UTAH'S ESSENTIAL STANDARDS

SCIENCE—Secondary

COVID-19 SPECIAL EDITION

The purpose of these essential standards is to provide educators with a prioritized list of standards to focus on during COVID-19.

While all standards have value, COVID-19 may limit instructional hours. The essential standards are intended to help teachers identify which standards to focus on. While these are the essential standards, if there is more instructional time, the recommendation is to extend the instructional focus to all standards.

UTAH STATE BOARD OF EDUCATION
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Sydnee Dickson, Ed.D., State Superintendent of Public Instruction

Guidance Document:
Teaching and Learning Secondary Science

Introduction
The Utah State Board of Education published Three Phases to Recovery in response to the effects of COVID-19 on education. In response to that plan, this document was developed to provide guidance for secondary science teachers in grades 6-12 regarding science instruction. The document is broken into two sections:

Section One: Foundational Information for Secondary SEEd Standards
Section One includes critical foundational information about secondary SEEd Standards instruction. This information is especially important and relevant due to the 2020-2021 school year being the first implementation year of the Science with Engineering Education (SEEd) Standards for high school. Through the use of guiding questions, information is presented and effective resources are provided with the intent of (a) supporting teachers to make shifts to instruction in response to new science standards and (b) determining how to address science education when instructional time is limited or shifting between synchronous and asynchronous instruction.

Section Two: Recommendations for Science Instruction
Section Two provides guidelines and recommendations for secondary science instruction based on different instructional scenarios that may occur as a result of school and district instructional format decisions. Resources from Section One are placed within appropriate instructional scenarios to provide guidance and clarity.

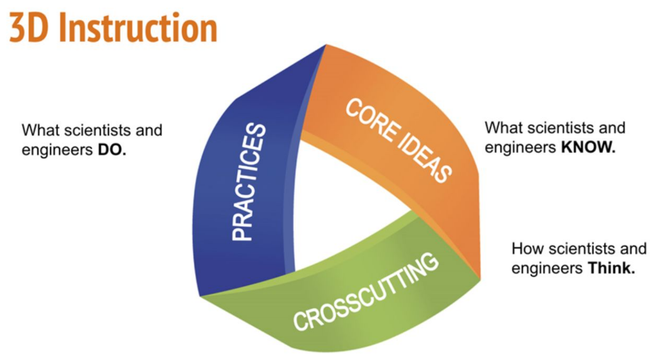
Critical Note: To best utilize this document, a thorough reading of Section One is recommended before reviewing Section Two. This order will help to support an understanding of the recommendations found in Section Two.

Section One: Foundational Information for Secondary SEEd Standards

What must effective secondary science instruction include?

1. Three-dimensional (3D) instruction

Three-dimensional instruction is the foundation of each Utah SEEd standard. For students to be proficient in each SEEd standard, they must engage in science and engineering practices, reason with the crosscutting concepts, and know and be able to use the core ideas within that standard. Teachers who simply focus on students memorizing content aligned to the standards are not meeting the expectations of the standards. Students must build conceptual understanding of science concepts and an understanding for both acting and thinking scientifically.



What are the Three dimensions and how do students use them:

- Science and Engineering Practices (SEPs) are what students do to act like scientists (e.g., ask questions, develop and use models, design and perform investigations, construct explanations)
- Crosscutting Concepts (CCCs) are lenses that support how students think like scientists, focusing on a specific aspect of the observations or data they observe (e.g., patterns, cause and effect, structure and function)
- Disciplinary Core Ideas (DCIs) are the science content that students must know and be able to apply (e.g., structure and properties of matter, growth and development of organisms, the history of planet Earth, optimizing design solutions).

Resources:

- A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas (A 2012 report by the National Research Council regarding effective practices in science education): A teacher friendly research document that explains the three dimensions of science including science and engineering practices, crosscutting concepts, and disciplinary core ideas. Each dimension is explained in depth within its own chapter. The disciplinary core ideas are grouped into major disciplines (i.e., Physical Sciences; Life Sciences; Earth and Space Sciences; Engineering, Technology, and Applications of Science). Each discipline is explained in a separate chapter. The report also describes developmentally appropriate learning progressions.
- USBE Implementing the Utah Science with Engineering Education (SEEd) Standards online Canvas Course A multi-module online course designed to support science teachers and leaders with a concrete understanding of the SEEd Standards and 3D Science. The course is free and asynchronous to support teachers learning on their own time.

BOX S-1

THE THREE DIMENSIONS OF THE FRAMEWORK

1 Scientific and Engineering Practices

1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

2 Crosscutting Concepts

1. Patterns
2. Cause and effect: Mechanism and explanation
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

3 Disciplinary Core Ideas

Physical Sciences
PS1: Matter and its interactions
PS2: Motion and stability: Forces and interactions
PS3: Energy
PS4: Waves and their applications in technologies for information transfer

Life Sciences
LS1: From molecules to organisms: Structures and processes
LS2: Ecosystems: Interactions, energy, and dynamics
LS3: Heredity: Inheritance and variation of traits
LS4: Biological evolution: Unity and diversity

Earth and Space Sciences
ESS1: Earth's place in the universe
ESS2: Earth's systems
ESS3: Earth and human activity

Engineering, Technology, and Applications of Science
ETS1: Engineering design
ETS2: Links among engineering, technology, science, and society

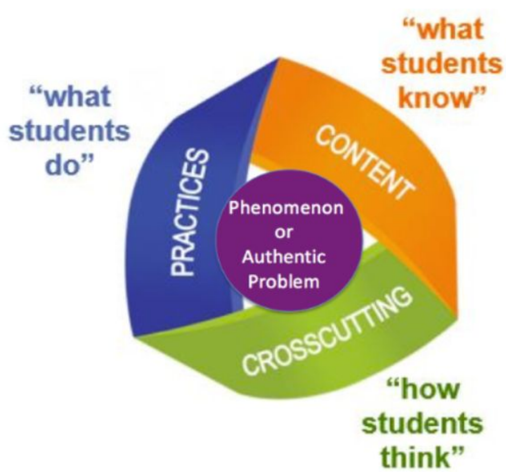
(NRC, 2012, p. 3)

2. **Phenomena-based instruction**

Three-dimensional instruction is most effective when it is centered on authentic learning experiences. As scientists work to describe and explain the natural universe, they focus on specific phenomena to explore and better understand what they observe. Phenomena are natural, observable events that occur in the universe that we can use our science knowledge to explain or predict (the singular form of phenomena is phenomenon). A phenomenon could be the presence of water on the outside of a cold glass on a hot day, that a dark t-shirt is warmer to the touch than a white t-shirt when both are in sunlight, or moss growing on the same side of trees in a forest. Teachers are encouraged to use phenomena-based instruction to fully engage students in three-dimensional science instruction. Phenomena-based instruction can be summarized in three steps:

1. Start instruction for a new unit or concept by presenting students with a phenomenon that will grab their attention, make them ask questions, become curious, and want to learn more. For most teachers, starting with a phenomenon is not new because many teachers start a new unit or concept by giving students a tangible example in the form of a picture, video, demonstration, or laboratory experience.
2. Provide opportunities for students to engage in Science and Engineering Practices to gather and reason information to explain the phenomenon. This is the most common shift that most science teachers need to make. Instead of giving students the answer to why the phenomenon occurs they allow students multiple opportunities to explore the phenomenon for themselves (both individually and in groups). Teachers scaffold the learning opportunities a little at a time assuming that along the way students will naturally be trying to explain why the phenomenon occurs.
3. Provide multiple opportunities for students to communicate their thinking for why the phenomenon occurs. To ensure that students are building depth in their understanding of the phenomenon, make sure to check that student explanations move from simple descriptions of what they observe is happening to more complex descriptions and predictions of why they think it is happening.
   NOTE: Never in this process are teachers telling students the answers to why a phenomenon occurs. Instead, they are providing students with more experiences to help them reach a common understanding. Often, teachers engage students in scientific arguments to challenge each other's claims and explanations for the phenomenon using the observations and evidence they have collected.

The phenomena used in instruction are central to effective three-dimensional science instruction.



The phenomena that teachers present to students must be accessible to everyone in the room and relevant to their lives to be able to help grab their interest and curiosity.

<u>Resources</u>:

- Using Phenomena in NGSS: A document that provides information about what phenomena are, why teachers should use them, how to use them, and what makes them effective during science instruction.
- USBE Implementing the Utah Science with Engineering Education (SEEd) Standards online Canvas Course
  A multi-module online course designed to support science teachers and leaders with a concrete understanding of the SEEd Standards and 3D Science. The course is free and asynchronous to support teachers learning on their own time. *There is an entire module focused on phenomena-based instruction.*

Why is science instruction important?

Many recent calls for improvements in K-12 science education have focused on the need for science and engineering professionals to keep the United States competitive in the international arena. Although there is little doubt that this need is genuine, a compelling case can also be made that understanding science and engineering, now more than ever, is essential for every American citizen. Science, engineering, and the technologies they influence permeate every aspect of modern life. Indeed, some knowledge of science and engineering is required to engage with the major public policy issues of today as well as to make informed everyday decisions, such as selecting among alternative medical treatments or determining how to invest public funds for water supply options. In addition, understanding science and the extraordinary insights it has produced can be meaningful and relevant on a personal level, opening new worlds to explore and offering lifelong opportunities for enriching people's lives. In these contexts, learning science is important for everyone, even those who eventually choose careers in fields other than science or engineering. (NRC, 2012, p. 7)

What is the vision for K-12 science education that underpins the new SEEd Standards?

A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas (NRC, 2012) is designed to help realize a vision for education in the sciences and engineering in which students, over multiple years of school, **actively engage** in scientific and engineering practices and apply crosscutting concepts to deepen their understanding of the core ideas in these fields. The learning experiences provided for students should **engage** them with fundamental questions about the world and with how scientists have **investigated and found** answers to those questions. Throughout grades K-12, students should have the opportunity to **carry ou**t scientific investigations and engineering design projects related to the disciplinary core ideas.

By the end of the 12th grade, students should have gained sufficient knowledge of the practices, crosscutting concepts, and core ideas of science and engineering to engage in public discussions on science-related issues, to be critical consumers of scientific information related to their everyday lives, and to continue to learn about science throughout their lives. They should come to appreciate that science and the current scientific understanding of the world are the result of many hundreds of years of creative human endeavor. It is especially important to note that the above goals are for all students, not just those who pursue careers in science, engineering, or technology or those who continue on to higher education.

[The committee who wrote the report] anticipate that the insights gained and interests provoked from studying and engaging in the practices of science and engineering during their K-12 schooling should help students see how science and engineering are instrumental in addressing major challenges that confront society today, such as generating sufficient energy, preventing and treating diseases, maintaining supplies of clean water and food, and solving the problems of global environmental change. In addition, although not all students will choose to pursue careers in science, engineering, or technology, [the committee] hope that a science education based on the framework will motivate and inspire a greater number of people—and a better representation of the broad diversity of the American population—to follow these paths than is the case today.

The committee's vision takes into account two major goals for K-12 science education: (1) educating all students in science and engineering and (2) providing the foundational knowledge for those who will become the scientists, engineers, technologists, and technicians of the future. (NRC, 2012, pp. 8-10)

What does this mean for classroom instruction?

The framework endeavors to move science education toward a more coherent vision in three ways.

First, it is built on the notion of learning as a developmental progression. It is designed to help children continually build on and revise their knowledge and abilities, starting from their curiosity about what they see around them and their initial conceptions about how the world works. The goal is to guide their knowledge toward a more scientifically based and coherent view of the sciences and engineering, as well as of the ways in which they are pursued and their results can be used.

Second, the framework focuses on a limited number of core ideas in science and engineering both within and across the disciplines. The committee made this choice in order to avoid shallow coverage of a large number of topics and to allow more time for teachers and students to explore each idea in greater depth. Reduction of the sheer sum of details to be mastered is intended to give time for students to engage in scientific investigations and argumentation and to achieve depth of understanding of the core ideas presented. Delimiting what is to be learned about each core idea within each grade band also helps clarify what is most important to spend time on and avoid the proliferation of detail to be learned with no conceptual grounding.

Third, the framework emphasizes that learning about science and engineering involves integration of the knowledge of scientific explanations (i.e., content knowledge) and the practices needed to engage in scientific inquiry and engineering design. Thus the framework seeks to illustrate how knowledge and practice must be intertwined in designing learning experiences in K-12 science education. (NRC, 2012, pp. 10-11)

What professional learning opportunities are available to help teachers learn more about three-dimensional, phenomena-based instruction?

- Implementing the Utah Science with Engineering Education (SEEd) Standards K-12 Canvas Course:
  This Canvas-based course contains six modules: Introduction to the SEEd Standards, Science and Engineering Practices (SEPs), Crosscutting Concepts (CCCs), Disciplinary Core Ideas (DCIs), Engineering Design, and Using Phenomena. The course's purpose is to support educators in understanding shifts to instruction that are required to effectively implement the Utah SEEd Standards The course is free for participants and is self-paced. K-12 educators may register at any point. Successful completion of the entire course is worth 2.0 USBE Credits. Credit will be assigned three times during the year.
- SEEd Content Courses for Grades K-8:
  These Grade K-8 content courses are developed specifically for elementary teachers and Grade 6-8 middle school science teachers. The Utah K-8 SEEd standards are integrated standards meaning that each grade contains content in earth and space science, life science, and physical science. While most elementary education and secondary science education programs provide some general understanding in each of these content areas, no teacher comes out with a solid understanding for all of them. These courses were created to build and support teachers' science conceptual knowledge of the disciplinary core ideas (DCIs) used within each grade of the K-8 SEEd Standards. These courses are free for participants and are self-paced. Educators may register at any time. Successful completion of each component within the course is worth between .5 and 1.0 USBE Credits. *It's important to note that because high school SEEd Standards are still based on the content areas of biology, chemistry, earth and space science, and physics and since teachers must complete state endorsement requirements to teach these courses, content courses like these are not needed for high school.*
- The Utah Science Teachers Association annual conference and regional conferences include multiple breakout sessions for 6th Grade, 7th Grade, 8th Grade, Biology, Chemistry, Earth and Space Science, and Physics teachers to help them engage in three-dimensional science instruction. Look to these opportunities for teacher professional learning specific to SEEd Standards.
- Districts and schools (including Charter Schools) are encouraged to focus both resources and professional learning time specifically to science teachers learning of three-dimensional science and SEEd standards. Information about available professional learning is shared through the USBE Science Listserv.

How are the SEEd Standards organized?

The Utah SEEd standards are organized into strands which represent significant areas of learning within grade level progressions and content areas. Each strand introduction is an orientation for the teacher in order to provide an overall view of the concepts needed for foundational understanding. These include descriptions of how the standards tie together thematically and which DCIs are used to unite that theme. Within each strand are standards. A standard is an articulation of how a learner may demonstrate their proficiency, incorporating not only the disciplinary core idea but also a crosscutting concept and a science and engineering practice. While a standard represents an essential element of what is expected, it does not dictate curriculum—it only represents a proficiency level for that grade. While some standards within a strand may be more comprehensive than others, all standards are essential for a comprehensive understanding of a strand's purpose.

The standards of any given grade or course are not independent. SEEd standards are written with developmental levels and learning progressions in mind so that many topics are built upon from one grade to another. In addition, SEPs and CCCs are especially well paralleled with other disciplines, including English language arts, fine arts, mathematics, and social sciences. Therefore, SEEd standards should be considered to exist not as an island unto themselves, but as a part of an integrated, comprehensive, and holistic educational experience. (Introduction to the Utah SEEd Standards, USBE, 2019, p. 13)

What SEEd Standards should teachers focus on during instruction in limited-time scenarios?

The general expectation for the SEEd standards is that students reach proficiency for each of the three dimensions included in every standard for their grade level or high school course. In the standards for every middle school grade level (6-8) and each high school course, there is some repetition that exists for the science and engineering practices, crosscutting concepts, and disciplinary core ideas. This repetition is meant to offer students depth in their learning experiences throughout the year as practices pair with different crosscutting concepts or as different disciplinary core ideas pair together adding conceptual depth.

During limited-time scenarios, when instruction time with students is cut back due to school soft-closures, remote-learning situations, or shortened class time due to staggered small class groupings, etc., it is critical to ensure that student engagement with the vision of the SEEd standards does not suffer. Due to limited-time scenarios, many district schools and charter schools are looking for ways to pare back the content that students are expected to learn in the school year. **This important focus must be maintained when it comes to secondary science education, that students learn all three dimensions found in their grade or course standards to their fullest potential.** The following list describes some appropriate and inappropriate approaches to adjusting or paring back content due to these scenarios.

Appropriate approaches to adjusting instruction or paring back Secondary Science Content: The following practices are not ideal but are appropriate during limited-time scenarios:

- **Design limited learning time so that synchronous learning time is spent engaging students with practices that are best done as a whole class and designing asynchronous learning time for individual investigation and sense making.** While effective phenomena-based instruction may best occur in the classroom setting where questions can be asked and students can engage in discussion, much of phenomenon-based instruction occurs individually or in small groups. Plan limited synchronous learning time so that those things that are most effectively done as a whole class can occur (e.g., introducing phenomena, engaging in investigations that must be done together, communicating models or explanations, engaging in argument). Plan for assignments where students can do asynchronous work alone or using technology in small groups (e.g., observing phenomena, asking questions, analyzing data, developing and using models, construction explanations or arguments).
- **Identify standards that are similar in their science concepts so they can be combined together to create a set of lessons with a common focus.** Reading through the SEEd Standards for each grade or high school course a teacher is assigned to teach, they look for standards that have a common content focus and could be taught using the same phenomenon. Combine these standards while planning instruction, ensuring that the DCIs are still appropriately used by students. This may bring the total standards from over 20 down to maybe 16, which may not sound like a lot, however assuming that most teachers plan 2-3 weeks for each standard, it should provide several extra weeks to spread out pacing guides that help planning for the school year.
- **Organize learning goals for each grade or high school course taught in the school year by identifying all of the SEPs, CCCs, and DCIs for that grade and creating a personalized learning map based on ensuring they are all taught.** While the SEEd Standards for each grade or high school course contain each of the science and engineering practices and crosscutting concepts, the disciplinary core ideas are shared among a grade band (grade 6-8 and 9-12) and not all of them are used in each grade. As long as by the end of the school year, a student has proficiency in each practice, crosscutting concept, and core idea at their prescribed progression level, they will be proficient for the standards. Teachers will simply need to organize how they will lead students and build this information through the year and repeat the SEPs and CCCs in lesson planning to ensure students have sufficient experience with them.

Inappropriate approaches to adjusting instruction or paring back Secondary Science Content: The following practices are strongly advised against as they do not support the vision of the SEEd Standards and are unacceptable practice:

- **Paring back the use of some or all science and engineering practices or crosscutting concepts to focus mostly on teaching the content found in the disciplinary core ideas.** Teaching only content to students without their use of authentic science and engineering practices and reasoning with crosscutting concepts goes against effective science education research going back for decades and this is unacceptable.
- **Making local decisions about which SEEd standards are more or most important and only teaching those standards.** The national science education leaders and science scholars that prepared the foundation research for the SEEd standards found in A Framework for K-12 Science Education did the heavy lifting of paring down science content to what is essential for the 6-8 and 9-12 grade bands. The content that remains in the DCIs at each grade band are what is essential to student learning. Any paring back of SEEd standards in their entirety must be done only when ensuring that students are still learning each prescribed DCI found in the SEEd standards for the grade level or high school course. Not teaching a single practice, crosscutting concept, or core idea will leave holes in students' essential science understanding.

How can teachers assess students for gaps in science instruction?

On a positive note, since the SEEd standards were first used by 6th - 8th grade students starting in the 2017-2018 school year, all 7th - 11th grade students this school year (2020-21) should have some experience with three-dimensional standards. However, since not all high school students used three-dimensional standards in the past few years and due to potential learning losses due to the effects of COVID-19 during the end of the 2019-2020 school year, there may be some learning gaps teachers will need to look for during instruction this school year. While this may seem daunting to teachers, there are a couple of resources that support the creation of assessments that can be used to measure students' current knowledge in each of the three dimensions of science. These resources provide a clear way to know where students are along a continuum and what they need to move to the next level of understanding on that continuum.

The first resource is the K-12 Framework (NRC, 2012). The framework includes clear and detailed developmental progressions for all three of the dimensions of science instruction. Each dimension provides a description for students learning at different levels from K-12. These progressions are the most clear within the descriptions of the disciplinary core ideas. For example, each core idea individually delineates what students should know and be able to apply to novel situations for each grade-band (K-2, 3-5, 6-8, and 9-12). With this information assessments can be created to see if a student has a K-2 level, a 3-5 level, a 6-8 level, or a 9-12 level of understanding. Additionally, these learning progressions found in the K-12 Framework for each dimension (SEP, CCC, and DCI) have been organized into tables that were created by the National Science Teaching Association (NSTA).

Another important document is the Utah Science with Engineering Education (SEEd) Standards Core Guides (currently released in draft form for 30-day public feedback). These documents provide information about concepts and skills to master, critical background knowledge, related current and future grade level standards, academic language, and assessment supports. Additionally, they include the details from each of the NSTA tables specific for each SEEd standard.

By using the proficiency statements for current and prior grade-level standards, located in the Assessment Exemplar section of these core guides, teachers can assess students' knowledge and skills to pinpoint students' current developmental level. Then, by locating that level in the progressions of the Critical Background Knowledge section of the core guides, teachers can design instruction that scaffolds students' knowledge and skills to the next developmental level.

As specific assessments are created by teachers, schools, and districts the hope is that these are shared widely with others teachers, schools, and districts in the state who are looking for similar resources.

What resources are available to help teachers design instruction and assessment?

- UEN Learn at Home - Science: Examples of student science experiences to consider using during remote learning instruction-used as a resource for teacher designed instruction.
- Utah OER Science Textbooks: Grade appropriate readings, phenomena, and thought provoking questions to support student sensemaking - must be combined with tasks and experiences to engage in science and engineering practices.
- STEM Teaching Tool #29: Resource that provides steps to designing three-dimensional assessment.
- STEM Teaching Tool #30: Resource that provides ways to integrate science and engineering practices into instruction and assessment.
- STEM Teaching Tool #41: Resource that provides prompts for integrating crosscutting concepts into instruction and assessment.
- STEM Teaching Tool #62: Resource that provides ways to integrate science with other contents in elementary education.
- Phet Simulations: Online simulations that allow students to investigate science concepts in a virtual environment.

Reference:

National Research Council 2012. A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas. Washington, DC: The National Academies Press. https://doi.org/10.17226/13165.

Section Two: Recommendations for Science Instruction

Soft-Closure Scenario

1. **Recommendations for Instruction:**
   - Choose an appropriate approach to adjust instruction or pare back Secondary Science Content that still ensures all science and engineering practices, crosscutting concepts, and disciplinary core ideas are learned and used by students.
   - Incorporate curriculum and instruction that use authentic phenomena from student science experiences into remote learning instruction and provide opportunities for students to use practices and think focused in crosscutting concepts: UEN Learn at Home - Science
     - Ensure that all at-home labs are equitable (ensuring all students will have easy access to necessary materials) and are safe for all students.
     - Incorporate virtual simulations that help students investigate science concepts: Phet Simulations
     - NOTE - If teachers create Student Experiences using the UEN Learn at Home format want them shared with others. Please share it with Ricky Scott at richard.scott@schools.utah.gov to be reviewed by peers to be posted to the website.
   - Incorporate grade appropriate phenomena, readings, and thought provoking questions to support student sensemaking and used of core ideas into remote instruction: Utah OER Science Textbooks

   Recommendations for Assessment:
   - Incorporate strategies from Section One: How can teachers assess students for gaps in science instruction?
   - Determine students' current developmental level in each of the three dimensions: Utah Science with Engineering Education (SEEd) Standards Core Guides
   - Resources to support assessment development: STEM Teaching Tool #29, STEM Teaching Tool #30, STEM Teaching Tool #41

   Resources for supporting teacher and student mental health and social emotional needs:
   - What is Social Emotional Learning (SEL): Introduction to SEL and its importance for students
   - Social and Emotional Learning (SEL) Competencies: Describes five core competencies of SEL.

2. **Utilize resources for remote instruction to inform methods for personalizing instruction and validating learning that occurs outside the classroom**
   Recommendations:
   - Support building bridges of communication with home to support both in-school and remote learning.
     - Resource that provides strategies for building bridges between home and school
       - Colorin Colorado: Toolkit for Educators: (While written to provide strategies for building communication between school and English Language Learner families, the strategies can be applied in many situations)
   - Consider ways to plan for a variety of instructional presentation methods:
     - A Plan to Safely Reopen America's Schools and Communities: Pages 10-11 provide ideas for different learning systems such as remote-learning, blended-learning, and in-person instruction.
     - TNTP Learning Acceleration Guide: This guide provides information to plan for restarting school and accelerating student learning.
     - Remote Learning Resource: Leading an Anchoring Phenomenon Routine: The purpose of this document is to motivate students in figuring out phenomena or solving design problems in remote learning situations.
     - Remote Learning Resource: Discourse: Strategies and tools for building understanding and consensus during remote learning situations that are synchronous, asynchronous, and without technology are provided. Also, equity considerations are addressed.
     - Remote Learning Tools: Online tools to support learning in science such as anchoring a phenomenon, implementing discourse, engaging in tasks online, and conducting investigations.

Small or Staggered Groups and/or Remote Learning Scenario

1. **Recommendations for Instruction:**
   - Choose an appropriate approach to adjust instruction or pare back Secondary Science Content that still ensures all science and engineering practices, crosscutting concepts, and disciplinary core ideas are learned and used by students
     - If necessary, determine how time will be spent in class vs. in remote learning (asynchronously) due to shorter class time
   - Incorporate curriculum and instruction that use authentic phenomena from student science experiences into remote learning instruction and provide opportunities for students to use practices and think focused in crosscutting concepts: UEN Learn at Home - Science
     - Remote Learning
       - Ensure that all at-home labs are equitable (ensuring all students will have easy access to necessary materials) and are safe for all students.
       - Incorporate virtual simulations that help students investigate science concepts: Phet Simulations
     - Small or Staggered Groups
       - Ensure there are protocols for safe lab work including cleaning lab materials and safety goggles before and after use. Note the State Public Health Order that requires all individuals on school property to wear face coverings (with certain exceptions).
       - Provide sufficient class time for cleaning preparation and end of lesson clean up.
       - Plan for guided (but not fully directed) at-home or asynchronous data analysis and sense making
     - NOTE - If teachers create Student Experiences using the UEN Learn at Home format want them shared with others. Please share it with Ricky Scott at richard.scott@schools.utah.gov to be reviewed by peers to be posted to the website.
   - Incorporate grade appropriate readings, phenomena, and thought provoking questions to support student sensemaking into remote instruction: Utah OER Science Textbooks

   Recommendations for Assessment:
   - Incorporate strategies from Section One: How can teachers assess students for gaps in science instruction?
   - Determine students' current developmental level in each of the three dimensions: Utah Science with Engineering Education (SEEd) Standards Core Guides
   - Resources to support assessment development: STEM Teaching Tool #29, STEM Teaching Tool #30, STEM Teaching Tool #41

   Resources for supporting teacher and student mental health and social emotional needs:
   - What is Social Emotional Learning (SEL): Introduction to SEL and its importance for students
   - Social and Emotional Learning (SEL) Competencies: Describes five core competencies of SEL.

2. **Apply lessons learned from remote instruction to inform methods for personalizing instruction and validating learning that occurs outside the classroom**

   Recommendations:
   - Support building bridges of communication with home to support both in-school and remote learning.
     - Resource that provides strategies for building bridges between home and school
       - Colorin Colorado: Toolkit for Educators: (While written to provide strategies for building communication between school and English Language Learner families, the strategies can be applied in many situations)
   - Consider ways to plan for a variety of instructional presentation methods:
     - A Plan to Safely Reopen America's Schools and Communities: Pages 10-11 provide ideas for different learning systems such as remote-learning, blended-learning, and in-person instruction.
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     - Remote Learning Tools: Online tools to support learning in science such as anchoring a phenomenon, implementing discourse, engaging in tasks online, and conducting investigations.

Small or Staggered Groups and/or Regular School Schedule Scenario

1. **Recommendations for Instruction:**
- Prepare for the year assuming that eventually school may be forced to a remote learning format and hoping that it doesn't. Pace the school year's work by choosing an appropriate approach to adjust instruction or pare back Secondary Science Content that still ensures all science and engineering practices, crosscutting concepts, and disciplinary core ideas are learned and used by students
  - If necessary, determine how time will be spent in class vs. in remote learning (asynchronously) due to shorter class time
- Incorporate curriculum and instruction that use authentic phenomena from student science experiences into remote learning instruction and provide opportunities for students to use practices and think focused in crosscutting concepts: UEN Learn at Home - Science
  - Remote Learning
    - Ensure that all at-home labs are equitable (ensuring all students will have easy access to necessary materials) and are safe for all students.
    - Incorporate virtual simulations that help students investigate science concepts: Phet Simulations
  - Small or Staggered Groups
    - Ensure there are protocols for safe lab work including cleaning lab materials and safety goggles before and after use. Note the State Public Health Order that requires all individuals on school property to wear face coverings (with certain exceptions).
    - Provide sufficient class time for cleaning preparation and end of lesson clean up.
    - Plan for guided (but not fully directed) at-home or asynchronous data analysis and sense making
  - NOTE - If teachers create Student Experiences using the UEN Learn at Home format want them shared with others. Please share it with Ricky Scott at richard.scott@schools.utah.gov to be reviewed by peers to be posted to the website.
- Incorporate grade appropriate readings, phenomena, and thought provoking questions to support student sensemaking into remote instruction: Utah OER Science Textbooks

Recommendations for Assessment:
- Incorporate strategies from Section One: How can teachers assess students for gaps in science instruction?
- Determine students' current developmental level in each of the three dimensions: Utah Science with Engineering Education (SEEd) Standards Core Guides
- Resources to support assessment development: STEM Teaching Tool #29, STEM Teaching Tool #30, STEM Teaching Tool #41

Resources for supporting teacher and student mental health and social emotional needs:
- What is Social Emotional Learning (SEL): Introduction to SEL and its importance for students
- Social and Emotional Learning (SEL) Competencies: Describes five core competencies of SEL.

2. **Apply lessons learned from remote instruction to inform methods for personalizing instruction and validating learning that occurs outside the classroom**

Recommendations:
- Support building bridges of communication with home to support both in-school and remote learning.
  - Resource that provides strategies for building bridges between home and school
    - Colorin Colorado: Toolkit for Educators: (While written to provide strategies for building communication between school and English Language Learner families, the strategies can be applied in many situations)
- Consider ways to plan for a variety of instructional presentation methods:
  - A Plan to Safely Reopen America's Schools and Communities: Pages 10-11 provide ideas for different learning systems such as remote-learning, blended-learning, and in-person instruction.
    - TNTP Learning Acceleration Guide: This guide provides information to plan for restarting school and accelerating student learning.
    - Remote Learning Resource: Leading an Anchoring Phenomenon Routine: The purpose of this document is to motivate students in figuring out phenomena or solving design problems in remote learning situations.
    - Remote Learning Resource: Discourse: Strategies and tools for building understanding and consensus during remote learning situations that are synchronous, asynchronous, and without technology are provided. Also, equity considerations are addressed.
    - Remote Learning Tools: Online tools to support learning in science such as anchoring a phenomenon, implementing discourse, engaging in tasks online, and conducting investigations.