstrate partial mastery of the essential course-level knowledge and skills. Students at the Limited Knowledge level will:

- Recall and identify significant individuals, events, and issues in U.S. history, 1865-2001.
- Demonstrate partial competency to analyze textual and visual evidence.
- Define appropriate social studies terminology and vocabulary.
- Demonstrate partial competency to draw conclusions, analyze, evaluate, interpret, and/or integrate concepts as related to U.S. history.

☐ **UNSATISFACTORY: OPI score range: 440-667**

Students have not performed at least at the Limited Knowledge level. Students at the Unsatisfactory level have not demonstrated course-level knowledge and skills.

Additional Resources and Information
Office of Assessment - 405-521-3341
Bilingual Education/Migrant Education - 405-521-2846
Special Education Services - 405-521-3351
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STUDENT REPORT

Oklahoma Core Curriculum Tests (OCCT)
End-of-Instruction Spring Retest 2016

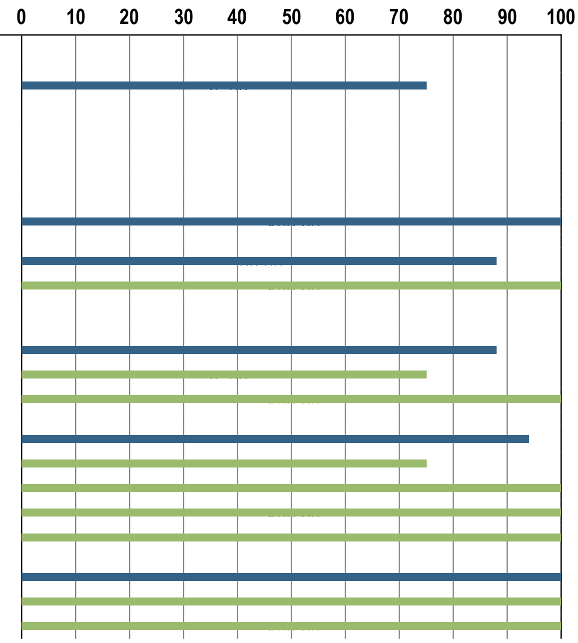
FNAME38 LNAME38
State Student ID: DHS0000038
Birth Date: 09/23/1997

Demonstration School 1
Demonstration District A
Code: DEMONA-DE1

FNAME38'S OPI Score & Performance Level in OCCT ACE U.S. History: 863 / Advanced

Performance in each skill area

Standards and Objectives	Points Possible	Number Correct	Percent Correct
U.S. History			
1.0 Transformation of the United States from Post-Reconstruction to the Progressive Era, 1878 - 1900	**8**	**6**	**75**
1.1 Post Reconstruction Amendments	3	NR	
1.2 Immigration, Westward Movement, and Native American Experiences	3	NR	
1.3 Impact of Industrialization on Society, Economics, and Politics	2	NR	
2.0 Expanding Role of the United States in International Affairs	**6**	**6**	**100**
3.0 Cycles of Economic Boom and Bust in the 1920s and 1930s	**8**	**7**	**88**
3.1 Economic, Political, & Social Transformation Between the World Wars	5	5	100
3.2/3.3 Economic Destabilization and the Great Depression/New Deal	3	NR	
4.0 Role of the U.S. in International Affairs and World War II, 1933 - 1946	**8**	**7**	**88**
4.1 Mobilization for World War II	4	3	75
4.2/4.3 World War II and U.S. Reaction to the Holocaust	4	4	100
5.0 U.S. Foreign and Domestic Policies during the Cold War, 1945 - 1975	**18**	**17**	**94**
5.1/5.2 The Cold War - Foreign and Domestic	4	3	75
5.3 The Vietnam War Era	4	4	100
5.4 The African American Civil Rights Movement	5	5	100
5.5 Social Political Transformation	5	5	100
6.0 U.S. Foreign and Domestic Policies, 1976 to the Present	**12**	**12**	**100**
6.1/6.2/6.3 End of the Cold War	6	6	100
6.4/6.5/6.6 Post Cold War World	6	6	100



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Help your student get into college: *Go to* ***www.okcollegestart.org*** *and* ***www.okhighered.org/students/*** *for information about getting into an Oklahoma college or university. You will find information about financial aid, college entrance exams, and colleges and universities across the country.*

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Standard Met: The Proficient level and the Advanced level are considered "meeting the standard".

OCCT EOI 2015-2016

Roster Report

Roster

EOI, Cyber District, English II, Spring 2016, Final

Organization | Fields | Scores | Search | Filter | Other

Save Report | Download | Student View | Reset Report

			English II		
Last Name	First Name	School Name	Raw Score (66)	OPI	Performance Level
Doe002	John002	Cyber High A	30	634	Limited Knowledge
Doe003	John003	Cyber High A	46	748	Proficient
Doe003	John003	Cyber High A	48	763	Proficient
Doe004	John004	Cyber High A	59	869	Advanced
Doe004	John004	Cyber High A	40	713	Proficient
Doe005	John005	Cyber High B	23	588	Unsatisfactory
Doe006	John006	Cyber High B	52	795	Proficient
Doe006	John006	Cyber High B	12	440	Unsatisfactory
Doe006	John006	Cyber High B	27	609	Limited Knowledge
Doe007	John007	Cyber High B	59	869	Advanced
Doe007	John007	Cyber High B	61	903	Advanced
Doe008	John008	Cyber High B	34	674	Limited Knowledge
Doe008	John008	Cyber High B	12	440	Unsatisfactory
Doe009	John009	Cyber High B	41	719	Proficient
Doe011	John011	Cyber High A	49	770	Proficient
Doe011	John011	Cyber High A	47	755	Proficient
Doe012	John012	Cyber High A	49	772	Proficient
Doe012	John012	Cyber High A	57	843	Advanced

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Group Summary (Performance Levels)

Group Summary: Performance Levels

EOI, English II, Winter 2015-2016, Trimester 2015-2016, Spring 2016, Summer 2016, Final

Disaggregate: Gender

Organization | Scores | Filter | Disaggregate | Other

Save Report | Download | Transpose | Reset Report

		English II								
					% in Each Performance Level					
Group	Administration	Total N	Valid N	Mean OPI	Unsatisfactory	Limited Knowledge	Proficient	Advanced	% At or Above Proficient	% Below Proficient
Cyber District	Winter 2015-2016	525	119	693	18	23	54	6	60	40
Female	Winter 2015-2016	239	61	708	13	21	59	7	66	34
Male	Winter 2015-2016	286	58	677	22	24	48	5	53	47
Cyber District	Trimester 2015-2016	327	5	656	40	20	40	0	40	60
Female	Trimester 2015-2016	131	2	707	0	50	50	0	50	50
Male	Trimester 2015-2016	196	3	622	67	0	33	0	33	67
Cyber District	Spring 2016	4137	3782	709	14	23	51	11	62	38
Female	Spring 2016	2064	1925	723	10	22	54	13	68	32
Male	Spring 2016	2073	1857	695	19	25	48	8	57	43

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Group Summary (Standards & Objectives)

Group Summary: Standards And Objectives

EOI, English II, Spring 2016, 2-Week

Disaggregate: Mode

Organization | Scores | Filter | Disaggregate | Other

Save Report | Download | Reset Report

			English II													
					1.0	2.0					3.0					4.0
Group	Administration	Form	Total N	Valid N	Mean Percent Correct (6)	Mean Percent Correct (17-18)	EII.R2.1 (4)	EII.R2.2 (5)	EII.R2.3 (4)	EII.R2.4 (4-5)	Mean Percent Correct (18-19)	EII.R3.1 (4-5)	EII.R3.2 (5-6)	EII.R3.3 (4-5)	EII.R3.4 (4)	Mean Percent Correct (6)
Cyber District	Spring 2016	Equivalent	83	79	62	56	49	64	49	63	65	53	69	72	66	56
Online	Spring 2016	Equivalent	83	79	62	56	49	64	49	63	65	53	69	72	66	56
Cyber District	Spring 2016	Operational	4,310	3,770	73	60	54	61	63	63	62	63	60	67	56	63
Online	Spring 2016	Operational	4,109	3,684	74	61	55	62	64	64	63	64	61	68	57	65
Paper/Pencil	Spring 2016	Operational	201	86	21	24	22	20	31	24	17	11	17	29	13	13
Cyber High A	Spring 2016	Equivalent	38	36	67	57	51	63	48	64	65	52	67	71	69	59
Online	Spring 2016	Equivalent	38	36	67	57	51	63	48	64	65	52	67	71	69	59
Cyber High A	Spring 2016	Operational	1,926	1,702	72	61	53	61	64	64	62	64	60	67	57	63
Online	Spring 2016	Operational	1,833	1,662	74	62	54	62	65	65	63	65	61	68	58	64
Paper/Pencil	Spring 2016	Operational	93	40	21	24	19	22	31	26	16	12	18	23	13	11
Cyber High B	Spring 2016	Equivalent	45	43	58	56	47	65	49	62	65	55	70	72	63	54
Online	Spring 2016	Equivalent	45	43	58	56	47	65	49	62	65	55	70	72	63	54
Cyber High B	Spring 2016	Operational	2,384	2,068	73	60	54	60	63	62	62	63	60	68	55	64
Online	Spring 2016	Operational	2,276	2,022	74	61	55	61	63	63	63	64	61	68	56	65
Paper/Pencil	Spring 2016	Operational	108	46	21	24	23	19	30	22	18	10	16	35	13	15

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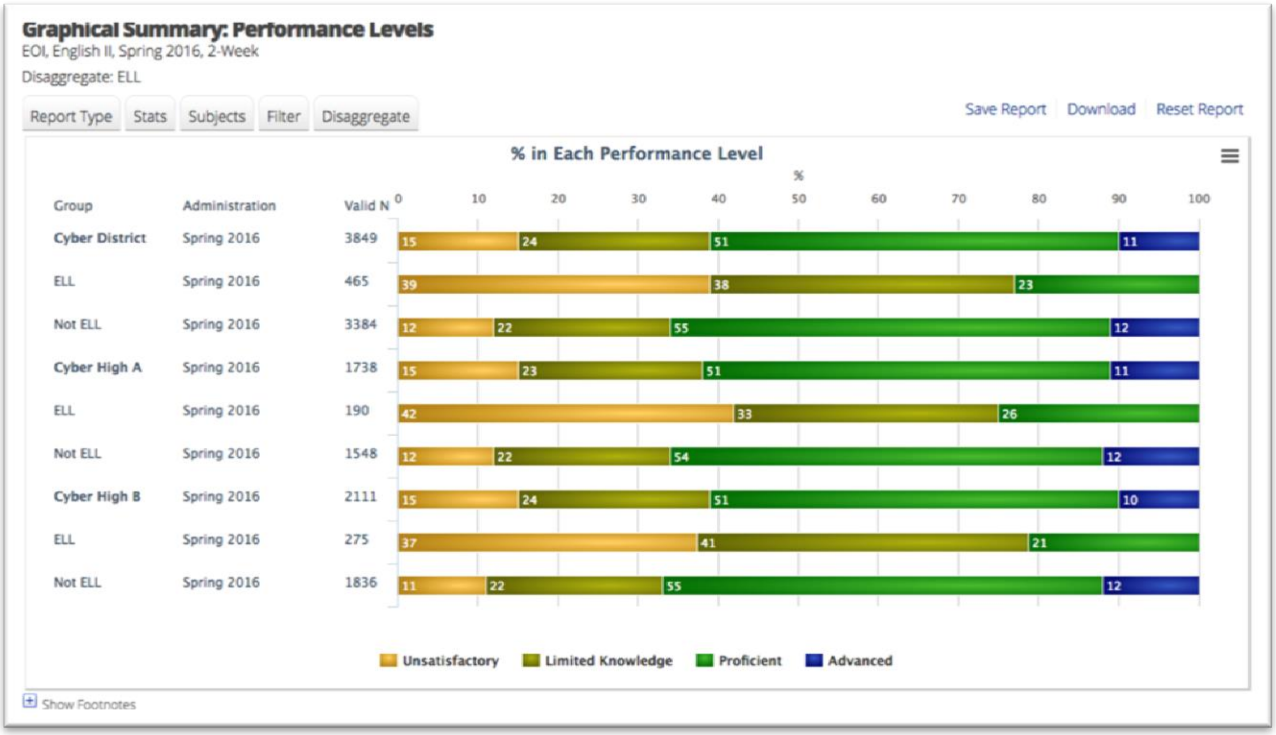
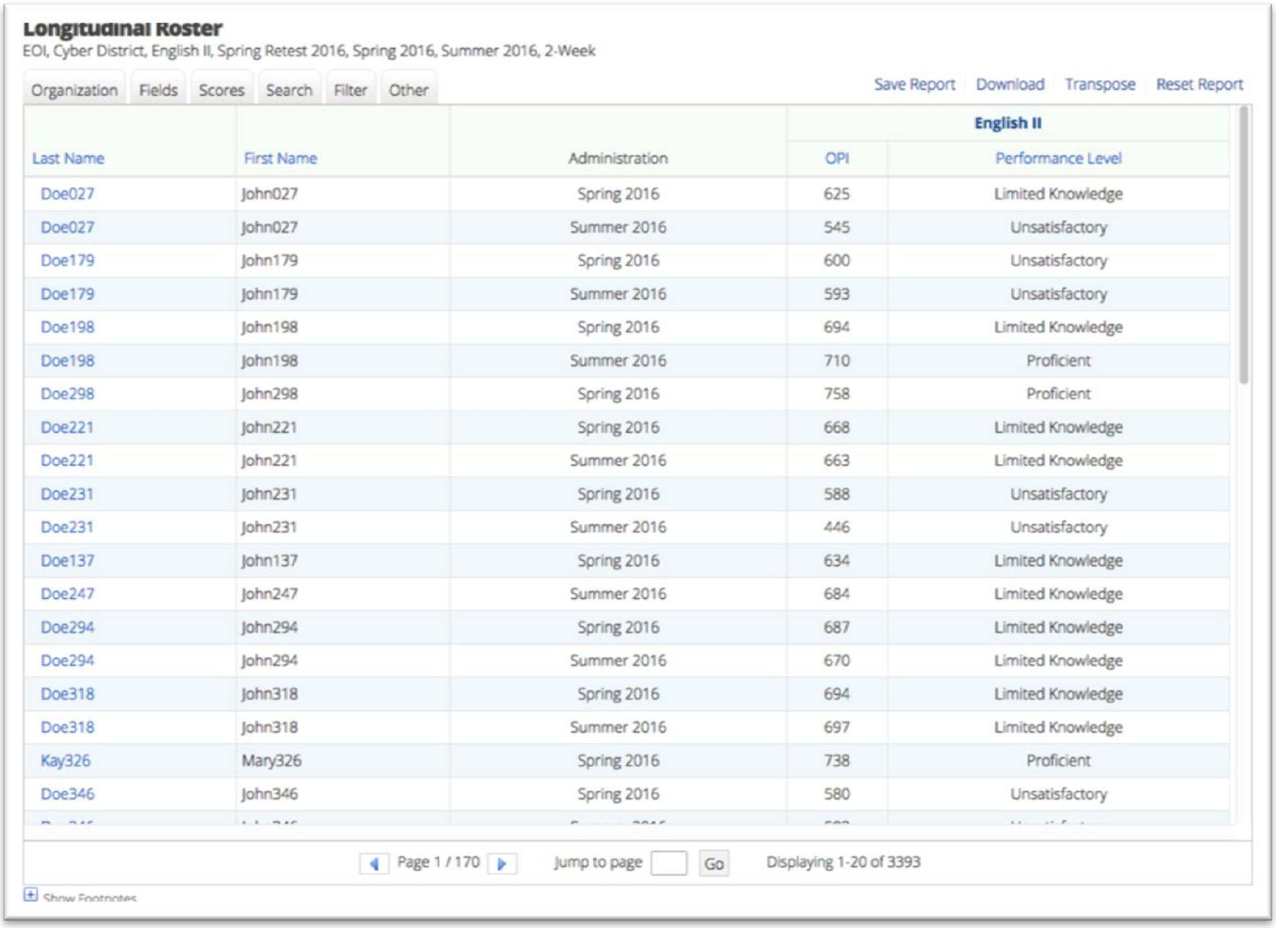
Graphical Summary (Performance Levels)



Longitudinal Roster Report



Longitudinal Roster

EOI, Cyber District, English II, Spring Retest 2016, Spring 2016, Summer 2016, 2-Week

Organization | Fields | Scores | Search | Filter | Other

Save Report | Download | Transpose | Reset Report

			English II	
Last Name	First Name	Administration	OPI	Performance Level
Doe027	John027	Spring 2016	625	Limited Knowledge
Doe027	John027	Summer 2016	545	Unsatisfactory
Doe179	John179	Spring 2016	600	Unsatisfactory
Doe179	John179	Summer 2016	593	Unsatisfactory
Doe198	John198	Spring 2016	694	Limited Knowledge
Doe198	John198	Summer 2016	710	Proficient
Doe298	John298	Spring 2016	758	Proficient
Doe221	John221	Spring 2016	668	Limited Knowledge
Doe221	John221	Summer 2016	663	Limited Knowledge
Doe231	John231	Spring 2016	588	Unsatisfactory
Doe231	John231	Summer 2016	446	Unsatisfactory
Doe137	John137	Spring 2016	634	Limited Knowledge
Doe247	John247	Summer 2016	684	Limited Knowledge
Doe294	John294	Spring 2016	687	Limited Knowledge
Doe294	John294	Summer 2016	670	Limited Knowledge
Doe318	John318	Spring 2016	694	Limited Knowledge
Doe318	John318	Summer 2016	697	Limited Knowledge
Kay326	Mary326	Spring 2016	738	Proficient
Doe346	John346	Spring 2016	580	Unsatisfactory

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Quick Reports

Summary Counts Of Total Tested

EOI, English II, Winter 2015-2016, Trimester 2015-2016, Spring 2016, Summer 2016, 2-Week

Disaggregate: Mode, Other Placement, 2nd Time Testing Opportunity, Condition Code

Organization | Scores | Filter | Disaggregate | Other

Save Report | Download | Reset Report

		OCCT
Group	Administration	Count
Cyber District	Winter 2015-2016	541
Online	Winter 2015-2016	522
Paper/Pencil	Winter 2015-2016	19
2nd Time Testing Opportunity	Winter 2015-2016	392
Total Tested	Winter 2015-2016	428
Absent	Winter 2015-2016	22
Did Not Attempt	Winter 2015-2016	87
Invalidated	Winter 2015-2016	4
Cyber District	Trimester 2015-2016	360
Online	Trimester 2015-2016	344
Paper/Pencil	Trimester 2015-2016	16
2nd Time Testing Opportunity	Trimester 2015-2016	344
Total Tested	Trimester 2015-2016	245
Did Not Attempt	Trimester 2015-2016	92
Invalidated	Trimester 2015-2016	23
Cyber District	Spring 2016	4393
Online	Spring 2016	4192
Paper/Pencil	Spring 2016	201
Other Placement	Spring 2016	5

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APPENDIX U—ANALYSIS AND REPORTING DECISION RULES

Analysis and Reporting Decision Rules: 2015-2016
Oklahoma 15-16 Winter EOI: Retest, Winter, Trimester
Oklahoma 15-16 Spring EOI: Retest, Spring
Oklahoma 15-16 Spring OCCT 3-8

This document details rules for analysis and reporting for the Oklahoma Program. This document is considered a draft until the Oklahoma State Department of Education (SDE) signs off. If there are rules that need to be added or modified after said sign-off, SDE sign-off will be obtained for each such rule.

Table of Contents:

Year to Year Change Highlights:

Date	Description	Page(s)
Spring 2016	‘Other’ no longer a PartStatus	Removed throughout
Spring 2016	Grade 5 & 8 Writing is a field-test in 1516 and reported separately via sFTP data files.	Noted throughout.
Spring 2016	Grade 3 Reading RSA will be reported starting in 1516.	Page 12
Spring 2016	Grade 3-8 Reading Lexile Scores will be reported starting in 1516.	Page 12
Spring 2016	rptIEP/rpt504/rptELL calculations clarified for “with” and “without” accommodations.	Page 11
Spring 2016	School for the Blind, School for the Deaf: Reporting at both testing and sending schools (“Dual Reporting”)	Page 9

Decision Rules

I. Contract Overview

A. Test Administration(s)

This section lists all administrations covered by these decision rules.

Admin ID	Description	Test Grade(s)	Subject
1	EOI Optional Winter Retest	HS	EOI: English II, English III, Algebra I, Algebra II, Geometry, Biology I, U.S. History
2	EOI Winter Block	HS	EOI: English II, English III, Algebra I, Algebra II, Geometry, Biology I, U.S. History OMAAP: English II, Algebra I, Biology I, U.S. History
3	EOI Winter Trimester	HS	EOI: English II, English III, Algebra I, Algebra II, Geometry, Biology I, U.S. History OMAAP: English II, Algebra I, Biology I, U.S. History
4	EOI Spring Retest	HS	EOI: English II, English III, Algebra I, Algebra II, Geometry, Biology I, U.S. History
5	EOI Spring	HS	EOI: English II, English III, Algebra I, Algebra II, Geometry, Biology I, U.S. History OMAAP: English II, Algebra I, Biology I, U.S. History
0	OCCT	03-08	Reading, Mathematics, Writing, Science, Social Studies

B. General Reporting Cycles

Release	Description	Applies To:
EOI		
-	Instant Reporting	Online tests only
1	48 Hour Reporting	Online tests only, English II/III MC only
2	Preliminary Reporting	All
3	Final Reporting	All
OCCT		
-	Instant Reporting , No performance levels	Online tests only
1	Expedited Reporting	Grade 03 Reading
2	48 Hour Reporting	6-8 Online only, no writing
3	Preliminary Reporting	All, Writing will not be included in the online reporting portal.
4	Final Reporting	All except for Writing
N/A	Grade 5 & 8 Writing Field Test	Writing Field Test delivered via sFTP.

C. Post-Test Clean Up Expectations

There will be one specified window of opportunity to update student biographical data. This will occur after preliminary reporting and prior to final reporting. The cleanup occurs using Measured Progress' Student Record Editing System for Winter. The cleanup occurs using the department's online accountability system for Spring administrations.

II. Internal Data Sources

A. Item Banking

All items and associated metadata are stored in Measured Progress's Content Bank.

B. School Information (iCore)

School types are calculated by MP based on SchoolTypeID and SchoolSubTypeID:

SchType	Identification	Description
PUB	**1,1**	Public Schools
CHA	**1,11** **1,12**	Charter Schools, Virtual Charter Schools
PRI	**3,2**	Non Public Schools, including BIA schools

i. ***Additional iCore Specific Rules/Information***
Non-Public Data are not provided to the SDE, with the exception of The School for the Deaf and The School for the Blind.

C. Data Processing (DP)

i. ***Test Booklet Reconciliation (i.e. Online, Paper, Multiple Paper Tests)***
All test records and pre-id records are reported with the exception of merged duplicate test records.

ii. ***Duplicate Resolution***
Do not Report-Duplicate is assigned by DP

iii. ***OMAAP Invalidations***
If IEP = 0 or 2nd Time Tester = 0, set to Invalidated.

iv. ***Class Level Assignments***
Class name from the pre-code file, online portal, or class id sheet will be used to identify how the classes are organized for reporting in the eMetric system. For final reporting, the class name will come from the bio data updates. If no class name is provided, students will be reported under the class name of 'No Name'.

v. ***Final reporting demographics and test codes***
All final demographics and test status codes come from the bio data update file, the SDE Approved Status Codes file, and SDE NFAY updates.

III. External Data Sources

A. Pre-code files

i. In the Winter Measured Progress combined the demographic information from the WAVE with the test information collected from the schools.

ii. The files will be used for enrollment counts for test material orders, generating labels for paper tests, pre-id rosters, setting up online tests, and preliminary demographic information.

iii. In the Spring, the WAVE is the sole source for both demographic and test information. For schools whose students are not included in WAVE the individually submitted pre-ID data are used instead.

B. State Status Codes File

i. A file is sent to Measured Progress prior to preliminary reporting, as well as prior to final reporting, listing students with a State approved code. This is used by data processing to update the student test participation status.

- In addition to a student status code, students may be marked 'Other Placement' special reporting requirements apply.

    a. This applies if a student has been placed by state or court order in a facility or district. These students will receive an Individual Parent/Student Report of their scores and will appear on class/school rosters. However, their scores will not be summarized and reported with the class, school, or district. Instead they will be placed within a "virtual district" at the state level and the state will be accountable.

C. Bio Data Clean up File

i. An updated Bio data cleanup file is supplied after preliminary reporting to be used for final reporting.

D. NFAY Update File

i. MP will provide a results file to SDE after bio data review. SDE will update the NFAY status and return the file, to be used for final reporting.

E. OMAAP Update File

i. At the same time the NFAY file is provided, SDE will also provide a file to update OMAAP students to either invalidate or to 'un' invalidate them if they were invalidated due to IEP and 2nd time tester status.

ii. Spring 2016 is the last administration of OMAAP.

IV. Data Reconciliation Audits

The following cleanup will be performed on student level data prior to analysis once demographic data and reconciled test information are compiled to ensure consistency. Calculations are performed in the order listed below, and audited values are used in each subsequent check and for all analysis, reporting, and deliverables as applicable:

A. *No/Incomplete Response to Demographic Information*

i. The following fields are yes/no fields, and will have a blank translated to 'no' (0):

- Hispanic, American Indian, Asian, African American, Pacific Islander, Caucasian

- Alt. Ed. Academy
- Migrant
- Title X, Part C
- Free/Reduced Lunch
- Distance learning
- 2nd Time Testing Opportunity
- IEP
- 504
- IEP or 504 with accommodations
- IEP Large Print
- IEP Braille
- ELL
- ELL with accommodations
- eMetric Accommodation – Read Aloud
- eMetric Accommodation – Zoom
- eMetric Accommodation – Color Contrast
- Other Placement

B. *IEP Braille and IEP Large Print*

i. If TestMode is online, then IEPBraille and IEP LargePrint are set to 0.

C. *ELL and First & Second Year Proficient (EllProficient)*

i. If both ELL 1st Year Proficient and ELL 2nd Year Proficient are marked the student is considered 2nd Year Proficient (ELLProficient = 2). If neither are marked then ELLProficient = 0. Otherwise it is 1.

D. *Non-Full Academic Year*

i. If Non-Full Academic Year (NFAY) is blank, then set to 0.

ii. Hierarchy of assignment if one or more NFAY bubbles are marked:

- Non-Full Academic Year in school, district and state (NFAY = 3)
- Non-Full Academic Year in school and district (NFAY = 2)
- Non-Full Academic Year in school (NFAY = 1)

E. *Not Tested Code Resolution*

i. If multiple not tested codes are indicated, a single code is assigned based on the following hierarchy:

- No Longer Enrolled
- Absent
- State Alternate Testing (OAAP)
- Previously Passed

V. Student Participation and Reporting Status

A. Basic Definitions

The following criteria are defined for use during the participation status assignment hierarchy. Students may meet the criteria for multiple definitions, but during the hierarchy are assigned a single final participation status.

i. ***Test Attemptedness*** *(by subject)*

- 5 & 8 Writing (field-test in 1516)
  - ***a.*** The Writing prompt is considered to be attempted if a non-blank score is received. This includes non scorable reasons of Illegible\Incomprehensible, Language other than English, Refusal to Answer, and Off-topic.
  - ***b.*** If the prompt receives a non scorable reason of 'Blank', the prompt is not considered to be attempted. This will be reported as a score of 0 unless a state approved status or not tested code is present.
- For all other grades and subjects, a student must attempt a minimum of 5 multiple-choice items in the content area to receive a score. The 5 items must be operational items and not indicated as flawed, placeholder, or field test items (or non-braille-able items in a Braille test) in the item database. These 5 items may be anywhere in the content area, regardless of session.
  - ***a.*** The English II and English III tests are considered attempted based on the criteria above, regardless of a writing prompt score. However, the presence of only a writing prompt score is not considered a valid attempt.
  - ***b.*** If no valid attempt, the student receives the Did Not Attempt status (assuming other student statuses are not applicable)

ii. ***Not Tested Indicators*** *(by subject)*

- Not tested codes
  These codes are collected from the answer document, online testing system, or through the bio data cleanup window. If multiple codes are indicated, a hierarchy is applied.
  - ***a.*** No Longer Enrolled
  - ***b.*** Absent
  - ***c.*** State Alternate Testing (OAAP)
    - Not applicable for OMAAP
  - ***d.*** Previously Passed
- State approved status codes
  These codes are supplied by the state.
  - ***a.*** Mastery Demonstrated Exempt
    - Only applies to Algebra II, English III, Geometry, and U. S. History
    - Not valid for OMAAP or OCCT 3-8.
  - ***b.*** ELL 1st Year in U.S. Exempt
    - Applies to:
      - English II and English III
      - 3-8 Reading
      - 5&8 Writing (field-test)
  - ***c.*** Emergency Exempt
  - ***d.*** Do not Report

e. Do not Report – Duplicate (set by DP)

f. Invalidated

- For OMAAP, if IEP = 0 or 2nd Time Tester = 0, MP set to Invalidated.

B. Participation Status Assignment Hierarchy *(by subject)*

i. Regardless of attempt status, if the student has a State Code provided they are assigned a participation status per the following hierarchy and existing work is not reported:

- Mastery Demonstrated Exempt
  - ***a.*** Only applies to Algebra II, English III, Geometry, and U. S. History
  - ***b.*** Not valid for OMAAP
- ELL 1st Year in U.S. Exempt
  - ***a.*** Only applies to English II and English III
- Emergency Exempt
- Do not Report
- Do not Report – Duplicate
  (note these are set by data processing, not by the SDE)
- Invalidated

ii. Otherwise, if the student attempted the test they are reported as a participant and all Not Tested Codes are suppressed.

iii. Otherwise, if the student did not attempt the test they are assigned a participation status per the following hierarchy of Not Tested Codes:

- No Longer Enrolled
- Absent
- State Alternate Testing (OAAP)
  - ***a.*** Not applicable for OMAAP.
- Previously Passed

iv. Otherwise, if it is 5 & 8 writing, the student is reported as a participant. Did not Attempt is not applicable for 5 & 8 Writing.

v. Otherwise, the student is assigned a status of Did Not Attempt.

C. Participation Status Summary

Subjects	Administrations	Description	MP Part Status	Printed Report Text	
				Results Label	Student Report
All	All	Valid Participant	Z	Earned Perf. Level	Earned Perf. Level
All	All	Did not Attempt *(not applicable for 5&8 Writing)*	A	DNA	Your student did not attempt the test.
Algebra II, English III, Geometry, and U.S. History	EOI	Mastery Demonstrated Exempt	B	MDE	Your student did not take the test based upon the status of Mastery Demonstrated Exempt.
English II, English III	*EOI*	ELL 1st Year in U.S. Exempt	C	ELL1	Your student did not take the test based upon your student's *<test name+content area name>* language learner status and being first year in the U.S.
All	All	Emergency Exempt	D	EE	Your student did not take the test based upon the status of Emergency Exempt.
All	All	Do not Report	E	*N/A*	*N/A*
All	All	Invalidated	F	INV	Your student's test was Invalidated.
All	All	No longer Enrolled	G	*N/A*	*N/A*
All	All	Absent	H	ABS	Your student was absent and did not take the test.
All	EOI	State Alternate Testing (OAAP)	I	*N/A*	*N/A*
All	All	Previously Passed	J	*N/A*	*N/A*
All	All	Do not Report- Duplicate	L	*N/A*	*N/A*

D. Post-Discrepancy Participation Status Assignment

After the bio data cleanup window, an updated bio data file and State status code file are sent to Measured Progress. The resolution of these codes and student Participation Status assignment will be completed again following the rules defined in previous sections.

E. Dual Reporting - The School for the Deaf and the School for the Blind have students who are accountable to a sending school.

i. The student IDs for students at the School for the Blind and the School for the Deaf have been provided to Measured Progress in order to identify students who should be reported at both the sending school (identified in the WAVE) and the School for the Deaf or the School for the Blind (the testing school).

ii. Student reports will be sent to both the sending school and the School for the Deaf or the School for the Blind (the testing school).

iii. Students will appear in the reporting portal at both schools.

iv. The students will be included in aggregation for both schools (sending and testing) and districts (sending and testing).

v. The students will appear once in the state level data file at the sending school.

vi. The student will be included in state aggregations once.

VI. Calculations

A. Student Level Calculations

i. Calculations by Participation Status Summary

Description	MP Part Status	Raw Scores *(Reports)*	Item Scores *(Reports)*	OPI Score *(Reports)*	Performance Level *(Reports)*	Data File Raw Scores	Data File Item Scores	Data File OPI Score	Data File Performance Level
Valid Participant	Z	✓	✓	✓	✓	✓	✓	✓	✓
Did not Attempt	A				DNA				
Mastery Demonstrated Exempt	B				MDE				
ELL 1st Year in U.S. Exempt	C				ELL1				
Emergency Exempt	D				EE				
Do not Report	E*								
Invalidated	F				INV				
No longer Enrolled	G*								
Absent	H				ABS				
State Alternate Testing (OAAP)	I*								
Previously Passed	J*								
Do not Report- Duplicate	L*								

***** *Student records only appear in State results file. They do not appear in online or paper reports.*

ii. ***Resolved Ethnicity for reporting (Ethnic)***

- If 'Hispanic' is indicated, then the student is marked as Hispanic.
- Otherwise if only one race is indicated, the student is reported as that race.
- Otherwise the student is reported as 'Two or More Races'.
- The values for Ethnic are as follows:
  1 = Black/African American
  2 = American Indian/Alaska Native
  3 = Hispanic/Latino
  4 = Asian
  5 = Pacific Islander
  6 = White/Caucasian
  7 = Two or More Races

iii. ***Resolved IEP and 504 for reporting (rptIEP, rpt504)***
Note: OMAAP does not have 504.

- If IEP and 504 are both 0 and no IEP/504 With Accommodations are marked (paper IEP/504 With Accommodations or online IEP With Accommodations or online 504 With Accommodations), then report as not IEP and not 504.
  a. rpt504 = 0, rptIEP = 0
- If IEP and 504 are both 0 and paper IEP/504 With Accommodations or online IEP With Accommodations is marked, then report as IEP with Accommodations and not 504.
  a. rptIEP = 1, rpt504 = 0
- If IEP and 504 are both 0 and online 504 With Accommodations is marked, then report as 504 with Accommodations and not IEP.
  a. rptIEP = 0, rpt504 = 1
- If IEP and 504 are both 1 then report as IEP (with or without accommodations) and not 504.
  a. rpt504 = 0
  b. If paper IEP/504 With Accommodations or online IEP With Accommodations is present, then rptIEP = 1; otherwise rptIEP = 2.
- If IEP is 0 and 504 is 1, then report as 504 with (or without) Accommodations.
  a. If paper IEP/504 With Accommodations or online 504 With Accommodations is present, then rpt504 = 1; otherwise rpt504 = 2.

iv. ***Resolved ELL for reporting (rptELL)***

- If ELL With Accommodations is marked, the student is ELL with accommodations.
  a. rptELL = 1
- Otherwise if ELL = '1' and ELL With Accommodations is not marked then the student is ELL without accommodations.
  a. rptELL = 2
- Otherwise set rptELL = '0'.

v. ***Regular Education(RegularEd)***

- If IEP or ELL = 1, then RegularEd = 0. Otherwise RegularEd = 1.

vi. ***Writing Condition Code***

The following table shows the MP raw value and the reported value of Writing Condition code for Writing Prompts that do not earn a score.

MP Raw Data Value	Description	Reported Value	Report Score Condition Text
I	Illegible/Incomprehensible	I	Illegible/Incomprehensible
F	Language Other than English	L	Language Other than English
B, R	Blank response/ refusal	N	No Response or Refusal to Answer
O	Off Topic	O	Off-topic

vii. ***Class Name***

- If ClassName is blank, set to 'No Name'.

viii. ***Raw Score calculations***

- Only common, non-flawed items are included in raw score calculations.

ix. **Reading Sufficiency Act (RSA) –** new for Spring 2016

- Applies to Grade 3 Reading. At Grade 3, new legislation requires reporting whether a student has met or not met the Reading Sufficiency Act (RSA) requirement.
- The items included in a student's RSA raw score is a subtest of the grade 3 reading test, included common, non-flawed items identified with standard of either: Vocabulary (2.0) or Comprehension/Critical Literacy (4.0).
- A standards validation was held to determine the cut score that is applied based on the RSA raw score.
- Students will be reported with a value of 0 if they have not met the RSA criteria or with a value of 1 if they have met the RSA criteria.
- This is reported on the Grade 3 Reading Student Report per the approved drafts, the reporting portal, and state student results data file.

x. **Lexile –** new for Spring 2016

- For grades 3-8 Lexile measures will be reported for Reading.
- A lookup was provided by MetaMetrics.
- The Lexile measure will be applied based on the students Reading scaled score.
- If the student's Lexile measure is negative, BR=Beginning Reader will be reported on the student report.
- If the student's Lexile measure is not negative, the formatted measure from the Reported Lexile Measure column in the lookup table will be reported on the student report, data files and in the reporting portal.

B. Aggregate Calculations

i. ***Number Enrolled***

The following students are included in Enrollment counts:

a. Valid Participants, Did Not Attempt, Mastery Demonstrated Exempt, ELL 1st Year Exempt, Emergency Exempt, Invalidated, Absent, State Alternate Assessment (PartStatus = Z,A,B,C,D,F,H,I)

ii. ***Number Tested***

The following students are included in participation tested counts:

- ***a.*** Valid Participants (PartStatus = Z)

iii. ***Performance Summary***

The following rules describe whether students are included in performance level and OPI score aggregations at the Class, School, District, and State level.

The following students are included in all aggregations unless otherwise noted: (IncludedClass/School/District/State = 1)

- ***a.*** Valid Participants (PartStatus = Z)
- ***b.*** 1st Time Testers (TwoTT = 0)

- Additional Rules
  - ***a.*** Students at Non Public schools (Schtype = PRI) are not included in State aggregations. (IncludedState = 0)
  - ***b.*** Other Placement students are not included in Class, School, or District aggregations. (IncludedClass/School/District= 0)
  - ***c.*** Operational, Equivalent, and Braille tests are included and aggregated together.

iv. ***Standards and Objectives Summary***

The following rules describe whether students are included in standards and objectives raw score aggregations at the Class, School, District, and State level.

The following students are included in all aggregations unless otherwise noted: (IncludedClass/School/District/State = 1)

- ***a.*** Valid Participants (PartStatus = Z)
- ***b.*** 1st Time Testers (TwoTT = 0)

- Additional Rules
  - ***a.*** Students at Non Public schools (Schtype = PRI) are not included in State aggregations. (IncludedState = 0)
  - ***b.*** Other Placement students are not included in Class, School, or District aggregations. (IncludedClass/School/District= 0)
  - ***c.*** Operational and Equivalent tests are aggregated separately.
  - ***d.*** Braille tests are not included.

Analysis and Reporting Decision Rules: 2015-2016 Spring
Oklahoma 15-16 Spring EOI: Retest, Spring
Oklahoma 15-16 Spring OCCT 3-8

This document details rules for analysis and reporting that are specific to the Spring (EOI and OCCT). This document is considered a draft until the Oklahoma State Department of Education (SDE) signs off. If there are rules that need to be added or modified after said sign-off, SDE sign-off will be obtained for each such rule.

Table of Contents:

Year to Year Change Highlights:

Date	Description	Page(s)
Spring 2016	Writing (field-test) Data Files	Noted throughout

Decision Rules

I. Contract Overview

A. Test Administration(s)

This section lists all administrations covered by these decision rules.

Admin ID	Description	Test Grade(s)	Subject
4	EOI Spring Retest	HS	EOI: English II, English III, Algebra I, Algebra II, Geometry, Biology I, U.S. History
5	EOI Spring	HS	EOI: English II, English III, Algebra I, Algebra II, Geometry, Biology I, U.S. History OMAAP: English II, Algebra I, Biology I, U.S. History
0	OCCT	03-08	Reading, Mathematics, Science, Social Studies Writing (field-test, excluded from OCCT reporting)

B. Reporting Cycles

Release	Description	Applies To:
EOI		
-	Instant Reporting	Online tests only
1	48 Hour Reporting	Online tests only, English II/III MC only
2	Preliminary Reporting	All
3	Final Reporting	All
OCCT		
-	Instant Reporting , No performance levels	Online tests only
1	Expedited Reporting	Grade 03 Reading
2	48 Hour Reporting	6-8 Online only
3	Preliminary Reporting	All, Writing will not be included in the online reporting portal.
4	Final Reporting	All except for Writing
N/A	5 & 8 Writing Field Test	5 & 8 OCCT Writing Field Test

C. Deliverables List

Client and internal deliverables are listed. Specifications for each deliverable are detailed in the Deliverable Specifications section TBD.

All but the Final reporting releases occur on an administration based schedule. The final reporting is completed at the same time for all spring administrations.

Administration	Release	Deliverable	Method of Delivery	To Who	Includes	Other details
Spring EOI Retest	Instant	Raw Score	eMetric	Students taking the online test	Online testers only	
	48 hour	Data Interaction - Roster Report	eMetric (DI)	Schools and Districts	Online testers only	MC RawScore only for English II/III; OPI and Performance Level for all other content areas
		Data Interaction - Individual Student Report	eMetric (DI)	Schools and Districts	Online testers only	
	2 Week Preliminary	Data Interaction - Roster Report	eMetric (DI)	Schools and Districts	All testers unless excluded by business rules	
		Data Interaction - Individual Student Report	eMetric (DI)	Schools and Districts	All testers unless excluded by business rules	
		Student Results Data File	sftp	State	All testers unless excluded by business rules	
	Final	Data Interaction - Roster Report	eMetric (DI)	Schools and Districts	All testers unless excluded by business rules	
		Data Interaction - Individual Student Report	eMetric (DI)	Schools and Districts	All testers unless excluded by business rules	
		Printed Student Report	printed pdf	Shipped to Districts	All testers unless excluded by business rules	
		Printed Student Results Label	printed pdf	Shipped to Districts	All testers unless excluded by business rules	
		Student Results Data File	sftp	State	All testers unless excluded by business rules	
EOI Spring	Pre-Test	Printed PreCode Roster Report	printed pdf	Shipped to Districts	Paper testers only	
	Instant	Raw Score	eMetric	Students taking the online test	Online testers only	
	48 hour	Data Interaction - Roster Report	eMetric (DI)	Schools and Districts	Online testers only	MC RawScore only for English II/III; OPI and Performance Level for all other pre-equated content areas
		Data Interaction - Individual Student Report	eMetric (DI)	Schools and Districts	Online testers only	
	2 Week Preliminary	Data Interaction - Roster Report	eMetric (DI)	Schools and Districts	All testers unless excluded by business rules	
		Data Interaction - Individual Student Report	eMetric (DI)	Schools and Districts	All testers unless excluded by business rules	
		Data Interaction - Group Summary Report	eMetric (DI)	Schools and Districts	All testers unless excluded by business rules	
		Student Results Data File	sftp	State	All testers unless excluded by business rules	
	Final	Data Interaction - Roster Report	eMetric (DI)	Schools and Districts	All testers unless excluded by business rules	
		Data Interaction - Individual Student Report	eMetric (DI)	Schools and Districts	All testers unless excluded by business rules	
		Data Interaction - Group Summary Report	eMetric (DI)	Schools and Districts	All testers unless excluded by business rules	
		Printed Student Report	printed pdf	Shipped to Districts	All testers unless excluded by business rules	
		Printed Student Results Label	printed pdf	Shipped to Districts	All testers unless excluded by business rules	
		Student Results Data File	sftp	State	All testers unless excluded by business rules	

OCCT	Pre-Test	Printed PreCode Roster Report	printed pdf	Shipped to Districts	Paper testers only	
	Instant	Raw Score	eMetric	Students taking the online test	Online testers only	
	48 hour	Data Interaction - Roster Report	eMetric (DI)	Schools and Districts	Online testers only	OPI and Performance Level for only pre-equated content areas
		Data Interaction - Individual Student Report	eMetric (DI)	Schools and Districts	Online testers only	
	2 Week Preliminary	Data Interaction - Roster Report	eMetric (DI)	Schools and Districts	All testers unless excluded by business rules	
		Data Interaction - Individual Student Report	eMetric (DI)	Schools and Districts	All testers unless excluded by business rules	
		Data Interaction - Group Summary Report	eMetric (DI)	Schools and Districts	All testers unless excluded by business rules	
		Student Results Data File	sftp	State	All testers unless excluded by business rules	
	Writing data files	Writing Data Files	sftp	School, Districts	All testers unless excluded by business rules	
		Writing Participation Data File	sftp	State	All testers unless excluded by business rules	
	Final	Data Interaction - Roster Report	eMetric (DI)	Schools and Districts	All testers unless excluded by business rules	
		Data Interaction - Individual Student Report	eMetric (DI)	Schools and Districts	All testers unless excluded by business rules	
		Data Interaction - Group Summary Report	eMetric (DI)	Schools and Districts	All testers unless excluded by business rules	
		Printed Student Report	printed pdf	Shipped to Districts	All testers unless excluded by business rules	
		Printed Student Results Label	printed pdf	Shipped to Districts	All testers unless excluded by business rules	
		Student Results Data File	sftp	State	All testers unless excluded by business rules	

D. Post-Test Clean Up Expectations

There will be one specified window of opportunity to update student biographical data. This will occur after preliminary reporting and prior to final reporting. The cleanup occurs using the department's online accountability system for Spring.

II. Internal Data Sources

A. Test Information

i. Prior Administrations

Spring 2016 Tests	Prior Administration	
	Regular	**Equivalent**
EOI Spring Retest	Spring A1 14/15	N/A
EOI Spring	New Build	New Build
EOI OMAAP	Winter 15/16 Equivalent	Winter 15/16 Regular
OCCT	New Build	Spring 2014 (exception: Grade 7 Geography is new)

ii. Test Design

Tests	Grade	Subject	Form(s)	Items included in Raw Score	Item Types
EOI Spring Retest	HS	Algebra I Algebra II Biology I Geometry English II English IIII U.S. History	Regular Equivalent	Common Items	English II and III have selected response items and a Writing Prompt. All other tests consist of selected response items only.
EOI Spring	HS	Algebra I Algebra II Biology I Geometry English II English IIII U.S. History	Regular (Biology: A1-A9, B10-B18; non-Biology: A1-A3, B4-B5) Equivalent	Common Items to either Form A or Form B	English II and III have selected response items and a Writing Prompt. Biology has field test TEI and Multiple Part Selected Response items. All other tests consist of selected response items only.
EOI Spring OMAAP	HS	Algebra I Biology I English II U.S. History	Regular Equivalent	Common Items	English II and III have selected response items and a Writing Prompt. All other tests consist of selected response items only.
OCCT	03-08	Reading, Mathematics, Writing (FT), Science, Social Studies	Regular (Science Grade 5: A1-A15; Science Grade 8: A1-A23; Writing: A1-A5; Social Studies: A1-A5; Reading and Math: A1-A2) Equivalent	Common Items	Science has field test TEI and Multiple Part Selected Response items. Writing FT includes a prompt. All other tests consist of selected response items only.

iii. ***Item Reporting Categories*** *(Measured Progress daRepCatTextLookup)*

a. EOI Operational

- Objectives and Standards are reported for all content areas.
  - Biology I has two different types of Standards and Objectives that are mutually exclusive. They are called Process and Inquiry Standards, and Content Standards.
- Writing subtest information is also reported as part of English I & II:
  - Composite Score
  - The 5 individual trait scores
- See Appendix A for a table indicating the text and ordering of each of the Standards/Objectives on the Student Report.

b. EOI OMAAP

- Standards are reported; Objectives are not.
  - Biology I has two different types of Standards that are mutually exclusive. They are called Process and Inquiry Standards, and Content Standards.
- Writing subtest information is also reported as part of English Ii & III.
- See Appendix A for a table indicating the text and ordering of each of the Standards/Objectives on the Student Report.

c. OCCT

- Objectives and Standards are reported for all content areas.
  - Science has two different types of Standards and Objectives that are mutually exclusive. They are called Process and Inquiry Standards, and Content Standards.
- Writing (field-test) subtest information is reported (separate from OCCT operational reporting).
  - Composite Score
  - The 5 individual trait scores
- See Appendix A for a table indicating the text and ordering of each of the Standards/Objectives on the Student Report.

d. Minimum Item Counts

If a student attempts a content area, they are considered to have attempted all standards and objectives.

- Standards
  - If less than 6 points are included in a standard, the title is displayed but student scores are not reported.
  - The OMAAP Writing Composite is the exception to this rule. It has 3 points and is always reported.
- Objectives
  - If less than 4 points are included in an objective, the title is displayed but student scores are not reported.

iv. ***Non-Braille-able Item Identification***

- Responses for students that were administered a Braille accommodation must be transcribed onto an answer document with IEP Braille = Yes. Online tests will not be considered or reported as Braille.
    - ***a.*** The IEP Braille indicator is only printed on the paper answer documents.
- The items that could not be brailled are listed in Appendix B (from the SDE).

B. Scoring

i. ***Multiple Choice Scores – Scanning, eMetric***
Valid multiple choice responses are A, B, C, D, or F, G, H, I, blank, and * = multiple responses. All responses except "blank" are considered a response attempt. NOTE: OMAAP has options A, B, C only.

ii. ***Technology Enhanced Items (TEIs) – eMetric***

The TEIs are administered online only and the score is captured based on the scoring rubric. These items are field test only for this spring.

iii. ***Multiple Part Selected Response – eMetric***

Each of the two parts has a valid response of A, B, C, D, or blank. The two parts are combined for a final response. These items are field test only for this spring.

iv. ***Writing Composition Scores – Scoring***

- The EOI OMAAP writing composition is holistically scored based on 3 traits, with an overall score worth 1-3 points recorded.
    - ***a.*** The prompt is 100% double scored, with a 3rd score required if scores or non-scorable codes do not match.
- The EOI Operational and Retest, and OCCT writing composition is scored on 5 analytic traits:
    - ***a.*** The 5 traits are:
        - Ideas and Development
        - Organization, Unity, and Coherence
        - Word Choice
        - Sentences and Paragraphs
        - Grammar/ Usage and Mechanics
    - ***b.*** Each trait is 100% double scored, with a score range of 1-4. A 3rd score is required if scores are non-adjacent, or non-scorable codes do not match. A final trait score is then calculated. *(see calculations section III.A)*
- The following scores are valid for each individual score:

Raw Data Value	Description	Reported Value	Point Value
1-4 (per scorer) 1-3 (per scorer)	Trait 1-5 Score (EOI/OCCT) Holistic Score (OMAAP)	Final score Final score	1-4 1-3
I	Illegible/Incomprehensible	I	0
F	Language Other than English	L	0
B, R	Blank response/ refusal	N	0
O	Off Topic	O	0

v. ***Test Form Determinations***

- Braille form is determined if an answer document has IEP Braille bubbled. Online tests cannot be Braille.
- Otherwise the test form is determined by the answer document or the online test record.

vi. ***Off Grade Testing –*** OCCT 3-8 only. There is no a concept of off grade testing for EOI.

- If an expected subject is not received, build out a test on grade level and report as Did Not Attempt (DNA).
- If we receive an on grade test (with an attempt) and an above or below grade test for a student, the on grade result is reported. The above or below grade test is set to Do Not Report (DNR).
- If only an above grade test is received, the above grade test is reported.
- If only a below grade test is received, the below grade test is Invalidated (INV).
- If both above and below grade tests are received, the above grade is reported and the below grade is Invalidated (INV).

III. Calculations

A. Writing Scores

i. ***Final Analytic Trait score***

- If scorer 1 and 2 both provide scores and the scores are exact or adjacent then the final trait score is the average between the two scores.
- If scorer 1 and 2 both provide an agreeing not-scorable code the not scorable code is the final trait score.
- Otherwise the final trait score is the 3rd score or non-scorable code.

ii. ***Final Composition Score***

- EOI OMAAP

  The final score is the 3rd score if it exists; otherwise it is the 1st score. *(3rd score only exists if 1st and 2nd do not agree).*

- EOI Operational & Retest, OCCT 5 & 8 Writing (field-test)

  The final composition score is a linear combination of the 5 final analytical trait scores, which are weighted as follows:

Trait Code	Internal MPCode	Analytic Trait	Weight	Calculation
1.	I	Ideas and Development	.30	Final Trait Score x .30 = weighted score 1
2.	O	Organization, Unity, and Coherence	.25	Final Trait Score x .25 = weighted score 2
3.	W	Word Choice	.15	Final Trait Score x .15 = weighted score 3
4.	S	Sentences and Paragraphs	.15	Final Trait Score x .15 = weighted score 4
5.	G	Grammar / Usage and Mechanics	.15	Final Trait Score x .15 = weighted score 5
		Total		**Sum (weighted score 1 through 5)**

- English II

  Final Composition score = (Sum *x* **1.7**) – **1.025**

  The final composition score is rounded to the nearest whole value, with possible values ranging from 1-6.

- English III *(weights are multiplied by 5)*

  Final Composition score = (**5***Sum* **.58**) – **1.67843**

  The final composition score is rounded to the nearest whole value, with possible values ranging from 1-10.

- OCCT 5 & 8 Writing Field Test *(weights are multiplied by 15)*

  Final Composition score = (1**5***Sum)

  The final composition score is rounded to the nearest whole value, with possible values ranging from 15-60.

iii. ***Raw Score***

- ***English II/III***
  The raw score is calculated by summing the final calculated composition score and the MC raw score (common items). That score is used to get the final Scale Score and Performance Level.
- ***5 & 8 Writing***
  The raw score is the final calculated composition score. That score is used to get the final Scale Score and Performance Level, as applicable.
  If the trait scores are 'B', blank, and a not tested reason or status is not supplied, a score of 0 is assigned.

B. Reporting Category Score Calculations

i. Only common, non-flawed items are included in reporting category score calculations.

ii. The percent at each reporting category is rounded to the nearest whole number.

iii. The reporting categories associated with the Writing Prompt are reported as follows:

a. The Analytic Traits are the final calculated Trait score, with values of 1.0-4.0.

- If the prompt has a writing condition code, no score is reported for these reporting categories.

b. The Writing Composite score reported is the final calculated composite score, rounded to the nearest whole value. English II has possible values of 1-6, and English III has values of 1-10, and Grades 5 & & Writing has values of 15-60.

- If the prompt has a writing condition code, the code is reported as the composite score reporting category.

C. Scaling, Equating, and Item Statistics

i. Scaling & Equating

- EOI Spring Retest: All of the tests are pre-equated.
- EOI Spring: US History is post-equated, all other tests are pre-equated.
- EOI Spring OMAAP: All of the tests are pre-equated.
- OCCT: Science and Social Studies (including Grade 7 Geography) are post-equated. All others are pre-equated.

ii. Performance Level Coding

There are four possible Performance levels, assigned to students using the raw to Oklahoma Performance Index (OPI) lookup provided by psychometrics.

Performance Level	EOI Operational & Retest Description	EOI OMAAP Description	OCCT Description
1	Unsatisfactory	Unsatisfactory	Unsatisfactory
2	Limited Knowledge	Limited Knowledge	Limited Knowledge
3	Proficient	Satisfactory	Proficient
4	Advanced	Advanced	Advanced

IV. Deliverables Specifics

A. Grades 5 and 8 Writing Data Files

i. Data files will be delivered via the sftp site to districts.
ii. Data files will be produced at the district level , the school level and state level
iii. The school and district files will consist of aggregate results and the content will depend on the n size of the entity (school or district)
- Aggregate results will be suppressed if the n size of the entity is less than 5.

iv. The state will receive a data file that consists of students who participated in the writing assessments.
v. Data file layouts have not been finalized with SDE

Appendix

A. Reporting Category Text

Description: Reporting Categories Text and Ordering

Administration	Grade	Subject	Display Text
OCCT	03	OCCT Math	1.0 Algebraic Reasoning: Patterns and Relationships
OCCT	03	OCCT Math	1.1 Algebra Patterns
OCCT	03	OCCT Math	1.2 Equations
OCCT	03	OCCT Math	1.3 Number Properties
OCCT	03	OCCT Math	2.0 Number Sense and Operation
OCCT	03	OCCT Math	2.1 Number Sense
OCCT	03	OCCT Math	2.2 Number Operations
OCCT	03	OCCT Math	3.0 Geometry
OCCT	03	OCCT Math	3.1 Properties of Shapes
OCCT	03	OCCT Math	3.2 Spatial Reasoning
OCCT	03	OCCT Math	3.3 Coordinate Geometry
OCCT	03	OCCT Math	4.0 Measurement
OCCT	03	OCCT Math	4.1 Measurement
OCCT	03	OCCT Math	4.2 Time and Temperature
OCCT	03	OCCT Math	4.3 Money
OCCT	03	OCCT Math	5.0 Data Analysis
OCCT	03	OCCT Math	5.1 Data Analysis
OCCT	03	OCCT Math	5.2 Probability
OCCT	03	OCCT Reading	2.0 Vocabulary
OCCT	03	OCCT Reading	2.1 Words in Context
OCCT	03	OCCT Reading	2.2 Affixes, Roots, and Stems
OCCT	03	OCCT Reading	2.3 Synonyms, Antonyms, and Homonyms
OCCT	03	OCCT Reading	2.4 Using Resource Materials
OCCT	03	OCCT Reading	4.0 Comprehension/Critical Literacy
OCCT	03	OCCT Reading	4.1 Literal Understanding
OCCT	03	OCCT Reading	4.2 Inferences and Interpretation
OCCT	03	OCCT Reading	4.3 Summary and Generalization
OCCT	03	OCCT Reading	4.4 Analysis and Evaluation
OCCT	03	OCCT Reading	5.0 Literature
OCCT	03	OCCT Reading	5.2 Literary Elements
OCCT	03	OCCT Reading	5.3 Figurative Language/Sound Devices
OCCT	03	OCCT Reading	6.0 Research and Information
OCCT	03	OCCT Reading	6.1 Accessing Information
OCCT	04	OCCT Math	1.0 Algebraic Reasoning: Patterns and Relationships
OCCT	04	OCCT Math	1.1 Algebra Patterns

OCCT	04	OCCT Math	1.2 Equations
OCCT	04	OCCT Math	1.3 Number Properties
OCCT	04	OCCT Math	2.0 Number Sense and Operation
OCCT	04	OCCT Math	2.1 Number Sense
OCCT	04	OCCT Math	2.2 Number Operations
OCCT	04	OCCT Math	3.0 Geometry
OCCT	04	OCCT Math	3.1 Lines
OCCT	04	OCCT Math	3.2 Angles
OCCT	04	OCCT Math	3.3 Polygons
OCCT	04	OCCT Math	3.4 Transformations
OCCT	04	OCCT Math	4.0 Measurement
OCCT	04	OCCT Math	4.1 Measurement
OCCT	04	OCCT Math	4.2 Time and Temperature
OCCT	04	OCCT Math	4.3 Money
OCCT	04	OCCT Math	5.0 Data Analysis
OCCT	04	OCCT Math	5.1 Data Analysis
OCCT	04	OCCT Math	5.2 Probability
OCCT	04	OCCT Math	5.3 Central Tendency
OCCT	04	OCCT Reading	1.0 Vocabulary
OCCT	04	OCCT Reading	1.1 Words in Context
OCCT	04	OCCT Reading	1.2 Affixes, Roots, and Stems
OCCT	04	OCCT Reading	1.3 Synonyms, Antonyms, and Homonyms
OCCT	04	OCCT Reading	3.0 Comprehension/Critical Literacy
OCCT	04	OCCT Reading	3.1 Literal Understanding
OCCT	04	OCCT Reading	3.2 Inferences and Interpretation
OCCT	04	OCCT Reading	3.3 Summary and Generalization
OCCT	04	OCCT Reading	3.4 Analysis and Evaluation
OCCT	04	OCCT Reading	4.0 Literature
OCCT	04	OCCT Reading	4.2 Literary Elements
OCCT	04	OCCT Reading	4.3 Figurative Language/Sound Devices
OCCT	04	OCCT Reading	5.0 Research and Information
OCCT	04	OCCT Reading	5.1 Accessing Information
OCCT	05	OCCT Math	1.0 Algebraic Reasoning: Patterns and Relationships
OCCT	05	OCCT Math	1.1 Algebra Patterns
OCCT	05	OCCT Math	1.2 Equations
OCCT	05	OCCT Math	1.3 Number Properties
OCCT	05	OCCT Math	2.0 Number Sense and Operation
OCCT	05	OCCT Math	2.1 Number Sense
OCCT	05	OCCT Math	2.2 Number Operations
OCCT	05	OCCT Math	3.0 Geometry
OCCT	05	OCCT Math	3.1 Circles and Polygons
OCCT	05	OCCT Math	3.2 Angles

OCCT	05	OCCT Math	4.0 Measurement
OCCT	05	OCCT Math	4.1 Measurement
OCCT	05	OCCT Math	4.2 Money
OCCT	05	OCCT Math	5.0 Data Analysis
OCCT	05	OCCT Math	5.1 Data Analysis
OCCT	05	OCCT Math	5.2 Probability
OCCT	05	OCCT Math	5.3 Central Tendency
OCCT	05	OCCT Reading	1.0 Vocabulary
OCCT	05	OCCT Reading	1.1 Words in Context
OCCT	05	OCCT Reading	1.2 Affixes, Roots, and Stems
OCCT	05	OCCT Reading	1.3 Synonyms, Antonyms, and Homonyms
OCCT	05	OCCT Reading	3.0 Comprehension/Critical Literacy
OCCT	05	OCCT Reading	3.1 Literal Understanding
OCCT	05	OCCT Reading	3.2 Inferences and Interpretation
OCCT	05	OCCT Reading	3.3 Summary and Generalization
OCCT	05	OCCT Reading	3.4 Analysis and Evaluation
OCCT	05	OCCT Reading	4.0 Literature
OCCT	05	OCCT Reading	4.1 Literary Genres
OCCT	05	OCCT Reading	4.2 Literary Elements
OCCT	05	OCCT Reading	4.3 Figurative Language/Sound Devices
OCCT	05	OCCT Reading	5.0 Research and Information
OCCT	05	OCCT Reading	5.1 Accessing Information
OCCT	05	OCCT Reading	5.2 Interpreting Information
OCCT	05	OCCT Science	1.1 Matter has Physical Properties
OCCT	05	OCCT Science	1.1 SI (metric) Units
OCCT	05	OCCT Science	1.2 Physical Properties can be Measured
OCCT	05	OCCT Science	1.2 Similar/Different Characteristics
OCCT	05	OCCT Science	1.3 Energy can be Transferred
OCCT	05	OCCT Science	1.4 Potential/Kinetic Energy
OCCT	05	OCCT Science	2.1 Dependence Upon Community
OCCT	05	OCCT Science	2.1 Observable Properties
OCCT	05	OCCT Science	2.2 Individual Organism and Species Survival
OCCT	05	OCCT Science	2.2 Serial Order
OCCT	05	OCCT Science	3.1 Properties of Soils
OCCT	05	OCCT Science	3.2 Experimental Design
OCCT	05	OCCT Science	3.2 Weather Patterns
OCCT	05	OCCT Science	3.3 Earth as a Planet
OCCT	05	OCCT Science	3.4 Hazards/Practice Safety
OCCT	05	OCCT Science	4.2 Data Tables/Line/Bar/Trend and Circle Graphs
OCCT	05	OCCT Science	4.3 Prediction Based on Data
OCCT	05	OCCT Science	4.4 Explanations Based on Data
OCCT	05	OCCT Science	C1.0 Properties of Matter and Energy

OCCT	05	OCCT Science	C2.0 Organisms and Environments
OCCT	05	OCCT Science	C3.0 Structures of the Earth and the Solar System
OCCT	05	OCCT Science	P1.0 Observe and Measure
OCCT	05	OCCT Science	P2.0 Classify
OCCT	05	OCCT Science	P3.0 Experiment
OCCT	05	OCCT Science	P4.0 Interpret and Communicate
OCCT	05	OCCT Social Studies	1.0 James Towne Settlement and Plimoth Plantation
OCCT	05	OCCT Social Studies	1.1/1.2/1.3/1.4 James Towne Settlement
OCCT	05	OCCT Social Studies	1.5 Plimoth Plantation
OCCT	05	OCCT Social Studies	2.0 Colonial America
OCCT	05	OCCT Social Studies	2.1/2.3/2.6 Colonial Economics, Trade/Migration, Perspectives
OCCT	05	OCCT Social Studies	2.2/2.4/2.5 Self-government, Role of Religion, Leaders, and British and Native American Relationships
OCCT	05	OCCT Social Studies	3.0 American Revolution
OCCT	05	OCCT Social Studies	3.1 Causes and Effects of American Revolution
OCCT	05	OCCT Social Studies	3.2/3.3/3.4 Founding Documents of the Revolutionary Era
OCCT	05	OCCT Social Studies	3.5 Events of the Revolutionary War
OCCT	05	OCCT Social Studies	3.6 Key Individuals of the Revolutionary Era
OCCT	05	OCCT Social Studies	4.0 Early Federal Period
OCCT	05	OCCT Social Studies	4.1/4.2 Causes, Leaders, and Issues of the Constitutional Convention
OCCT	05	OCCT Social Studies	4.3 Purposes and Principles of the U.S. Constitution
OCCT	05	OCCT Social Studies	4.4/4.5 Ratification of the U.S. Constitution and the Bill of Rights
OCCT	05	OCCT Writing	1. Ideas and Development (30%)
OCCT	05	OCCT Writing	2. Organizations, Unity, and Coherence (25%)
OCCT	05	OCCT Writing	3. Word Choice (15%)
OCCT	05	OCCT Writing	4. Sentences and Paragraphs (15%)
OCCT	05	OCCT Writing	5. Grammar, Usage and Mechanics (15%)
OCCT	06	OCCT Math	1.0 Algebraic Reasoning: Patterns and Relationships
OCCT	06	OCCT Math	1.1 Algebra Patterns
OCCT	06	OCCT Math	1.2 Expressions and Equations
OCCT	06	OCCT Math	1.3 Number Properties
OCCT	06	OCCT Math	1.4 Solving Equations
OCCT	06	OCCT Math	2.0 Number Sense and Operation
OCCT	06	OCCT Math	2.1 Number Sense
OCCT	06	OCCT Math	2.2 Number Operations
OCCT	06	OCCT Math	3.0 Geometry
OCCT	06	OCCT Math	3.1 Three Dimensional Figures
OCCT	06	OCCT Math	3.2 Congruent and Similar Figures
OCCT	06	OCCT Math	3.3 Coordinate Geometry
OCCT	06	OCCT Math	4.0 Measurement
OCCT	06	OCCT Math	4.1 Circles

OCCT	06	OCCT Math	4.2 Conversions
OCCT	06	OCCT Math	5.0 Data Analysis
OCCT	06	OCCT Math	5.1 Data Analysis
OCCT	06	OCCT Math	5.2 Probability
OCCT	06	OCCT Math	5.3 Central Tendency
OCCT	06	OCCT Reading	1.0 Vocabulary
OCCT	06	OCCT Reading	1.1 Words in Context
OCCT	06	OCCT Reading	1.2 Word Origins
OCCT	06	OCCT Reading	3.0 Comprehension/Critical Literacy
OCCT	06	OCCT Reading	3.1 Literal Understanding
OCCT	06	OCCT Reading	3.2 Inferences and Interpretation
OCCT	06	OCCT Reading	3.3 Summary and Generalization
OCCT	06	OCCT Reading	3.4 Analysis and Evaluation
OCCT	06	OCCT Reading	4.0 Literature
OCCT	06	OCCT Reading	4.1 Literary Genres
OCCT	06	OCCT Reading	4.2 Literary Elements
OCCT	06	OCCT Reading	4.3 Figurative Language/Sound Devices
OCCT	06	OCCT Reading	5.0 Research and Information
OCCT	06	OCCT Reading	5.1 Accessing Information
OCCT	06	OCCT Reading	5.2 Interpreting Information
OCCT	07	OCCT Geography	1.0 Geographic Tools/Geography Skills
OCCT	07	OCCT Geography	1.1/1.2/1.3/1.4/1.5 Geographic Tools and Skills
OCCT	07	OCCT Geography	1.6 Freedom Week
OCCT	07	OCCT Geography	2.0 Human and Physical Characteristics of Regions
OCCT	07	OCCT Geography	2.1/2.2 Political and Physical/Cultural Regions
OCCT	07	OCCT Geography	2.3/2.5 Physical and Human Characteristics Linking/Dividing Regions
OCCT	07	OCCT Geography	2.4 Conflict and Cooperation
OCCT	07	OCCT Geography	3.0 Physical Systems of the Earth
OCCT	07	OCCT Geography	3.1 Visual Information, Landforms and Bodies of Water
OCCT	07	OCCT Geography	3.2 Impact of Natural Disasters on Human Populations
OCCT	07	OCCT Geography	4.0 Human Systems: People and Cultures
OCCT	07	OCCT Geography	4.1/4.2/4.5 Cultural Traits, Major World Religions, and Major Political Systems
OCCT	07	OCCT Geography	4.3/4.7 Human Characteristics of Developing and Developed Countries and Population Issues
OCCT	07	OCCT Geography	4.4/4.6 Economic Systems, Economic Interdependence and Trade
OCCT	07	OCCT Geography	5.0 Human Interaction with the Environment
OCCT	07	OCCT Geography	5.1 Distribution of Resources
OCCT	07	OCCT Geography	5.2/5.3 Human Modification and Regional Problems
OCCT	07	OCCT Math	1.0 Algebraic Reasoning: Patterns and Relationships
OCCT	07	OCCT Math	1.1 Linear Relationships
OCCT	07	OCCT Math	1.2 Solving Equations

OCCT	07	OCCT Math	1.3 Solving and Graphing Inequalities
OCCT	07	OCCT Math	2.0 Number Sense and Operation
OCCT	07	OCCT Math	2.1 Number Sense
OCCT	07	OCCT Math	2.2 Number Operations
OCCT	07	OCCT Math	3.0 Geometry
OCCT	07	OCCT Math	3.1 Classifying Figures
OCCT	07	OCCT Math	3.2 Lines and Angles
OCCT	07	OCCT Math	3.3 Transformations
OCCT	07	OCCT Math	4.0 Measurement
OCCT	07	OCCT Math	4.1 Perimeter and Area
OCCT	07	OCCT Math	4.2 Circles
OCCT	07	OCCT Math	4.3 Composite Figures
OCCT	07	OCCT Math	5.0 Data Analysis
OCCT	07	OCCT Math	5.1 Data Analysis
OCCT	07	OCCT Math	5.2 Probability
OCCT	07	OCCT Math	5.3 Central Tendency
OCCT	07	OCCT Reading	1.0 Vocabulary
OCCT	07	OCCT Reading	1.1 Words in Context
OCCT	07	OCCT Reading	1.2 Word Origins
OCCT	07	OCCT Reading	1.3 Idioms and Comparisons
OCCT	07	OCCT Reading	3.0 Comprehension/Critical Literacy
OCCT	07	OCCT Reading	3.1 Literal Understanding
OCCT	07	OCCT Reading	3.2 Inferences and Interpretation
OCCT	07	OCCT Reading	3.3 Summary and Generalization
OCCT	07	OCCT Reading	3.4 Analysis and Evaluation
OCCT	07	OCCT Reading	4.0 Literature
OCCT	07	OCCT Reading	4.1 Literary Genres
OCCT	07	OCCT Reading	4.2 Literary Elements
OCCT	07	OCCT Reading	4.3 Figurative Language/Sound Devices
OCCT	07	OCCT Reading	5.0 Research and Information
OCCT	07	OCCT Reading	5.1 Accessing Information
OCCT	07	OCCT Reading	5.2 Interpreting Information
OCCT	08	OCCT Math	1.0 Algebraic Reasoning: Patterns and Relationships
OCCT	08	OCCT Math	1.1 Equations
OCCT	08	OCCT Math	1.2 Inequalities
OCCT	08	OCCT Math	2.0 Number Sense and Operation
OCCT	08	OCCT Math	2.1 Number Sense
OCCT	08	OCCT Math	2.2 Number Operations
OCCT	08	OCCT Math	3.0 Geometry
OCCT	08	OCCT Math	3.1 Three Dimensional Figures
OCCT	08	OCCT Math	3.2 Pythagorean Theorem
OCCT	08	OCCT Math	4.0 Measurement

OCCT	08	OCCT Math	4.1 Surface Area and Volume
OCCT	08	OCCT Math	4.2 Ratio and Proportions
OCCT	08	OCCT Math	4.3 Composite Figures
OCCT	08	OCCT Math	5.0 Data Analysis
OCCT	08	OCCT Math	5.1 Data Analysis
OCCT	08	OCCT Math	5.3 Central Tendency
OCCT	08	OCCT Reading	1.0 Vocabulary
OCCT	08	OCCT Reading	1.1 Words in Context
OCCT	08	OCCT Reading	1.2 Word Origins
OCCT	08	OCCT Reading	1.3 Idioms and Comparisons
OCCT	08	OCCT Reading	3.0 Comprehension/Critical Literacy
OCCT	08	OCCT Reading	3.1 Literal Understanding
OCCT	08	OCCT Reading	3.2 Inferences and Interpretation
OCCT	08	OCCT Reading	3.3 Summary and Generalization
OCCT	08	OCCT Reading	3.4 Analysis and Evaluation
OCCT	08	OCCT Reading	4.0 Literature
OCCT	08	OCCT Reading	4.1 Literary Genres
OCCT	08	OCCT Reading	4.2 Literary Elements
OCCT	08	OCCT Reading	4.3 Figurative Language/Sound Devices
OCCT	08	OCCT Reading	5.0 Research and Information
OCCT	08	OCCT Reading	5.1 Accessing Information
OCCT	08	OCCT Reading	5.2 Interpreting Information
OCCT	08	OCCT Science	1.1 Chemical Reactions
OCCT	08	OCCT Science	1.1 Qualitative/Quantitative Observations/Changes
OCCT	08	OCCT Science	1.2 Conservation of Matter
OCCT	08	OCCT Science	1.2/1.3 Appropriate Tools and SI (metric) Units
OCCT	08	OCCT Science	2.1 Classification System
OCCT	08	OCCT Science	2.1 Motion of an Object
OCCT	08	OCCT Science	2.2 Object Subjected to a Force
OCCT	08	OCCT Science	2.2 Properties Ordered
OCCT	08	OCCT Science	3.1 Classification
OCCT	08	OCCT Science	3.2 Experimental Design
OCCT	08	OCCT Science	3.2 Internal and External Structures
OCCT	08	OCCT Science	3.3 Identify Variables
OCCT	08	OCCT Science	3.6 Hazards/Practice Safety
OCCT	08	OCCT Science	4.1 Landforms Result from Constructive and Destructive Forces
OCCT	08	OCCT Science	4.2 Data Tables/Line/Bar/Trend and Circle Graphs
OCCT	08	OCCT Science	4.2 Rock Cycles
OCCT	08	OCCT Science	4.3 Explanations/Prediction
OCCT	08	OCCT Science	4.3 Global Weather Patterns
OCCT	08	OCCT Science	5.1 Catastrophic Events
OCCT	08	OCCT Science	5.2 Fossil Evidence

OCCT	08	OCCT Science	C1.0 Properties and Chemical Changes in Matter
OCCT	08	OCCT Science	C2.0 Motion and Forces
OCCT	08	OCCT Science	C3.0 Diversity and Adaptations of Organisms
OCCT	08	OCCT Science	C4.0 Structures/Forces of the Earth/Solar System
OCCT	08	OCCT Science	C5.0 Earth's History
OCCT	08	OCCT Science	P1.0 Observe and Measure
OCCT	08	OCCT Science	P2.0 Classify
OCCT	08	OCCT Science	P3.0 Experiment
OCCT	08	OCCT Science	P4.0 Interpret and Communicate
OCCT	08	OCCT US History	1.0 Causes and Events of the American Revolution
OCCT	08	OCCT US History	1.1/1.2 Consequences of the French & Indian War, British Imperial Policies
OCCT	08	OCCT US History	1.3/1.4/1.5 Ideological War, Declaration of Independence's Grievances, Ideals, and Social Contract Selection
OCCT	08	OCCT US History	2.0 The Revolutionary Era
OCCT	08	OCCT US History	2.1/2.2/2.3 Articles of Confederation, Motivations & Choices, Key Military & Diplomatic Events
OCCT	08	OCCT US History	3.0 Developing the American Government System
OCCT	08	OCCT US History	3.1/3.2/3.3 Causes for the Constitutional Convention, and Ratification
OCCT	08	OCCT US History	3.4/3.5 Constitutional Principles and the Bill of Rights
OCCT	08	OCCT US History	4.0 The Transformation of the United States to the Mid-1800s
OCCT	08	OCCT US History	4.1 Major Events and Issues of Early Presidential Administrations
OCCT	08	OCCT US History	4.2/4.6 Jacksonian Era and Westward Expansion
OCCT	08	OCCT US History	4.3/4.4/4.5 Sectional Economic Systems, African American Experiences, and Reform Movements/Leaders
OCCT	08	OCCT US History	5.0 Causes, Events, and Leadership in the Civil War
OCCT	08	OCCT US History	5.1/5.2 Causes of the Civil War: 1850s through the 1860 Presidential Election
OCCT	08	OCCT US History	5.3/5.4 Advantages/Disadvantages, Leadership, Major Turning Points of the War
OCCT	08	OCCT Writing	1. Ideas and Development (30%)
OCCT	08	OCCT Writing	2. Organizations, Unity, and Coherence (25%)
OCCT	08	OCCT Writing	3. Word Choice (15%)
OCCT	08	OCCT Writing	4. Sentences and Paragraphs (15%)
OCCT	08	OCCT Writing	5. Grammar, Usage and Mechanics (15%)
EOI	HS	OCCT Algebra I	1.0 Number Sense and Algebraic Operations
EOI	HS	OCCT Algebra I	1.1 Equations and Formulas
EOI	HS	OCCT Algebra I	1.2 Expressions
EOI	HS	OCCT Algebra I	2.0 Relations and Functions
EOI	HS	OCCT Algebra I	2.1 Relations/Functions
EOI	HS	OCCT Algebra I	2.2 Linear Equations and Graphs
EOI	HS	OCCT Algebra I	2.3 Linear Inequalities and Graphs
EOI	HS	OCCT Algebra I	2.4 Systems of Equations

EOI	HS	OCCT Algebra I	3.0 Data Analysis, Probability, and Statistics
EOI	HS	OCCT Algebra I	3.1 Data Analysis
EOI	HS	OCCT Algebra I	3.2 Line of Best Fit
EOI	HS	OCCT Algebra I	1.0 Number Sense and Algebraic Operations
EOI	HS	OCCT Algebra I	1.1 Rational Exponents
EOI	HS	OCCT Algebra I	1.2 Polynomial and Rational Expressions
EOI	HS	OCCT Algebra I	1.3 Complex Numbers
EOI	HS	OCCT Algebra I	2.0 Relations and Functions
EOI	HS	OCCT Algebra I	2.1 Functions and Function Notation
EOI	HS	OCCT Algebra I	2.2 Systems of Equations
EOI	HS	OCCT Algebra I	2.3 Quadratic Equations and Functions
EOI	HS	OCCT Algebra I	2.4 Conic Sections
EOI	HS	OCCT Algebra I	2.5 Exponential and Logarithmic Functions
EOI	HS	OCCT Algebra I	2.6 Polynomial Equations and Functions
EOI	HS	OCCT Algebra I	2.7 Rational Equations and Functions
EOI	HS	OCCT Algebra I	3.0 Data Analysis, Probability, and Statistics
EOI	HS	OCCT Algebra I	3.1 Analysis of Collected Data
EOI	HS	OCCT Algebra I	3.3 Arithmetic and Geometric Sequences
EOI	HS	OCCT Biology I	1.0 The Cell
EOI	HS	OCCT Biology I	1.1 Cell Structures and Functions
EOI	HS	OCCT Biology I	1.2 Differentiation of Cells
EOI	HS	OCCT Biology I	1.3 Specialized Cells
EOI	HS	OCCT Biology I	2.0 The Molecular Basis of Heredity
EOI	HS	OCCT Biology I	2.1 DNA Structure and Function in Heredity
EOI	HS	OCCT Biology I	2.2 Sorting and Recombination of Genes
EOI	HS	OCCT Biology I	3.0 Biological Diversity
EOI	HS	OCCT Biology I	3.1 Variation Among Organisms
EOI	HS	OCCT Biology I	3.2 Natural Selection and Biological Adaptations
EOI	HS	OCCT Biology I	3.3 Behavior Patterns can be Used to Ensure Reproductive Success
EOI	HS	OCCT Biology I	4.0 The Interdependence of Organisms
EOI	HS	OCCT Biology I	4.1 Organisms Both Cooperate and Compete
EOI	HS	OCCT Biology I	4.2 Population Dynamics
EOI	HS	OCCT Biology I	5.0 Matter/Energy/Organization in Living Systems
EOI	HS	OCCT Biology I	5.1 Complexity and Organization Used For Survival
EOI	HS	OCCT Biology I	5.2 Matter and Energy Flow in Living and Nonliving Systems
EOI	HS	OCCT Biology I	5.3 Earth Cycles Including Abiotic and Biotic Factors
EOI	HS	OCCT Biology I	P1.0 Observe and Measure
EOI	HS	OCCT Biology I	P1.1 Qualitative/Quantitative Observations/Changes
EOI	HS	OCCT Biology I	P1.2/P1.3 Use Appropriate System International (SI) Units and Tools
EOI	HS	OCCT Biology I	P2.0 Classify
EOI	HS	OCCT Biology I	P2.1 Use Observable Properties to Classify

EOI	HS	OCCT Biology I	P2.2 Identify Properties of a Classification System
EOI	HS	OCCT Biology I	P3.0 Experimental Design
EOI	HS	OCCT Biology I	P3.1 Evaluate the Design of Investigations
EOI	HS	OCCT Biology I	P3.2/P3.4 Identify a Testable Hypothesis, Variables, and Controls
EOI	HS	OCCT Biology I	P3.3 Use Mathematics to Show Relationships
EOI	HS	OCCT Biology I	P3.5 Identify Potential Hazards and Practice Safety Procedures in all Science Activities
EOI	HS	OCCT Biology I	P4.0 Interpret and Communicate
EOI	HS	OCCT Biology I	P4.1 Select Predictions Based on Observed Patterns of Evidence
EOI	HS	OCCT Biology I	P4.3 Interpret Line, Bar, Trend, and Circle Graphs
EOI	HS	OCCT Biology I	P4.4 Accept or Reject a Hypothesis
EOI	HS	OCCT Biology I	P4.5 Make Logical Conclusions Based on Experimental Data
EOI	HS	OCCT Biology I	P4.8 Identify an Appropriate Graph or Chart
EOI	HS	OCCT Biology I	P5.0 Model
EOI	HS	OCCT Biology I	P5.1 Interpret a Model which Explains a Given Set of Observations
EOI	HS	OCCT Biology I	P5.2 Select Predictions Based on Models, Using Mathematics when Appropriate
EOI	HS	OCCT English II	1. Ideas and Development
EOI	HS	OCCT English II	1.0 Vocabulary
EOI	HS	OCCT English II	1.0/2.0 Writing Composite Score
EOI	HS	OCCT English II	2. Organizations, Unity, and Coherence
EOI	HS	OCCT English II	2.0 Comprehension
EOI	HS	OCCT English II	2.1 Literal Understanding
EOI	HS	OCCT English II	2.2 Inferences and Interpretation
EOI	HS	OCCT English II	2.3 Summary and Generalization
EOI	HS	OCCT English II	2.4 Analysis and Evaluation
EOI	HS	OCCT English II	3. Word Choice
EOI	HS	OCCT English II	3.0 Grammar, Usage, and Mechanics
EOI	HS	OCCT English II	3.0 Literature
EOI	HS	OCCT English II	3.1 Literary Genres
EOI	HS	OCCT English II	3.1 Standard English Usage
EOI	HS	OCCT English II	3.2 Literary Elements
EOI	HS	OCCT English II	3.2 Mechanics and Spelling
EOI	HS	OCCT English II	3.3 Figurative Language
EOI	HS	OCCT English II	3.3 Sentence Structure
EOI	HS	OCCT English II	3.4 Literary Works
EOI	HS	OCCT English II	4. Sentences and Paragraphs
EOI	HS	OCCT English II	4.0 Research and Information
EOI	HS	OCCT English II	5. Grammar, Usage and Mechanics
EOI	HS	OCCT English III	1. Ideas and Development
EOI	HS	OCCT English III	1.0 Vocabulary

EOI	HS	OCCT English III	1.0/2.0 Writing Composite Score
EOI	HS	OCCT English III	2. Organizations, Unity, and Coherence
EOI	HS	OCCT English III	2.0 Comprehension
EOI	HS	OCCT English III	2.1 Literal Understanding
EOI	HS	OCCT English III	2.2 Inferences and Interpretation
EOI	HS	OCCT English III	2.3 Summary and Generalization
EOI	HS	OCCT English III	2.4 Analysis and Evaluation
EOI	HS	OCCT English III	3. Word Choice
EOI	HS	OCCT English III	3.0 Grammar, Usage, and Mechanics
EOI	HS	OCCT English III	3.0 Literature
EOI	HS	OCCT English III	3.1 Literary Genres
EOI	HS	OCCT English III	3.1 Standard English Usage
EOI	HS	OCCT English III	3.2 Literary Elements
EOI	HS	OCCT English III	3.2 Mechanics and Spelling
EOI	HS	OCCT English III	3.3 Figurative Language
EOI	HS	OCCT English III	3.3 Sentence Structure
EOI	HS	OCCT English III	3.4 Literary Works
EOI	HS	OCCT English III	3.4 Manuscript Conventions
EOI	HS	OCCT English III	4. Sentences and Paragraphs
EOI	HS	OCCT English III	4.0 Research and Information
EOI	HS	OCCT English III	5. Grammar, Usage and Mechanics
EOI	HS	OCCT Geometry	1.0 Logical Reasoning
EOI	HS	OCCT Geometry	1.1 Inductive and Deductive Reasoning
EOI	HS	OCCT Geometry	1.2 Conditional Statements
EOI	HS	OCCT Geometry	2.0 Properties of 2-Dimensional Figures
EOI	HS	OCCT Geometry	2.2 Line and Angle Relationships
EOI	HS	OCCT Geometry	2.3 Polygons and Other Plane Figures
EOI	HS	OCCT Geometry	2.4 Similarity
EOI	HS	OCCT Geometry	2.5 Congruence
EOI	HS	OCCT Geometry	2.6 Circles
EOI	HS	OCCT Geometry	3.0 Triangles and Trigonometric Ratios
EOI	HS	OCCT Geometry	3.1 Pythagorean Theorem
EOI	HS	OCCT Geometry	3.2 Right Triangle Relationships
EOI	HS	OCCT Geometry	3.3 Trigonometric Functions
EOI	HS	OCCT Geometry	4.0 Properties of 3-Dimensional Figures
EOI	HS	OCCT Geometry	4.1 Polyhedra and Other Solids
EOI	HS	OCCT Geometry	4.2 Similarity
EOI	HS	OCCT Geometry	4.3 Models and Perspective
EOI	HS	OCCT Geometry	5.0 Coordinate Geometry
EOI	HS	OCCT Geometry	5.1 Properties of Points, Segments, and Lines
EOI	HS	OCCT Geometry	5.2 Properties of Figures
EOI	HS	OCCT US History	1.0 Post-Reconstruction to the Progressive Era, 1878 - 1900

EOI	HS	OCCT US History	1.0 Transformation of the United States from Post-Reconstruction to the Progressive Era, 1878 - 1900
EOI	HS	OCCT US History	1.1 Post Reconstruction Amendments
EOI	HS	OCCT US History	1.2 Immigration, Westward Movement, and Native American Experiences
EOI	HS	OCCT US History	1.3 Impact of Industrialization on Society, Economics, and Politics
EOI	HS	OCCT US History	2.0 Expanding Role of the United States in International Affairs
EOI	HS	OCCT US History	3.0 Cycles of Economic Boom and Bust in the 1920s and 1930s
EOI	HS	OCCT US History	3.1 Economic, Political, & Social Transformation Between the World Wars
EOI	HS	OCCT US History	3.2/3.3 Economic Destabilization and the Great Depression/New Deal
EOI	HS	OCCT US History	4.0 Role of the U.S. in International Affairs and World War II, 1933 - 1946
EOI	HS	OCCT US History	4.1 Mobilization for World War II
EOI	HS	OCCT US History	4.2/4.3 World War II and U.S. Reaction to the Holocaust
EOI	HS	OCCT US History	5.0 U.S. Foreign and Domestic Policies during the Cold War, 1945 - 1975
EOI	HS	OCCT US History	5.1/5.2 The Cold War - Foreign and Domestic
EOI	HS	OCCT US History	5.3 The Vietnam War Era
EOI	HS	OCCT US History	5.4 The African American Civil Rights Movement
EOI	HS	OCCT US History	5.5 Social Political Transformation
EOI	HS	OCCT US History	6.0 U.S. Foreign and Domestic Policies, 1976 to the Present
EOI	HS	OCCT US History	6.1/6.2/6.3 End of the Cold War
EOI	HS	OCCT US History	6.4/6.5/6.6 Post Cold War World

B. Non-Brailleable Items

Description: List of Items that could not be brailled

Test	Subject	Position
OCCT Spring 1516	Grade 8 Science	52

APPENDIX V—GLOSSARY OF ASSESSMENT TERMS

This glossary of commonly used assessment terms can be used to help interpret and communicate test results. Note that because assessment terms evolve in terms of meaning and application, the definitions for some words may evolve beyond the sense indicated here.

accommodation A general term referring to changes in the setting in which a test is administered, the timing of a test, the scheduling of a test, the ways in which the test is presented, and the ways in which the student responds to the test. The term is used to refer to changes that do not alter in any significant way what the test measures or the comparability of scores.

achievement test An assessment that measures a student's acquired knowledge and skills in a content area (for example, OCCT Grade 5 Mathematics) in which the student has received instruction.

alternate assessment A substitute way of gathering information on the performance and progress of students who cannot participate, even with accommodations, in the regular state or district assessment programs. Alternate assessments provide a mechanism for all students to be included in the accountability system.

analytic scoring A scoring procedure in which a student's writing is evaluated for selected traits or dimensions, with each trait receiving a separate score. The resulting values are combined for an overall score.

bias A systematic error in a test score. Bias occurs when factors irrelevant to the subject matter related to the assessment result in one or more specific groups of students being advantaged or disadvantaged relative to other groups.

classical test theory A psychometric theory based on the perspective that an individual's observed score on a test is composed of the true score of the examinee and an independent component of measurement error.

construct The underlying concept or the characteristic that a test is designed to measure.

construct irrelevance The extent to which test scores are affected by factors that are not relevant to the construct that the test is designed to measure.

construct validity (content validity) Construct validity indicates the extent to which the content of the test samples the subject matter or situation about which conclusions are to be drawn; also described as "evidence based on test content."

constructed-response item An assessment unit with directions, a question, or an idea that elicits a written response from a student.

content standard A statement describing the knowledge and skills in a content area that is expected to be taught in classrooms and should be met at a specified point in time (e.g., at the end of the course).

conversion tables Tables used to convert a student's test scores from raw-score total to scaled score.

criterion A standard or judgment used as a basis for quantitative and qualitative comparison; also a variable to which a test is compared as a measure of the test's validity.

criterion-referenced test An assessment that allows its users to make score interpretations of a student's performance in relation to specified performance standards or criteria, rather than in comparison to the performances of other test takers. See also **performance standard/level**.

cut score Selected points on the score scale of a test. The points are used to determine whether a particular test score is sufficient for some purpose. For example, student performance on a test maybe classified into one of several categories, such as unsatisfactory, limited knowledge, proficient or advanced on the basis of cut scores.

differential item functioning (DIF) A situation that occurs in testing when different groups of examinees (e.g., ethnic or gender groups) with the same true achievement levels have different levels of success on a particular item. Test developers reduce DIF by analyzing item data separately for each group. Items identified with DIF are carefully reviewed by content experts and culture and sensitivity committees. Items that appear to be unfair to one or more groups are discarded.

discrimination parameter Under **Item Response Theory** (IRT), it indicates the degree an item distinguishes between examinees of differing abilities on the trait being measured. Low discrimination values indicate an item does not discriminate students of low and high abilities.

distractor An incorrect answer choice in a selected-response or multiple-choice test item.

frequency distribution An ordered tabulation of individual scores (or groups of scores) showing the number of students obtaining each score or the number of students that were within each score grouping.

holistic scoring A scoring procedure yielding a single score based on overall student performance rather than on an accumulation of points. Holistic scoring uses rubrics to evaluate student performance. Note: This procedure is used to score the OMAAP English II Writing response.

item A statement, exercise, task, question, or problem on a test.

Item Response Theory (IRT) A set of mathematical models that describes the relationship between performance on test items and the student's level of performance on the same scale as the ability or trait being measured. For OCCT 3–8 and EOI, the three-parameter model is used for the calibration and scaling of multiple-choice items; the two-parameter partial credit model (2PPC) is used for Writing prompts in EOI English II and English III. For the EOI OMAAP assessments, the one-parameter (Rasch) model is used for calibration and scaling of multiple-choice items; the one-parameter partial credit model (1PPC) is used for the Writing prompt in English II. The various item parameters associated with each model (discrimination, difficulty, and guessing) are used to describe the statistical characteristics of each item. The Rasch and 1PPC only produce item difficulty estimates.

location (difficulty) parameter In Item Response Theory, this parameter is the point on the ability scale at which an item discriminates, or measures, best.

mean The quotient obtained by dividing the sum of a set of scores by the number of scores; also called the "average." Mathematicians call it the "arithmetic mean."

median The middle score in a set of ranked scores. Equal numbers of ranked scores lie above and below the median. It corresponds to the 50th percentile and the 5th decile.

mode The score or value that occurs most frequently in a distribution.

multiple-choice item A question, problem, or statement called a “stem” that appears on a test followed by two or more answer choices, called alternatives or response choices. The incorrect choices, called distractors, usually reflect common errors. The student’s task is to choose the best answer to the question posed in the stem.

normal distribution curve A bell-shaped curve representing a theoretical distribution of measurements that is often approximated by a wide variety of actual data. It is often used as a basis for scaling and statistical hypothesis testing and estimation in psychology and education because it approximates the frequency distributions of sets of measurements of human characteristics.

norm-referenced test A standardized assessment in which all students perform under the same conditions (e.g., carefully defined directions, time limits, materials, and scoring procedures). This type of test allows for the interpretation of the test score in relation to a specified reference group, usually others of the same grade and level.

Oklahoma Academic Standards The Oklahoma Academic Standards are Oklahoma’s core curriculum. Each subject/grade has a different set of standards and objectives on which students are tested.

Oklahoma Core Curriculum Tests (OCCT) The OCCT is the general testing program administered in Oklahoma public schools to students in Grades 3–8 and End-of-Instruction.

Oklahoma Modified Alternate Assessment Program (OMAAP) The OMAAP EOI is administered for retake purposes only in order to meet a graduation requirement or to apply a Modified Proficiency Score. Students must be 2nd Time Testers with a previous OMAAP score in the same subject and be on an Individualized Education Program (IEP). The current OMAAP assessments are High School EOI for Algebra I, English II, Biology I, and U.S. History.

Oklahoma Performance Index (OPI) The Oklahoma Performance Index (OPI) is a scaled score resulting from the mathematical transformation of the true score, which is associated with each of the raw scores. The OPI score is used to place students in one of four performance levels.

Oklahoma School Testing Program (OSTP) The OSTP is a testing program that includes the OCCT general assessment in Grades 3–8 and EOI, the OMAAP EOI assessments, and the OAAP portfolio assessment.

open-ended item See constructed-response item.

performance level A level of performance on a test, established by education experts, as a goal of student attainment. It may also refer to a description of the knowledge, skills, and abilities typically held by students within a performance level.

performance-level score range The performance-level score range is the range of scale scores that corresponds to one of the four performance levels: Advanced, Proficient/Satisfactory, Limited Knowledge, and Unsatisfactory.

Portfolio assessments The Portfolio assessment is a yearlong collection of information and pieces of evidence, which represent a student’s mastery of the Oklahoma Academic Standards.

raw score The number of correct answers on a test.

reliability The degree to which test scores obtained by a group of individuals are consistent over repeated applications. The reliability coefficient indicates the degree to which scores are free of measurement error. The conditions that the coefficient estimates may involve variations in test forms (alternate form reliability), repeated administration of the same form to the same groups after a time interval (test-retest reliability), or the statistical interrelationship of responses on separate parts of the test (internal consistency). Internal consistency fits into OCCT and EOI OMAAP test condition.

rubric A scoring tool, or set of criteria, used to evaluate a student's test performance. A scoring rubric is used to evaluate a student's response to the OCCT Grades 5 and 8 Writing, the OCCT ACE English II, and the ACE English III Writing prompt, as well as the EOI OMAAP English II Writing prompt.

scale scores Scores on a single scale with intervals. The scale can be applied to all groups taking a given test, regardless of group characteristics or time of year, making it possible to compare scores from different groups of students. Scale scores are appropriate for various statistical purposes. For example, they can be added, subtracted, and averaged across test levels. Such computations permit educators to make direct comparisons among examinees or compare individual scores to groups in a way that is statistically valid. This cannot be done with percentiles or grade equivalents.

standard A target toward which instruction is specifically directed. In OSTP tests, standards are used to cluster key skills and/or concepts in an instructional domain. For example, skills such as Literal Understanding and Inferences and Interpretation form part of the Comprehension standard in the OCCT Grade 8 Reading test and the ACE English II test.

standard deviation A statistic used to express the extent of the divergence of a set of scores from the average of all the scores in the group. In a normal distribution, approximately two thirds (68.3 percent) of the scores lie within the limits of one standard deviation above and one standard deviation below the mean. The remaining scores are equally distributed more than one standard deviation above and below the mean.

standard error of measurement (SEM) Measurement error is associated with all test scores. The standard error of measurement (SEM) is an estimate of the amount of error to be expected in a score from a particular test. This statistic provides a range within which a student's true score is likely to fall. The smaller the standard error of measurement, the smaller the range in which the student's true score would likely fall and the more accurate the test score.

standardized test a test that is given in exactly the same way to all children taking the test. The items are the same, the instructions are the same, the timing is the same, the method of determining correctness is the same, and the scoring is the same. No variations are allowed.

stem The part of an item that asks a question, provides directions, or presents a statement to be completed.

stimulus A passage or graphic display about which questions are asked.

test A device or procedure designed to elicit responses that permit an inference about what a student knows or can do.

test item See **item**.

true score In classical test theory, the hypothetical average score that would result if the test could be administered repeatedly without practice or fatigue effects. In Item Response Theory, the "true score" is the error-free value of the test taker's performance.

unscorable Writing responses that do not meet certain criteria cannot be scored. A zero composite score is given to responses that fall into the following categories:
N – No Response/Refusal to Answer I – Illegible/Incomprehensible
L – Language other than English O – Off Topic

validity The degree to which accumulated evidence and theory support specific interpretations of test scores proposed by users of a test.

writing prompt An assessment topic, situation, or statement to which students are expected to respond in the form of an essay.

APPENDIX W—ABERRANT RESPONSE PATTERN ANALYSES OF THE OCCT 2016 SPRING EOI TESTS

Aberrant Response Pattern Analyses of the OCCT 2016 Spring EOI Tests

Introduction

Student response patterns on OCCT 2016 Spring End of Instruction (EOI) tests for high school students were analyzed for aberrant responses. The analyses focused on a comparison of how a student responds to each item in relation to how they were expected to perform given the student's overall achievement. These analyses were conducted on the full student population, regardless of administration mode. Due to the operational equating procedures and limited size of the testing population for some test forms, such as the Equivalent or Braille forms, it was not possible to conduct the analyses on some test forms.

A brief description of how the analyses were conducted (a separate analysis for each grade level and content area) is given below. Note that the scale score change analysis was not conducted due to the lack of the scaled scores from the previous year.

1. Person-fit Analyses

These analyses focused on comparing the response pattern of a student to the expected response pattern of that student, given the estimated underlying IRT model. The l_z statistic (Drasgow, Levine, & McLaughlin, 1987) was used to calculate a person-fit index for each student. The interpretation of the person-fit statistic (l_z) depends on whether the fit statistic is a large positive number or a large negative number. A positive value means the person's items response data fit the psychometric model better than you would expect. A negative value indicates that a student displays a statistically unusual tendency to correctly answer difficult items while missing easy items. A person-fit statistic was calculated for each student, and students who had a large negative *z* value were flagged.

The l_z statistic was initially purported to be asymptotically standard normally distributed (Drasgow et al., 1987).

Because l_z was believed to be standard normal, it was originally thought that it could be interpreted like a *z* score, with decisions regarding the relative aberrance of response patterns based on values from a *z* score table. However, studies have shown that l_z may not be normally distributed when theta hat is substituted for theta in computing the statistic (Nering, 1995) and its variance may be underestimated as well (Snijders, 2001). Moreover, the skewness and kurtosis of the statistic's sampling distribution were found to be generally problematic, as was the Type 1 error rate associated with cut-off values obtained from a *z* table (Nering, 1995). For these reasons, Nering recommends using empirically-derived cut-off values when assessing person-fit using l_z, rather than uniformly applying a *z* table cut in all circumstances.

Assuming that the vast majority of response data conform to the fitted IRT model, the observed distribution of the l_z statistic in the population can be used to approximate the null hypothesis distribution of the statistic. Thus, the z table 95% cut-off value was empirically set by identifying the 5% of the students having the largest negative l_z statistics. Using this cut-off value for the l_z statistic, the percentage of students who were flagged was calculated at the district and school levels and was compared to 5%, the percentage we would expect to see under the null hypothesis (assuming there is no significant aberrance). A school or district was flagged if the percentage of students flagged was significantly greater than 5% as determined by the Binomial probability distribution.

Since it is possible to flag a large number of students just based on Type 1 error alone (i.e., due to normal random variation), the results should be interpreted cautiously and only be used as a preliminary indicator that there may have been some odd response patterns in the school or district of interest. Additionally, the percentages of districts and schools flagged were also compared to 5% to see if the number of districts and schools flagged were significantly greater than would be expected by chance.

To help guard against Type 1 error inflation due to non-normality, any district or school which had less than 20 students was excluded in the flagging.

Person-Fit Analyses Results Description

The results are provided in tabulated form in an accompanying Excel file, whose filename is “OCCT 1516 Spring EOI Person-Fit Analyses Results including Summary Tables.xlsx.” The results in this file are organized into four tabs: District Summary, District Details, School Summary, and School Details. Descriptions of the information provided on each tab are given next.

District Summary Tab:

The first table shows summary results for each district. The table lists the districts in order according to their code number ("DisCode"). Next to the code number, the district name ("DisName") is given, followed by:

- the number of grade levels and content areas that were tested ("N_Tests"),
- the number of grade levels and content areas for which the percentage of flagged students was significantly greater than 5% ("Frequency"), and
- the percent of grade levels and content areas for which the percentage of flagged students was significantly greater than 5% ("Percent"). If the Percent value has an asterisk next to it, then the district has significantly more than 5% of its grade levels and content areas flagged.

The second table summarizes the results according to grade level ("Grade") and content area ("Subject"). For each combination of grade level and content area, the tables list the following:

- the number of districts having that grade level and content area ("N_Districts"),
- the number of these districts for which the percentage of flagged students was significantly greater than 5% ("Frequency"),
- the percent of these districts for which the percentage of flagged students was significantly greater than 5% ("Percent").

PersonFit_Dis Tab:

This tab has one table that shows more detailed results for each district. The table is organized by grade level and content area, showing the results for every district for one grade level and content area before moving on to the next grade level and content area. Within each grade level and content area, the table lists the districts in order according to their code number ("DisCode"). Next to the code number, the district name ("DisName") is given, followed by:

- the number of students tested at that grade level and content area in the district (“N_Students”),
- the number of students flagged by the person-fit statistic (“N_StudentsFlagLZ”),
- the percentage of students flagged (“P_StudentsFlagLZ”),
- the *p*-value of the Binomial test for whether the percentage is significantly greater than 5% (“BinomialTest”), and
- an indicator of whether *p*-value is less than 0.05 (“BinomialFlag”). If "True", then the percentage of students flagged is significantly greater than 5%, the rate that is expected under normal random variation.

School Summary Tab:

This tab is similar to the "District Summary" tab. It has two tables. The first table shows summary results for each school. The table is organized by districts, showing all the schools for one district before moving on to another district. Within each district, the table lists the schools in order according to their code number ("SchCode"). Next to the code number, the school name ("SchName") is given, followed by:

- the number of grade levels and content areas that were tested ("N_Tests"),
- the number of grade levels and content areas for which the percentage of flagged students was significantly greater than 5% ("Frequency"), and
- the percent of grade levels and content areas for which the percentage of flagged students was significantly greater than 5% ("Percent"). If the Percent value has an asterisk next to it, then the school has significantly more than 5% of its grade levels and content areas flagged.

The second table summarizes the results according to grade level ("Grade") and content area ("Subject"). For each combination of grade level and content area, the tables list the following:

- the number of schools having that grade level and content area ("N_Schools"),
- the number of these schools for which the percentage of flagged students was significantly greater than 5% ("Frequency"), and
- the percent of these districts for which the percentage of flagged students was significantly greater than 5% ("Percent").

PersonFit_Sch Tab:
This tab has one table that shows more detailed results for each school. The table is organized by grade level and content area, showing the results for every school for one grade level and content area before moving on to the next grade level and content area. Within each grade level and content area, the schools are organized by district, showing all the schools for one district before moving on to another district. Within a district, the table lists the schools in order according to their code number ("SchCode"). Next to the code number, the school name ("SchName") is given, followed by:

- the number of students tested at that grade level and content area in this school ("N_Students"),
- the number of students flagged by the person-fit statistic ("N_StudentsFlagLZ"),
- the percentage of students flagged ("P_StudentsFlagLZ"),
- the *p*-value of the Binomial test for whether the percentage is significantly greater than 5% ("BinomialTest"), and
- an indicator of whether the *p*-value is less than 0.05 ("BinomialFlag"). If "True", then the percentage of students flagged is significantly greater than 5%, the rate that is expected under normal random variation.

References

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