Return to Learn: Launching Instruction for Secondary Science

A digital version of this document can be found at https://sde.ok.gov/covid19-instruction-support.

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Introduction

This guidance is designed to support educators and school administrators as they plan for various instructional delivery models for the 2020-21 school year. It has never been so important to take time and plan to attend to the goals of supporting students' academic growth, supporting students' and educators' social-emotional well-being, and creating a safe environment for all students and educators.

Teachers and schools should be responsive to their local context and student needs as they develop plans for the 2020-21 school year. Therefore, **please note that the guidance and resources provided in this document are not meant to be a directive or limitation**, but rather a tool. Additional guidance about the planning educators may undertake in preparation for this school year can be found beginning on page 29 of the Return to Learn Oklahoma: A Framework for Reopening Schools.

To provide feedback or make suggestions or requests for future guidance, please consider [completing this survey].

Questions to Consider While Planning for Instruction

Educators face unique circumstances as they plan for the 2020-21 school year. In science, teachers should ensure previous grade-level work is connected to on-grade-level work throughout the school year, using a high-quality, standards-based curriculum.

This section aims to provide general guidelines while also recognizing that local schools and districts have unique needs. This document focuses on the **opportunities for learning,** rather than focusing on learning gaps, and asks educators and administrators to consider what mathematical content students know and what mathematical dispositions they currently have.

Standards and Pacing

What content and disciplinary skills should instruction focus on this year?

A central goal of instruction—even in this time of disruption—is to ensure each student learns grade-level content and is ready to progress to the next grade. Given that some students may start the school year further behind than typical and that disruptions are likely, focusing students on the most important content will be essential. Achieving this goal requires each teacher to understand the essential knowledge and skills from the current and prior grades to ensure curriculum and instruction are focused and coherent.

- Use the resources provided in the Oklahoma Curriculum Frameworks for Science to fully understand the intent of grade-level standards and how disciplinary core ideas, crosscutting concepts, and science and engineering practices connect and progress across grade levels. Keep in mind, **all Oklahoma Academic Standards for Science (OAS-S) are deemed "essential standards."**
- Identify the content knowledge and disciplinary skills from previous grade levels that serve as prerequisite skills and knowledge for on-grade-level learning, and identify what students might struggle within their current grade that may have been abbreviated or unaddressed in the 2019-20 school year. *Embed these ideas* where they best support on-level content. In particular, focus on serving English learners, students with disabilities and other special populations.
    - **Resources:**
        - Look at the Oklahoma Academic Standards for Science (OAS-S) vertical learning

progressions documents for the disciplinary core idea, crosscutting concepts, and science and engineering practices.

    - Identify the prerequisite skills that are needed for current grade-level performance expectations.
    - Use the bundled units in the Oklahoma Curriculum Frameworks for Science or your school's curriculum map to match these prior skills to on-grade-level units/big ideas for embedded remediation efforts.
- Eliminate extraneous aspects of curriculum and instruction that are not closely aligned to the learning goals of the standards at grade level *without eliminating grade-level standards*.
    - **Example:** Incorporate science and engineering practices into investigations throughout the year rather than spending time teaching about the scientific method or the metric system and conversions or any lesson aligned to standards outside of grade-level.
- Bundle standards or learning objectives to provide students with deeper connections across standards and reinforcement of learning of standards throughout the year.
    - Use the following resource, Developing a Year-Long Storyboard for Instruction to bundle standards and create a scope and sequence for the year.
    - Review the bundles for each grade level provided in the Oklahoma Curriculum Frameworks by selecting the "grade level" then "Instructional Bundles."

Effective Instructional Routines

How might students learn the content and disciplinary skills associated with this discipline, whether in-person or distance learning?

In science, evidence-based effective instruction focuses on students engaging in science investigations and design to explain phenomena or develop solutions. A description of a cycle of learning, or routine for effective instruction, that supports this goal is provided below.

Cycle of Learning Example for Science (Full example found here)	**Cycle of Learning Example for Engineering** (Full example found here)
Introduce a phenomenon and ask students to **share their initial ideas/questions** for explaining the phenomenon.	**Introduce** a design challenge and associated constraints (time, money, resources or other societal influences/limitations), then ask students to **share their initial ideas/questions** for solving the design challenge.
Provide students opportunities to **gather**	Provide students opportunities to **research the**

observational data or information that will allow them to begin answering their questions and explain causes for the phenomenon.	**problem and draft solutions/prototypes** for the design challenge.
Provide students opportunities to **share their thinking with others** to **gain additional ideas** and evidence that support an explanation for the phenomenon.	Provide students opportunities to **share their thinking with others through sketches and/or models** to gain additional ideas for solving the design challenge.
Provide students with **accurate explanation(s) of science ideas** to further **refine an explanation** for the phenomenon.	Provide students with opportunities to **test and evaluate multiple versions** of their chosen prototype/solution to the design challenge, ensuring it meets the associated criteria and constraints.
Provide students with an analogous phenomenon to explain. One that can be explained using the same science ideas gained earlier in the cycle of learning.	Provide students with opportunities to i**mprove and redesign their solutions**.

NOTE: For specific guidance related to Special Education and English Learner instruction, visit the OSDE Office of Special Education and Office of English Language Learner websites.

Blended or Distance Learning

How can I adapt my instruction for blended or distance learning approaches?

Some schools are already planning to offer students opportunities to engage in blended or distance learning for a semester or the full school year. When planning for long-term blended or distance learning models, instructional planning considerations above should be leveraged. For districts using the in-person model, schools and teachers should consider developing week-long distance learning units that can be easily deployed if the need arises.

Effective instructional routines can be used in school-based and distance learning environments. Think about these key shifts in school-based and distance learning as you plan:

Key Shifts from In-Person to Distance Learning	
In-Person Learning	**Distance Learning**
Learning happens in school with consistent access to resources and materials	Learning happens in a variety of physical environments with varied access to resources and materials
Explicit instruction, independent and/or group work, and one-on-one support during daily class periods	Explicit instruction, independent and/or group work, and one-on-one support through flexible scheduling of asynchronous and synchronous learning Synchronous learning sessions may occur with full groups 2-3 times a week for 20-30 minutes, rather than daily, or through some other version of flexible scheduling.
Evidence of ongoing student learning is readily visible or understood through discussions, student work, and other representations	Evidence of ongoing student learning is collected in intentional ways through digital tools such as email, Learning Management Systems, video recordings, etc.
Teacher and peer feedback through written feedback on student work, classroom discussions, and conferring	Teacher and peer feedback through comments in collaborative platforms, audio- or video-recorded feedback, using synchronous meeting opportunities to provide complex feedback in real-time
Daily interactions with students to understand student progress, struggles, and well-being	Intentionally designed check-ins to understand student progress, struggles and well-being

For general guidance on distance learning, reference the OSDE document Science Distance Learning Grades 6-12. The table below, highlights modifications that can be made to engage students in the cycle of learning for Science. However the strategies and tools shared, can be used for Engineering as well.

<table>
<tr><th colspan="3">Modifications for Analog or Digital Learning Experiences</th></tr>
<tr><th>Science Cycle of Learning</th><th>Analog (No-Tech) Learning</th><th>Digital (Tech-Based) Learning</th></tr>
<tr><td rowspan="2">Introduce a phenomenon and ask students to share their initial ideas/questions for explaining the phenomenon.</td><td>Present students with a phenomenon using text, images, video and/or data and allow students to share questions they have about it on a Driving Question Board. Student questions can be used to drive further investigation(s).</td><td>Post picture(s) or video of a phenomenon on your class Learning Management System (LMS), email it to students, or put it on a frame in Google Jamboard. Ask students to submit what they notice and wonder using the post-it option in Google Jamboard.</td></tr>
<tr><td colspan="2">Example Phenomenon: Water droplets appear on the outside of a glass of ice water.
Possible Questions: Does this occur immediately? Does the amount of ice impact the number of water droplets?</td></tr>
<tr><td>Provide students opportunities to gather observational data or information that will allow them to begin answering their questions and explain causes for the phenomenon.</td><td>Allow students to collect data by planning and carrying out investigations that will help then explain the phenomenon and answer questions previously generated. Using Tasks for Science and Engineering Practices, ask students to analyze data and/or create sketch model drawings that serve as representations of what may cause the phenomena.</td><td>Record a video of an investigation to share with students or use a digital simulation (i.e., Phet simulations, Collisions Chemistry) that would provide opportunities for students to gather their own data. To share models, students can take a picture of their drawing then upload it to a Google document or Google Slide.</td></tr>
</table>

Provide students opportunities to **share their thinking with others** to gain additional ideas and evidence that support an explanation for the phenomenon.	Provide opportunities for small and whole group discussions, about data collected and analyzed as well as any explanations they may have for what they are noticing and wondering. To support deep, meaningful conversations, educators can utilize these Crosscutting Concepts Prompts, Talk Resource tools or Talk Activities Flow Chart.	Students can use digital collaborative tools (i.e. Google documents, Google sheets, etc.) to share and analyze data together. Students can use Flipgrid to record short videos and share ideas. Educators can host synchronous (whole class virtual) sessions on Zoom, Google Meet, or another appropriate platform, and utilize breakout rooms for small group discussion.
Provide students with **accurate explanation(s) of science ideas** to further **refine an explanation** for the phenomenon.	Students can be introduced to accurate science ideas that explain the phenomena through teachers facilitating whole-class discussions, lectures, videos and informational text. Students should use the information to refine or reinforce their developing explanations for the phenomenon. Teachers can use student talking prompts to facilitate discussions.	Students can share their initial explanations or models through Google Slide. They can then view other student ideas through a virtual "slide walk," where they look for similarities and differences between the slides. Whole class discussions can be facilitated through Zoom, Google Meet, or another appropriate platform. Breakout rooms can be used for small group discussions.
Provide students with an analogous phenomenon to explain.	Present students with a new phenomenon that can be explained using the same science ideas they learned to explain the phenomenon originally presented to them.	Post picture(s) or video of a phenomenon on your class Learning Management System (LMS), email it to students, or put it on a frame in Google Jamboard. Explanations for the phenomenon can be submitted via email, Google Forms or Google Classroom (or within your District's learning management system).

Additional Considerations:

- Reading this blog on how to adapt science investigations to distance learning.
- Consider designing science learning that leverages family members and other partners.
- Consider using digital science notebooking strategies like Google Jamboard, Seesaw or Flipgrid that allow students to create a digital record of their ideas and track how these ideas change over time

Additional Resources for Distance or Blended Learning:

- Guidance for engaging students in discourse in distance learning settings.
- Gather ideas for lessons through the Science Sample Learning Menu.
- Guidance for Investigating Phenomena at home.
- Phenomenal GRC Lessons provide lessons developed by teachers with suggestions for adapting for distance or blended here.
- OpenSciEd provides free and open middle school lessons and guidance for shifting to distance learning.
- inquiryHub Biology provides free and open high school lessons. Guidance for shifting to distance learning provided by OpenSciEd also supports shifts for these lessons.
- PhET Simulations can be used to replace in-person investigations.
- Teach Engineering: STEM Curriculum
- Review additional distance learning science tasks and databases.

Launching Instruction with Digital Tools

For more guidance for effectively implementing virtual instruction, blended learning, or creating digital variations of instruction to enact social distancing, visit Return to Learn: Launching Instruction with Digital Tools. The guidance is organized around the following principles to support all learners:

- select appropriate digital tools and implement with care,
- create clear and effective communication strategies,
- build and maintain community, and
- empower student choice.

Classroom Assessment

How will students be provided opportunities to showcase their learning and for teachers to provide feedback to students on their learning?

Science assessments can be incorporated throughout a cycle of learning for students. Providing students multiple opportunities to showcase their thinking throughout the cycle of learning will allow teachers to better understand what students are currently capable of and support equitable, on-grade level approaches to assessment.

Formative assessments are embedded throughout a cycle of learning (see pages -5-13) any time students share their thinking verbally, in writing, or through model drawings. The informal formative assessment cycle can be used as well as strategies for emerging bilinguals.

Interim and Summative Assessments can be used to determine learning that occurs during a unit or multiple units of grade-level instruction. Common interim or summative assessments may be provided by a district or school. Sample unit assessments are available through the Stanford Assessment Project and the Kentucky Department of Education.

Connections and Integration with Other Disciplines

How can instruction support integration and reinforcement of other content and disciplinary practices?

Effective science instruction provides numerous opportunities for the authentic development of literacy skills connected with the Oklahoma Academic Standards for English Language Arts.

- Students can leverage informational text (e.g. textbooks, online resources, journal articles, case studies) to support explanations for phenomena or design solutions.
- Students can evaluate evidence from informational text, discussions, videos of explanations or simulations to support an argument or explanation for phenomena or design solutions.
- Students can communicate their thinking or explanation for phenomena or design solutions through a variety of methods (e.g., recorded or written explanations, images of sketch model drawings).

Additional integration opportunities are available through collaboration with math, computer science, and technology courses. Use the STEM Framework Rubric to evaluate a lesson for potential opportunities to integrate additional content areas.

Intentional collaboration with other teachers to plan integrated lessons or units could **reduce the overall assignment load placed on students** in a given week or over the course of the year.

Student Social-Emotional Learning and Educator Well-Being

How can instruction in this discipline support social-emotional learning for students?

Students will return to school this fall amid two profound crises: an unprecedented global pandemic and social upheaval as the nation reckons with its legacy of systemic racial oppression. For this reason, as educators plan for a strong start to the 2020-21 school year, it will be critical to prioritize well-being and connection, which research shows are prerequisites to effective teaching and learning.

> **NOTE:** Consider incorporating sample teaching activities provided by the Collaborative for Academic, Social, and Emotional Learning (CASEL) to support core competencies of social-emotional learning for students this year.

Evidence-based approaches to science instruction and assessment also support social-emotional learning for students. Here are a few specific suggestions for supporting student well-being and social-emotional learning in science for both in-person and distance learning.

- Establish Collaborative Norms and a Supportive Learning Environment at the beginning of the year.
  Resources:
  - Classroom Norms
  - Classroom Culture that Supports Figuring Out
- Providing students opportunities to engage in phenomena investigations that connect to their interests and surroundings.
  Resources:
  - Science Instruction can Leverage and Develop Student Interests
  - Launching STEM Investigations that Build on Student and Community Interest
- Provide students with the opportunity to revise their thinking based on newly acquired information or evidence to help them gain confidence and feel a sense of autonomy in their learning.
- Structure opportunities for students to engage in discussions throughout investigations through in-person and remote learning experiences that encourage them to value the perspectives of others.
- Provide authentic feedback and ask open-ended questions that invite students to engage in

deeper reflection about their strengths and interests as it relates to science investigations and engineering design.
- Provide consistent check-in opportunities for students throughout the year.

> **NOTE:** Consider sharing these documents with families of students Self-Care for Parents and Caregivers | Guidance for Distance Learning Environment: Helpful Tips for Families | Family Guide to Positive Behavior in Distance Learning Environments.

What are ways to ensure regular self-care as an educator?

Before teachers can be expected to provide healthy and safe environments for students, it is important that they also take time to attend to their personal care and well-being. Doing a personal check-in using the questions below can be a good place to start.
- How am I taking care of my physical needs, including getting enough sleep, exercise, and nutrition?
- Do I have a routine? If so, which parts of the routine are working well, and which could be improved on? If not, how can I use a routine to reduce stress and encourage healthy behaviors?
- Do I have a sense of balance between work and other life demands? How can I take steps to “turn off” work and spend time doing other things that bring joy?
- Am I staying connected with friends and family? How do I need to make adjustments given current limitations?

Here are a few additional resources to support teacher well-being at this time:
- Self-Care for Teachers and Educational Professionals
- Free interactive sessions from Pure Edge, to support self-care.
- Social-Emotional Toolkit for Educators

How can students experiencing chronic stress be supported?

Students are going to have a variety of reactions to the realities of 2020. Here are a few examples of how to create a safe space for students who may be experiencing chronic stress due to past and recent events:
- Leverage the **SEL Hacks** and **read this blog** showing how to create a safe, nurturing, relationship-based environment for students both in-person or through distance learning.
- Provide age-appropriate and factual information to students about COVID-19, but try to focus on how adults are trying to keep them safe.

- Consider reactions students may have to the pandemic and ways to support them (English | Spanish).
- Consider the effect discussions about the pandemic may have on students who may have experienced the effects of COVID-19 and other diseases in family and acquaintances. Caution should be generously applied in any case where such context may create discomfort or harm for any students.
- Encourage students to verbalize their feelings. Helping them put their emotions into words can give them a sense of control in the situation.
- Help students build connections, with you and with each other. This may be more challenging given the need for social distancing or distance learning, but caring connections with others are more important than ever (see building classroom community resources above).
- Routine and predictability are important. If possible, try to communicate with students about any changes before they happen. Given potentially quick changes that may happen this year, explaining the changes as or after they happen can help students adjust as well.
- Explore The National Child Traumatic Stress Network Resource Guide for Trauma-Informed School Strategies During Covid-19. This document gives deeper insight into Covid-19 related chronic stress and tangible strategies for teachers and administrators.

Equity and Inclusion

What curriculum choices and instructional practices support equity and access to quality instruction?

While the guidance provided throughout this document promotes equitable teaching and learning practices through research-based effective mathematics, educators need to spend time reflecting on planning for and implementing strategies that support more equitable and inclusive learning environments for students in the 2020-21 school year. In addition to the equitable instructional practices referenced throughout the document, the chart below lists practices to keep in mind given the current realities of returning to school:

More Equitable Practices	Less Equitable Practices
Making sure that students and families have what they need to access instruction or communication, and shifting practices where necessary to ensure access for all.	Deciding on one form of instructional delivery or family communication and not adjusting to meet the needs of students and families.

Providing all students grade-level learning, regardless of their starting points. All students are capable of progressing to the next grade level this fall and mastering that content.	Never giving students access to on grade-level content because of the perceived deficits they entered this school year with or providing "over-remediation" instead of focusing on below-grade-level work only when it is necessary for a student to complete grade-level work.[1]
Noticing/paying attention to students' scientific thinking to see how students position and identify themselves and each other. Learn about the different worlds your students live in, and bring in science phenomena that come from those worlds.[3]	Using examples and other materials that are limited in their diversity and/or representation of cultures and experiences and not make connections between learning opportunities and student identities.
Purposeful selection of learning targets, extended time for learning and reflection, and including meaningful, manageable tasks and projects.	Packets of worksheets and busywork, assigning readings to stay "caught up," and assuming a strict "school day" schedule.
Asking students to identify relevant problems in their lives and engage in design cycles to address them. Allowing students to deeply explore phenomena or problems of interest through investigation to build understanding and practice over time.	Emphasizing memorizing science content or "checking off" tasks on lists; asking students to solve contrived or hypothetical problems, or complete design projects that value form over function; and covering content through a volume of activities or skipping from topic to topic
Offering multiple opportunities and methods for students to demonstrate their proficiencies.	Using only one form of assessment to measure student progress.
Providing opportunities for teacher self-reflection and student-reflection.	Continuing with a pacing guide or curriculum map without pausing for reflection or making adjustments based on student need and reflection.

What are productive structures to organize students for instruction?

Decisions about how students will be organized for instruction will vary within schools and across school districts. These decisions will reflect beliefs about how and which students can and should

[1] TNTP. (2020, April). *Learning Acceleration Guide.* TNTP. https://tntp.org/assets/covid-19-toolkit-resources/TNTP_Learning_Acceleration_Guide.pdf

learn science and engineering. To promote equitable access to high-quality science and engineering education, we must have productive structures for organizing students[2].

- Assign students to teachers using structures that ensure heterogeneous ability groups, being mindful of potential inequities, such as access to technology, as schools shift between in-school and out-of-school learning.
- Create strategically mixed groups of students with a variety of strengths within classes and have them collaborate to complete rich tasks in a variety of media, including digital and print.
- Ensure that highly qualified science teachers are in place for initial instruction and any intervention plans.
- Build equitable learning communities that foster trusting and caring relationships.

Teacher Self-Reflection

Equity-based teaching requires reflection, which involves not just reflecting on your pedagogy and your classroom norms, but also considering how you identify yourself and how others identify you. Before and during the school year, reflect on your own identity, positions, and beliefs in regards to biased and sorting-based routines.[3] Consider examining your science curriculum and instructional practices for inherent or implicit bias by exploring the following questions:

- Do I withhold certain instructional practices or content from certain groups of students based on assumptions or beliefs about their capacity, home-life, culture or some other factor assumed to make them less ready?
- Do my instructional practices invite in multiple voices and perspectives?
- Do I find time to provide individual attention to my students during instruction or during assessment feedback loops?
- Do my assignments and tasks limit the curiosity, creativity and potential of students?
- Am I providing my scientific knowledge rather than helping students develop their own?
- How might my curriculum and instruction perpetuate an education system that marginalizes certain students?

> **NOTE:** Test your own implicit bias and learn about strategies for overcoming these biases using information provided through Harvard University's Project Implicit.

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[2] NCTM/NCSM. (2020, June). *Moving Forward: Mathematics Learning in the Era of COVID-19*. NCSM. https://www.mathedleadership.org/docs/resources/NCTM_NCSM_Moving_Forward.pdf

[3] Chao, Gutierrez, Murray. *What Are Classroom Practices That Support Equity-Based Mathematics Teaching?* NCTM. https://www.nctm.org/Research-and-Advocacy/Research-Brief-and-Clips/Classroom-Practices-That-Support-Equity-Based-Mathematics-Teaching/

Creating an Anti-Bias Classroom

Current events addressing systemic racism in our nation remind us to examine our own biases as educators and any bias in our curriculum and instruction. When we focus on creating a classroom focused on anti-bias education, we provide opportunities for students to use their lived experiences and interests to deepen their understanding of science. Science education can be used to support more just, sustainable, and culturally thriving futures--especially for those who have historically been and continue to be disenfranchised from science.[4]

- Bringing equitable, culturally-responsive teaching practices and professional learning opportunities to your classroom, school, and district (Why it is crucial to make cultural diversity visible in STEM Education and Indigenous Education Tools: Culture and Learning).
- Focusing on the idea that all students can learn science and implement multiple types of assessments to measure students' science understandings.
- Allowing students choice in their science pathways and providing access to high-quality instruction and rich tasks for all students, regardless of their science course.
- Focusing on science strengths and areas of growth with targeted meaningful feedback that promotes learning, not labeling.
- Helping students develop and maintain positive science identities and encourage multiple perspectives and processes to be brought to the classroom.
- Understanding the history of science education and bringing diverse instructional voices, knowledge, and skills to science curriculum and instruction (Point of View Affects How Science is Done).
- Learn more about how to support equity and diversity in serving Oklahoma's students and educators with the OSDE's Counseling Equity Resources.

Recognizing that learners are diverse provides an opportunity to enrich the curriculum and make it relevant to students. Students bring their individual voices and experiences to the tasks as they approach the content from multiple entry points. Multiple means of assessment honor academic strengths and motivate students to apply critical thinking to problems.
Culturally responsive teaching[5] holds culture as central to learning, framing all aspects of their learning. Culturally responsive pedagogy addresses instruction, classroom culture, family and community engagement and teacher leadership that facilitate critical practices for anti-bias education. This is also a time to examine the history and nature of science and engineering.

[4] Bang, M., B. Brown, A. Calabrese Barton, A. Rosebery, and B. Warren. 2017. Toward more equitable learning in science. In Helping students make sense of the world using next generation science and engineering practices, eds. C. V. Schwarz, C. Passmore, and B.J. Reiser, 33-58. Arlington VA: NSTA Press.
[5] The Education Alliance at Brown University, Teaching Diverse Learners.

- What voices and contributions are valued and promoted?
- What biases are reflected?
- What are multiple ways of knowing about the world?
- What career barriers and opportunities are available for all professionals?

Often, the answers to these questions are tinged by inherent or implicit bias. Therefore, educators should consider examining their curriculum and instructional practices for inherent or implicit bias. This brief provides insights for avoiding possible pitfalls of culturally responsive teaching and the National Association for Multicultural Association provides additional resources for teachers here.

Safety Considerations: Physical Environment and Supplies

Educators planning for in-person, blended and distance learning instructional delivery models should always defer to the safety guidelines provided by your school or district. As the Covid-19 situation continuously develops, also consult the current Oklahoma Department of Health (OSDH) and Center for Disease Control (CDC) health and safety guidelines.

Science investigations and student interactions to make sense of observations from investigations are key components of science learning. Teachers may need to modify instructional practices to prevent the spread of viruses and other disease-causing organisms. The following science classroom safety considerations are not intended to replace a district's emergency or crisis safety plan and are not an exhaustive list of the health and safety needs to be considered.

Physical Learning Environment

Science instruction utilizes a variety of learning environments: classrooms, dedicated laboratories, or a combination of the two. Often materials are shared between students. Here are some physical considerations for science classroom and labs:

- Desks and students should remain spaced at least 6 feet apart, to the extent possible, and face the same direction rather than students facing each other or working in physical groups. The spacing could also be encouraged through markings on tables and floors. Partitions that can be sanitized may be placed between lab stations, being sure to use a material that would not react with the chemicals used in class. This could cause cracking in the partitions. Utilize digital tools and class discussions to maintain additional collaborative learning opportunities.
- Keep doors open or consider holding some classes outdoors or in larger spaces such as gymnasiums, auditoriums, vacant hallways, and cafeterias, if possible.

- Consider the available ventilation, including exhaust fans and window openings. Fume hoods provide little ventilation for the entire room. Odors from activities might irritate sensitive lungs and eyes.
- Frequently wipe down high-touch surfaces such as desks, tables, chairs, door handles, and light switches. Some possibilities include using soapy water or dunking in bleach solutions (remembering that bleach becomes weaker over time and should be made for each day). Have soap, hand sanitizers and wipes available. Cleaning products should not be used near children or with poor ventilation.
- Where students typically wait in line, place tape markings to indicate social distancing.
- Educators are strongly encouraged to use assigned seating.

Classroom Materials

- Classrooms should reduce use of shared items that may be difficult to clean. Items that must be shared, such as computers and tablets, should be cleaned between use. Provide methods for safe and sanitary disposal of used materials.
- Plan for the washing and/or sanitation of lab equipment, materials, and personal protective equipment such as safety glasses, gloves, and aprons. Be certain to wash and/or sanitize items before being used by another student. Some possibilities include using soapy water or dunking in bleach solutions (remembering that bleach becomes weaker over time and should be made for each day). Have soap, hand sanitizers and wipes available. Cleaning products should not be used near children or with poor ventilation.

> **NOTE:** It is unclear whether ultraviolet lights, such as in goggle sanitizer cabinets, are effective for reducing the spread of COVID-19.

- Consider using disposable materials and small-scale practices (e.g. micro-scale chemistry) to reduce washing and sanitation needs. Give attention to safe and sanitary disposal methods for chemicals, supplies, materials and personal items.
- Reduce the sharing of materials by encouraging students to bring their own items when feasible, such as calculators, rulers, hand lenses (magnifying glasses), gloves, and goggles.
- Remove unnecessary items that could need washing and sterilizing, such as excess glassware and reagent bottles.
- Keep each student's belongings separated from those of others and in individually labeled containers, cubbies or areas.

- Instead of turning in paper copies of assignments, consider taking a picture to view or having students submit student work digitally, allowing for closer examination and/or digital collaboration.

Additional Considerations for In-Person Science Learning

- Evaluate planned student activities for safety and student interactions, but also their value for engaging students in meaningful science thinking and learning. Consider alternatives that teach the same concepts and skills. Build in extra time for sanitizing activities.
- Include instruction that teaches the routines and procedures that students should use in the class and out-of-school. Consider traffic flow when distributing materials and other movements. Minimize the number of students that need to move. Establish personal student practices such as wearing masks, washing hands, and sharing materials. Use signage that encourages the practices.
- Modify grouping practices. For physical investigations, one student could perform the investigation and share the observations with partners who remain at a proper distance. The student performing the investigation could make a video recording to share observations and use a shared computer application for sharing data. The group could share data analysis and the development of explanations through digital applications and platforms.

Additional Consideration for Blended or Distance Learning

The OSDE document Science Distance Learning 6-12 provides general instruction recommendations for both digital and analog delivery methods. In addition, here are some specific items to consider:

- Safety considerations are paramount. Plan for anything that could go wrong and consider that students might not have adult support and supervision. Document safety considerations in student materials, parent guidance, and teacher lesson plans.
- Be cautious about the handling of chemicals, plants and animals. Consider the hazards and safety precautions for sharp objects, heated objects, and breakable items. Students may have allergies and sensitivities. Pay attention to the needs for eye protection, gloves, hand washing and disposal. It is not generally recommended to engage students in investigations remotely that require laboratory equipment, chemicals or any materials that could cause students harm. Teachers should defer to district and school policy prior to assigning investigations to students that are to be conducted remotely. Here are a few additional considerations:
    - o The use of household chemicals or kitchen supplies should be limited to those that have a safety classification as 1 on the Safety Data Sheet (SDS). For example, vinegar should not be used without appropriate personal protective equipment because of the safety label of 2 (see excerpt from SDS below). Safety data sheets should be reviewed

before indicating the use of any household substances in an activity. Safety hazard information can be found at https://www.era-environmental.com/blog/ghs-hazard-classification. Safety Data Sheets can be found through the school's safety materials or through searching the internet for "SDS <chemical name>."

  - Personal Protective Equipment (PPE) is to be provided by the school or parent prior to the completion of any investigation with safety considerations. Eye protection, such as goggles or protective glasses, should be worn with any activity or experiment that includes the use of chemicals (including common household chemicals), sharp objects, and projectile objects. If proper PPE is not available, the laboratory exercise or activity should not be conducted outside of the classroom setting.

- Examine any videos you assign to students for safety practices. Do they use proper eye protection? Do they give the students ideas for dangerous activities that students might try? The statement of "Don't try this at home" is not adequate protection from injury and liability.
- Teachers can provide video recordings of investigations as demonstrations and provide written narratives of investigations for students without digital access.
- Provide means for students to have productive discussions with their peers or family members about the topic, investigation or project. Discussion can be facilitated through phone conferencing programs, electronic dashboards, and video conferences.

Additional Safety Resources

- The National Science Teachers Association has a collection of science safety resources, including position statements, resources and blog posts for both COVID-19 and non-COVID-19 situations.
- The National Science Education Leadership Association also has a Safety Position Statement.

Ongoing Support for Instruction

OSDE will continue to provide ongoing support for instruction during the 2020-2021 academic year. Continue to check the OSDE Science Website and sign up for the Science Newsletter to see upcoming professional learning opportunities, office hours, and additional instructional resources.

Professional Learning Opportunities
• OKScience Toolkit - Use this toolkit to guide ongoing discussions and planning for the successful implementation of the Oklahoma Academic Standards for Mathematics.

- Tech Tool Tuesday Recordings- Learn about different education technology tools for instruction.
- OKSciTeachers.com- Oklahoma educators' ideas and thoughts related to science and STEM education.

OSDE Hosted Virtual Meetings

Join OSDE staff and science teachers around the state for monthly professional learning opportunities during the 2020-21 school year.

Science Virtual Meetings

- Every 2nd Wednesday of each month, 4:30-5:30 p.m.
- First meeting will occur on August 12th.
- Zoom information will be communicated through the OKSci Newsletter. Subscribe here!

Social Media Connections

Facebook	Twitter
• All Grade Levels: #OKSci • OKSci Elementary • #OKSci5th • OKSci Middle School • OKSci High School • OKSci Biology • Oklahoma Science Teaching Association • To create an additional Facebook Group for a science course not currently represented, create a group #OK[sciencesubject] then post in the #OKSci Facebook Group that you've created the group!	• Use and search **#OKSci #NGSSchat** and **#oklasta** to highlight and find science resources for Oklahoma Educators • Oklahoma Science Teaching Association • NGSS Phenomena • NGSSchat • **@oksde** - OSDE Twitter Account

State-Level Science Organizations

- Oklahoma Science Teaching Association

Contact Information

Contact Information for OSDE Science Office of Instruction Staff

We are here to help in any way we can. Feel free to email any of the following people at OSDE if you have questions or need support.

- **Heather Johnston**, Director of Science and Engineering, heather.johnston@sde.ok.gov
- **Susan Wray**, Oklahoma Excel Science Specialist, susan.wray@sde.ok.gov
- **Dawna Schweitzer**, Science Instructional Specialist, dawna.schweitzer@sde.ok.gov