

# The Oklahoma Academic Standards for Science Writing Committee's Response to Public Comments

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The Oklahoma State Department of Education provided a public comment period for the Oklahoma Academic Standards for Science revised in 2013-2014. The public comment period began on December 13<sup>th</sup> 2013 and concluded on January 17<sup>th</sup>, 2014. The public comments that were received were then provided to the Oklahoma Academic Standards for Science Writing Committee for consideration. The comments and the committee's responses can be found below:

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## I. K-5 Public Comments:

The following concerns with the K-5 standards that were submitted through public comment were addressed as follows by the Oklahoma Academic Standards for Science Writing Committee.

### **Concerns from Public Comments:**

1. The Oklahoma Academic Standard for Science 1-LS1-1, use of the term *design* may imply that plants and animals have been purposively designed some sections on adaptation incorrectly imply that organisms will reach perfection through the process of natural selection.

#### **Committee Response:**

*In looking at this public comment, the committee believes the reviewer may have been confused about the intent of the standard. The standard asks students to design a solution to a human problem and look at characteristics of animals that might provide a solution for a human problem. There is no intent in the standard for students to examine how animals gained those characteristics, just that they have them. The goal is simply to examine the characteristics to see if they provide a solution to a human problem if mimicked.*

#### **Performance Expectation:**

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

2. The Oklahoma Academic Standard for Science 1-LS1-2 seems overly abstract. First graders are just beginning to understand the idea of cause and effect but the standard requires students to draw conclusions about cause and effect relationships which is an extra layer of complexity that the students

may not be developmentally ready for.

**Committee Response:**

*In this standard students are asked to look at patterns of behavior. They will see patterns that are cause and effect but they are not asked to go beyond that. They are not asked to analyze the cause and effect relationship, simply recognize that there is one (e.g. The bird peeps and the mom feeds them. Babies cry and we check to see if they need to be changed, are hurt, or need to be fed).*

**Performance Expectation:**

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

3. In the Oklahoma Academic Standard, 1-ESS1-2, students are required to record and analyze temperature and time (amount of daylight). Students are just being taught how to read thermometers and have rudimentary sense of time. It seems developmentally inappropriate to analyze such data and make meaningful conclusions

**Committee Response:**

*The standard does not mention thermometers. Students are comparing relative values of temperature, not specific ones. The committee feels this standard fits well with what many teachers in first grade do with 'what clothes to wear' today or tomorrow.*

**Performance Expectation**

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.

4. The Oklahoma Academic Standards for Science provide connections to math standards at elementary that ask students to reason abstractly. It is developmentally inappropriate to ask younger students to reason abstractly.

**Committee Response:**

*Younger students are not asked to reason abstractly without concrete experiences. This is one of the reasons why the new standards integrate science and engineering practices with each content standard. Some concepts in science are abstract, but if students are given opportunities to have first-hand experiences with objects that assist them in learning abstract concepts, the learning is developmentally appropriate. Below is an example for reasoning abstractly in math for younger students.*

**Example:**  $3+4 = 7$  This is actually an abstract concept, but if we give students manipulatives, like checkers, they can layout three checkers and four checkers and put

*them together to make seven total checkers.*

5. The Oklahoma Academic Standards for science have no or limited focus on physiological systems in early grade levels.

**Committee Response:**

*The current PASS standards for science have limited or no focus on physiological systems in early grade levels. Body systems are quite complex and to be honest, very specific (with naming organs, etc). Additionally, kids can't really do much direct observation with the internal organs/systems unless they dissect (which is not recommended by most experts until middle school anyway).*

6. Two of the four K-level standards in ESS are not really earth science (life science maybe).

**Committee Response:**

The committee determined that the standards at the Kindergarten level do constitute their placement under the domain of Earth Science as they encompass topics such as weather and how animals (including humans) can change the environment to meet their needs.

7. The Oklahoma Academic Standard for Science 2-ESS-2 is about plate tectonics, but the narrative has nothing to do with plate tectonics, and is vague.

**Committee Response:**

*The committee believes maps can be used to show patterns of plate tectonic features. Therefore the categorical placement is appropriate at this grade level because identifying shapes and kind of land and bodies of water in an area will assist students later in understanding plate tectonics.*

**Performance Expectation:**

Develop a model to represent the shapes and kind of land and bodies of water in an area.

**Clarification Statement:**

Maps show where things are located. One can map the shapes and kinds of land and water in any area.

**Assessment Boundary:** Assessment does not include quantitative scaling in models.

8. The Disciplinary Core Idea that corresponds to 4-ESS2-2, states that major mountain chains form inside continents or near their edges. Public Comment: Mountain ranges normally DON'T form inside continents, but rather near the edges, where plates interact.

**Committee Response:**

*It is true mountains don't normally form inside continents--but they do on occasion—so the Disciplinary Core Idea statement as true --an example would be the Rocky Mountains (or better the Ancestral Rocky Mountains).*

9. For the Oklahoma Academic Standards for Science 4-ESS3-1, why not also mention nuclear waste problems?

**Committee Response:**

*The committee believes that nuclear waste could be too advanced for fourth grade. However, the standard doesn't limit a teacher from introducing it in connection with the standard.*

**Performance Expectation:**

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:**  
N/A

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## II. Middle School Public Comments:

The following concerns with the Middle School standards that were submitted through public comment were addressed as follows by the Oklahoma Academic Standards for Science Writing Committee.

### **Concerns from Public Comments:**

1. It seems to me that the standards should be grouped better (life science together in one year, etc.). I understand your desire to touch on each main subject each academic year, but the way the standards are split do not really lend themselves to a full unit of topic. It would make much more sense to put all life science together in one year, all the physical science together in one year, etc.

#### **Committee Response:**

*The committee agreed with the approach that previous committees had taken in the revision process of science standards in Oklahoma, and maintained the integration of physical science, life science, and earth and space science at each grade level in middle school. The committee saw the distribution of standards in each of the three domains as an opportunity to expose the students to integrated science. Teachers have opportunities to bundle standards and concepts across domains for units of study, to show students that science is not comprised of individual topics separated into individual domains, but that concepts in science are connected. The committee also believes the integrated approach better supports students that take biology in 10th grade. The integrated approach at middle school limits the gap students would have otherwise if all of the life science standards were placed in 7th grade. Another reason the committee stayed with the integrated approach was to support strong progressions of learning. The concepts build through the middle school standards, and the committee feels this leads to more coherence in students' understanding of the science concepts at the end of middle school. The content does progress but it is not repetitive. The committee's goal was to spread out the standards as equally as possible throughout 6th, 7th, and 8th grade.*

2. I am confused as to why the middle level (6 - 8) standards are split the way they are. In 6th grade they have just a few standards on energy, for example. Those few standards do not really go with the other standards that are taught that year, they do not really lend themselves to being taught in a complete unit, plus they go more with what is taught in 7th and 8th grade.

#### **Committee Response:**

*The committee consulted the PASS 2011 standards for science when considering the distribution of concepts throughout the middle school standards. While, some concepts have been moved to better support progressional learning in middle school, the committee felt "Energy" should stay in 6<sup>th</sup> grade, where it currently is in PASS (2011). The committee did elect to place "Forces and Motion" in 6<sup>th</sup> grade because they felt exploring "Forces and Motion" and "Energy" would allow for a stronger conceptual understanding of both. "Forces and Motion" was not in 6<sup>th</sup> grade in PASS (2011).*

3. My biggest concern is the addition of new content information. It is already a struggle to properly cover

all the content that is currently in the standards. Adding the "Waves and their Applications" content to the content that was already included is going to be a huge burden on my teaching load. I do not think there are enough days in the school year to properly teach all of this information and expect my students to be able to pass their OCCT test.

**Committee Response:**

*When covering the concepts opportunities arise to cover more than one standard at a time. For instance, when teaching about earthquakes and plate movements, waves are also covered(both MS-PS4-1 and MS-PS4-2), as well as how waves move through different material (e.g. crust, mantle, core). This is how scientists can get a picture of what the internal structure of the Earth is like. Also when comparing each middle school grade, each has approximately 9 standards (6th - 18; 7th - 19; 8th - 19) whereas PASS had 32 standards and sub-standards per grade. When teaching science as an integrated subject versus compartmentalized, the committee feels the standards can be covered very easily.*

4. In the Oklahoma Academic Standard for Science MS-ESS1-1, it should state that annular eclipses are caused **mostly** by the moon's eccentricity around earth.

**Committee Response:**

The committee agreed with this comment and made the change seen below:

**Performance Expectation:**

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

5. For Oklahoma Academic Standard for Science MS-ESS1-4, why exclude absolute dating, which also comes from analysis of rock strata?

**Committee Response:**

*The committee determined that absolute dating is generally used for igneous and metamorphic and not sedimentary strata. Including absolute dating would change the core idea outlined in the standard.*

**Performance Expectation:**

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.

6. The Clarification Statement for the Oklahoma Academic Standard MS-ESS2-2 should be modified because examples of gradual processes are actually catastrophic processes.

**Committee Response:**

*The committee determined that there was an error with parenthetical placement in this clarification statement. See changes below:*

**Performance Expectation:**

**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.

7. From the Oklahoma Academic Standard for Science MS-ESS2-3, why ignore the best evidence for plate movements, and among the easiest to demonstrate and understand, paleomagnetic data?

**Committee Response:**

The committee determined that this comment is more related to how the standard should be taught. Instruction is not outlined in the standards. This is at the local control of the teacher and/or district.

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### III. High School Biology Public Comments

The following concerns with the High School Biology standards that were submitted through public comment were addressed as follows by the Oklahoma Academic Standards for Science Writing Committee.

**Concerns from Public Comments:**

1. The Oklahoma Academic Standards for Science state that "Species are said to become extinct because they can no longer survive and reproduce (p.203)". This implies that species respond as a collective unit rather than all of the individuals classified as a species independently fail to survive and reproduce.

**Committee Response:**

*A species is an entity made up of individuals and species are said to become extinct because individuals of that species can no longer survive and reproduce. This would be delineated during classroom instruction. Delineation is not necessary at the standard level.*

2. The Oklahoma Academic Standard HS-LS1-6 is above what a Biology or Pre-AP Biology student should be expected to understand. The AP Bio curriculum discusses the Calvin cycle with the formation of G3P and then infers that this molecule can be used to provide the carbon backbone for all the other organic compounds. But in AP Bio we do not spend a lot of time discussing how and where the amino and carboxyl groups are added to the carbon skeleton to make the amino acid.

**Committee Response:**

*The intent of the performance expectation is that students are able to explain how sugar molecules and the elements that make up sugar molecules can recombine with other elements to form amino acids and other carbon-based elements. For the purpose of classroom instruction, the life processes mentioned can be utilized as well as details related to the chemical processes. However, the intent is not for students to be required to memorize each step or chemical process, but rather to understand the big idea underlined above.*

3. Is the Oklahoma Academic Standards for Science, HS-LS2-2 referring to exponential versus logistic growth rates, or what they are wanting the students to average? They need to be more specific.

**Committee Response:**

*The clarification statement allows the teacher to decide. However, there will be “Test Item Specification Documents” produced for 5th grade, 8th grade, and Biology 1 that will include further details about how students will be assessed at a state level on this performance expectation.*

**Performance Expectation: HS-LS2-2**

*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.

4. Comments related to the absence of evolution in the Biology standards:

- Students need to learn that evolution is the central organizing concept in biology and unless this is explicitly made clear, many are not likely to make the connection.
- I have also not observed much in the new objectives dealing with the fact that many issues in biology such as evolution, global warming, ozone depletion, acid rain, etc. are quite controversial. If we are to present open mindedness to our next generation we need to be looking at all sides of these issues and not just presenting what an educational elitist group consider to be the facts.
- I teach college-level biology courses in which I regularly encounter students who received zero or very little high school education about biological evolution. This subject is fundamental in order to understand earth history, medicine, human health, ecology, etc. Any well-educated citizen of the world will be familiar with this foundational area of biology. I care enough about public education to write this email, because I don't want Oklahomans penalized by an insufficient science education. Please consider making these changes.

**Committee Response:**

*The committee followed precedent set by past standards revision committees in Oklahoma and included “Natural Selection and Adaptation” in the Oklahoma Academic Standards for Science. As a reminder, districts can choose to go beyond the standards outlined. Determination to cover scientific concepts beyond the standards is determined at the local level by districts and teachers.*

5. We have basically quit teaching about the human body in biology. Years ago about 1/4 of the class was about the human body and today it is just about absent. My suggestion is this that we put back in

objectives dealing with the human body and make this a priority.

Committee Response:

*The committee focus followed the precedent set by past standards revision committees in Oklahoma and included the underlying principles that lead students to better understand the function of the human body (e.g. DNA, cellular division, cell differentiation, tissues, and organs, cellular respiration). As a reminder, districts can choose to go beyond the standards outlined. Determination to cover scientific concepts beyond the standards is determined at the local level by districts and teachers. The committee also determined that additional concepts related to the human body are often taught in Human Anatomy, Physiology, and Biology 2 courses in high schools.*

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## IV. High School Chemistry Public Comments

The following concerns with the High School Chemistry standards that were submitted through public comment were addressed as follows by the Oklahoma Academic Standards for Science Writing Committee.

### Concerns from Public Comments:

1. The Oklahoma Academic Standards for Science do not address stoichiometry.

Committee Response:

*The committee added stoichiometry as an example of a mathematical idea that can be utilized to communicate the proportional relationships between masses of atoms in the reactants and the products.*

#### **Performance Expectation: HS-PS1-7 Matter and Its Interactions**

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 **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.

2. The Oklahoma Academic Standards for Science do not cover compounds.

**Committee Response:**

*The committee added compounds into one of the existing performance expectations.*

#### **Performance Expectation: HS-PS1-2 Matter and Its Interactions**

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, and **(remove and)** 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, combustion, oxidation/reduction, acid/base).

**Assessment Boundary:**

Assessment is limited to chemical reactions involving main group elements and combustion reactions.

3. The Oklahoma Academic Standards do not cover “Types of Reactions”.

**Committee Response:**

*The committee added “Types of Reactions” into one of the clarification statements for an existing performance expectation.*

**Performance Expectation: HS-PS1-2 Matter and Its Interactions**

[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, and 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, combustion, oxidation/reduction, acid/base).**

**Assessment Boundary:**

Assessment is limited to chemical reactions involving main group elements and combustion reactions.

4. The Oklahoma Academic Standards for Science do not cover “Phases of Energy(e.g.Endothermic and Exothermic)”.

**Committee Response:**

*The committee determined that “Phases of Energy” can be found in the HS-PS1-4 whereby the performance expectation states:*

[Develop a model to illustrate](#) the that release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.

*Released energy comes from an exothermic reaction and absorbed energy comes from an endothermic reaction. This is what students would cover as they are learning about the concepts that help them understand and demonstrate the performance expectation (HS-PS1-4).*

5. The Oklahoma Academic Standards for Science do not cover “Heat of Enthalpy”. We have deleted organic chemistry.

**Committee Response:**

*The committee determined that while “Heat of Enthalpy” is not explicit in the Oklahoma Academic Standards for Science, there are standards that allow teachers to investigate “Heat of Enthalpy” HS-PS1-4 and HS-PS3-4. They also referred to the PASS 2011 standards and determined that “Heat of Enthalpy” was not explicitly stated.*

6. The Oklahoma Academic Standards for Science do not cover “Solutions/Solution Chemistry.”

**Committee Response:**

*The committee recognizes that “Solutions/Solution Chemistry” is not one of the Disciplinary Core Ideas in the New Oklahoma Academic Standards for Science. In researching when this concept appeared in previous PASS standards, it was determined that “Solutions/Solution Chemistry” was added in PASS 2011, and it only appears in the progression of learning in one objective in 3rd grade, one in 7th grade, and two in Chemistry. The committee’s focus in developing the Oklahoma Academic Standards was to showcase standards that reflect “big ideas” in science and a progression of learning with those “big ideas”, from Kindergarten through 12th grade. With this focus some concepts may not appear that appeared in previous standards, and some concepts that didn’t appear in previous standards, now do appear. As a reminder, the standards represent a set of expectations for what students should be able to demonstrate and understand in science. **Districts can choose to go beyond the standards.** With this in mind, districts can choose to cover “Solution/Solution Chemistry”.*

7. The Oklahoma Academic Standards for Science do not cover “Organic Chemistry”.

**Committee Response:**

*The committee determined that “Organic Chemistry” is not currently covered in the PASS 2011 standard and that while principals of Organic Chemistry can be taught in some high school chemistry classes, many schools chose to focus on it in advanced chemistry courses. As a reminder, the standards represent a set of expectations for what students should be able to demonstrate and understand in science. **Districts can choose to go beyond the standards.** With this in mind, districts can choose to cover “Organic Chemistry” in their high school chemistry courses.*

8. The Oklahoma Academic Standards for Science sometimes mention ideas that are not mentioned at all in the Disciplinary Core Idea section. For example, on HS-PS1-7 it expects students to understand the mole, a very difficult and crucial part of chemistry, but yet it is not introduced as a big idea anywhere.

**Committee Response:**

*The committee determined that Mole is not necessarily a Disciplinary Core Idea in science; it is a new unit of measurement being introduced in chemistry. Therefore it is appropriately placed in the clarification statement and not the Disciplinary Core Ideas column.*

9. The Oklahoma Academic Standards for Science include an error in the science of HS-PS1-8. Where it says, “The total number of neutrons and protons does not change in a nuclear process” under the Disciplinary Core Idea column. Einstein proved, some of the mass in a nuclear reaction becomes energy. So although the sum of the mass and energy is conserved, the individual masses of the particles may not necessarily be.

**Committee Response:**

*The committee determined the last sentence under the Disciplinary Core Idea column for HS-PS1-8 is misleading as it only represents a partial statement for the description mentioned in the Frameworks for K-12 Science Education. The committee decided to remove it.*

10. The Oklahoma Academic Standards for Science do not mention “pH”.

**Committee Response:**

*The committee determined that adding the example of acid/bases as a way to classify reactions in HS-PS1-2 allows educators an opportunity to focus on “pH” and that it can be introduced in other standards as well.*

**Performance Expectation: HS-PS1-2 Matter and Its Interactions**

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, and 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, combustion, oxidation/reduction, acid/base).

**Assessment Boundary:**

Assessment is limited to chemical reactions involving main group elements and combustion reactions.

11. The Oklahoma Academic Standards for Science focuses on chemical reactions and energy flow, whereas equilibrium plays an important role in defining the behavior of materials and is given limited treatment.

**Committee Response:**

*The committee determined that with the scope of the chemistry standards a whole, the amount of time devoted to equilibrium in the standards is appropriate in HS-PS1-6.*

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## V. High School Earth and Space Science Comments:

The following concerns with the High School Earth and Space Science standards that were submitted through public comment were addressed as follows by the Oklahoma Academic Standards for Science Writing Committee.

1. For the Oklahoma Academic Standard, HS-ESS-1-5, the clarification statement on line 8, “increasing” should be replaced with “decreasing” and the text implies that plate tectonics affects only surface geology. Plates remain intact during deep subduction into the mantle (~800 km).

**Committee Response:**

*The committee agreed and made the changed the word increasing to decreasing. However the committee determined that including deep subduction would go beyond the scope of the intended core idea and may be less relevant at a high school level.*

2. For the Oklahoma Academic Standards HS-ESS1-6, some of the oldest dated rocks actually come from earth (e.g., Jack Hills granite (Australia)).

**Committee Response:**

*The committee determined that the standard fits the intent of the core idea and should not be changed.*

3. For the Oklahoma Academic Standard HS-ESS2-2, the text states that loss of wetlands causes drop in humidity, which leads to more wetland loss. This idea is speculative and as far as we know, it’s just a hypothesis.

**Committee Response:**

*The committee determine that the example given in the clarification of wetlands, is simply and example. Students are asked through the standard to analyze geoscience data, which means that if a teacher utilizes this example students would examine the data and support or refute claims*

*about it. Because of the intent of the standard, the committee decided not to change the clarification statement.*

4. In the Oklahoma Academic Standard for Science HS-ESS2-3, “one-dimensional” should be changed to “two-dimensional and the statement that changes in earth magnetic field affect mantle convection should be removed. This idea is not proven. “Identification” should be replaced with “prediction”.

**Committee Response:**

*The committee determined that the reviewer may have misinterpreted the clarification statement. The intent is to look at changes in one dimension (depth) whereas a second dimension would be lateral changes, changes along the same depth. The committee did determine to modify the clarification to say prediction instead of identification.*

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## VI. General Comments:

The following general concerns with the K-12 science standards received through public comment were addressed as follows by the Oklahoma Academic Standards for Science Writing Committee.

### **Concerns from Public Comments:**

1. While, I understand and somewhat agree with the push toward engineering practices, I feel that implementing these practices may not be practical for all schools. I teach at a small rural school with limited time and resources. Successfully implementing these practices may not always be a realistic expectation. In addition, most of my students are not college bound but will go right into the workforce after high school, and while exposing them to the engineering concepts is always beneficial, it should not be required.

**Committee Response:**

The committee determined that the inclusion of engineering practices at each grade level in the Oklahoma Academic Standards for Science is essential to the future of our state. The 2011 PASS standards for science limited inclusion of engineering design process standards to high school physical science, chemistry, and physics standards. The committee believes adding a focus on engineering at each grade level will provide students with early exposure to the engineering design process and its application to science concepts. In adding engineering practices to each grade level the committee ensured that the practices were grade level appropriate and that they built in complexity from grade to grade. The committee recognizes that this will be a new addition for many teachers and districts and recommends that the state work to ensure that teachers and districts feel supported with this transition through professional development.

2. Were the Next Generation Science Standards (NGSS) consulted during the revision of the Oklahoma Science Standards as they (NGSS) are the latest national science standards released?

**Committee Response:**

*In looking at the history of science standards development in Oklahoma, the Oklahoma Academic Standards for Science Writing Team, followed the precedent set by previous Oklahoma standards revision committees have done consulted the latest publications on K-12 science education from organizations like the National Research Council (NRC), American Association for the Advancement of Science (AAAS), and the National Association on Educational Progress (NAEP). The committee requested to utilize both A Framework for K-12 Science Education and the Next Generation Science Standards, along with other resources including the Priority Academic*

*Student Skills (PASS 2011) for Science. In doing so, the committee members reviewed every aspect of the Next Generation Science Standards and determined what should and should not be included in the Oklahoma Academic Standards for Science. The committee did not elect to adopt the Next Generation Science Standards in their entirety. As a result of the review, the committee determined that many aspects of the Next Generation Science Standards should be incorporated into the science standards; they also modified, added, and deleted aspects.*

3. It would be good to see even stronger core standards on well-established concepts such as climate change, and forcing of the climate system (both natural and anthropogenic).

**Committee Response:**

*The committee felt the focus on climate was appropriate in the scope and sequence of the K-12 standards, considering there are many “big ideas” in science for students to explore. As a reminder, districts can choose to go beyond the standards outlined. Determination to cover scientific concepts beyond the standards determined at the local level by districts and teachers.*

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## VII. General Comments: No Response Required

1. First of all, I appreciate the new format. I find that the Disciplinary Core Ideas and the Performance Expectations are much more specific (which is helpful and appreciated). I like that there is now a Clarification Statement as well. It makes planning for lessons and evaluations much easier when I know exactly what my students are going to be required to know.

2. I've been reviewing the first draft for the past couple of weeks. I like the change to "science and engineering practices" and the presence of "crosscutting concepts". There are great collaborative opportunities for teachers provided such as the connections to ELA/Literacy and Mathematics. And, for the high school standards, some of the same ones appear in multiple subject areas. The explanations of how standards are arranged in middle school and high school is also useful. I think the progression of standards through the grades for each domain is well done.

3. Overall, I appreciate the new format of the science standards released. I particularly like the performance expectations column and the information it provides to help direct teachers in their presentation of concepts that will be tested.

4. I have looked over the draft version of the Oklahoma new science standards, and wished to comment that I am glad to see some inclusion of Earth Science concepts at the High School level. Earth is our home; it is critical that students learn basic science about our planet. I teach Earth Science at OU, and have had many, many students in introductory geology classes who have never learned basic concepts, which contributes to general public misunderstanding about issues critical to our survival on the planet.