UTAH'S ESSENTIAL STANDARDS

SCIENCE—Elementary

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
250 East 500 South P.O. Box 144200 Salt Lake City, UT 84114-4200
Sydnee Dickson, Ed.D., State Superintendent of Public Instruction

Three Phases to Recovery:

Teaching and Learning Elementary 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 elementary teachers in Grades K-6 regarding science instruction. The document is broken into two sections:

Section One: Foundational Information for Elementary SEEd Standards
Section One includes critical foundation information about elementary science instruction. This information is especially important and relevant due to the 2020-2021 school year being the first year of implementation for Grades K-5 of the Science with Engineering Education (SEEd) Standards. 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 when shifting between synchronous and asynchronous instruction.

Section Two: Guidance for Science Instruction
Section Two provides guidelines for elementary science instruction during different instructional scenarios that may occur as a result of school and district instructional format decisions. Resources explained in Section One are placed within appropriate instructional scenarios to provide guidance and clarity.

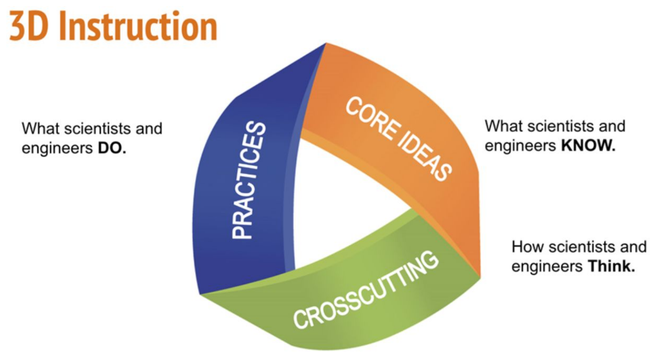
Critical Note: To best utilize this document, a thorough reading of Section One is strongly recommended before reviewing Section Two. This will support an understanding of the recommendations found in Section Two.

Section One: Foundational Information for Elementary SEEd Standards

What must effective elementary 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 a science and engineering practice(s), reason with the crosscutting concept(s), and know and be able to use the core idea(s) 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 provide 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

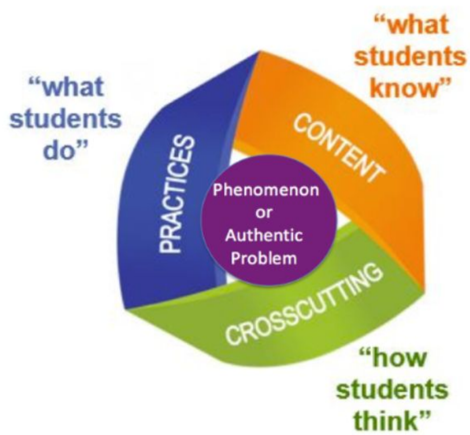
(NRC, 2012, p. 3)

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, a dark t-shirt that 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 is relevant to their lives, engaging them in asking questions about what they observe, and building in students a desire 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 about information with the intent of ultimately explaining the phenomenon. This is a shift in science instruction that most teachers will need to make. It entails not giving students the answer to why the phenomenon occurs. Instead, teachers should allow students multiple opportunities to explore the phenomenon, both individually and in groups, while scaffolding the learning opportunities. This supports students in developing an understanding of the science concepts and allows them to construct their own explanations for 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 a 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 the phenomenon 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 an appropriate understanding. Often, teachers engage students in scientific arguments in which they challenge one another's claims and explanations for a phenomenon using the observations and evidence they have collected.

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



Critical Note: The phenomena that teachers present to students must be accessible to everyone in the room and relevant to their lives.

<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 courses are developed specifically for elementary educators and Grade 6-8 middle school science teachers. The purpose of these courses is to build and support teacher science conceptual knowledge of the disciplinary core ideas (DCIs) used within the 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.

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?

As previously explained, each standard contains all of the three dimensions of science instruction. The expectation is that students reach proficiency for each of the three dimensions included in each standard for all of the standards. However, when instruction time is limited due to school soft-closures, remote-learning situations, or staggered small class groupings, knowing where the majority of the standards for a grade focus in regard to the science and engineering practices, crosscutting concepts, and disciplinary core ideas can help teachers, grade level teams, coaches, schools, and districts make informed decisions about the focus of available instructional time. Therefore, this section provides information about the concentration of each of the three dimensions by grade-band or grade-level depending on what category provides the best information.

Science and Engineering Practices:

While all of the science and engineering practices are important and should be used flexibly to support student sense-making, specific grades or grade-bands may focus more on certain practices as determined by the number of times a practice is explicitly named throughout the standards of a specific grade. Below is a chart highlighting the concentration of each practice within a grade-band or grade-level. The labels of *critical, essential*, and *needed* reflect the amount of focus a practice receives in the standards of that grade-band or level.

Grade-Band	Critical	Essential	Needed
K-2	-Asking questions or defining problems -Planning and carrying out investigations -Construction Explanations and designing solutions -Obtaining, evaluating, and communicating information	-Developing and using models -Analyzing and interpreting data	-Using mathematics and computational thinking -Engaging in argument from evidence
3-5	-Asking questions or defining problems -Developing and using models -Planning and carrying out investigations -Analyzing and interpreting data -Construction Explanations and designing solutions	-Obtaining, evaluating, and communicating information	-Using mathematics and computational thinking -Engaging in argument from evidence
6	-Asking questions or defining problems -Developing and using models -Planning and carrying out investigations -Analyzing and interpreting data -Construction Explanations and designing solutions	-Using mathematics and computational thinking -Engaging in argument from evidence -Obtaining, evaluating, and communicating information	

Crosscutting Concepts:

As previously discussed with the science and engineering practices, all of the crosscutting concepts are important and should be used flexibly to support student sense-making. However, specific grades or grade-bands do focus more on certain crosscutting concepts by including them in a greater number of grade-level standards. Below is a chart highlighting the concentration of each crosscutting concept within a grade-band or grade-level. The labels of critical, essential, and needed reflect the amount of focus a crosscutting concept receives in the standards of that grade-level.

Grade-Band	Critical	Essential	Needed
K-1	-Patterns -Cause and effect	-Structure and function	-Scale, proportion, and quantity -Systems and system models -Energy and matter -Stability and change
2	-Patterns -Structure and function	-Cause and effect -Stability and change	-Scale, proportion, and quantity -Systems and system models -Energy and matter
3-4	-Patterns -Cause and effect -Stability and change	-Structure and function -Energy and matter -Systems and system models	-Scale, proportion, and quantity
5	-Patterns -Cause and effect -Energy and matter -Scale, proportion, and quantity	-Systems and system models -Structure and function	-Stability and change
6	-Patterns -Cause and effect -Energy and matter -Scale, proportion, and quantity -Stability and change	-Systems and system models -Structure and function	

Disciplinary Core Ideas:

As previously explained, the *framework* (NRC, 2012) document already established essential core concepts called disciplinary core ideas (DCIs) for science instruction. To be considered as essential and be included in the framework document, each included core idea had to generally meet three of the four criteria that follow:

- Have broad importance across multiple sciences or engineering disciplines or be a key organizing principle of a single discipline.
- Provide a key tool for understanding or investigating more complex ideas and solving problems.
- Relate to the interests and life experiences of students or be connected to societal or personal concerns that require scientific or technological knowledge.
- Be teachable and learnable over multiple grades at increasing levels of depth and sophistication. This is, the idea can be made accessible to younger students but is broad enough to sustain continued investigation over years. (NRC, 2012, p. 31)

As delineated in the fourth bullet, the majority of included DCIs are addressed with increasing complexity from K-12 in successive grade-bands (i.e., K-2, 3-5, 6-8, 9-12). Thus, a core idea is introduced sometime within the K-2 grade-band and revisited with increasing complexity sometime within each of the following grade-bands. This allows the *framework* (NRC, 2012) document to provide a developmental progression for each core idea. Because of this progression, neglecting to teach a core idea within any of the grade-bands creates a gap in understanding for students.

This is important information to know because the SEEd Standards were developed from this research. This means that the SEEd Standards also use the same structure for introducing and building upon core ideas. The K-12 SEEd DCI Science Concepts Progressions document provides information about where each core idea is found within the SEEd Standards. Additionally and more importantly, this document shows how each core idea progresses through different grade-bands by explicitly stating the SEEd standards that incorporate each DCI. A teacher can follow the developmental progression K-12 of a DCI by reading the SEEd Standards associated with a specific DCI.

Because only essential core ideas were included in the SEEd Standards as delineated in the *framework* (NRC, 2012), and because each core idea builds in complexity with each successive grade-band, it is challenging to say which core ideas are “more essential”. Therefore, there is no attempt made to determine the “essential” of the essential standards.

However, guidance is provided to support teachers in determining priorities for instructional time. Understanding the organization of the standards within a grade level is important in determining priorities. Grade level standards are grouped into bigger conceptual ideas called strands. Each strand starts with standards that contain more foundational core ideas with the following sequential standards generally building onto the previous core ideas. Thus, the higher the standard is numbered within a strand, the more complex the core ideas generally tend to be. This means that a higher number standard is not intended to be a students’ first exposure to that science or engineering concept within a strand. Teachers should start with the first standard within each strand and add on standards in a sequential order or group standards with like DCIs as instructional time permits.

How can teachers assess students for gaps in science instruction?

On a positive note, all K-6 students are implementing the SEEd Standards for the first time during the 2020-2021 school year as the standards are new to K-5 grades and to students entering Grade 6. This means there is not a learning gap from lost instructional time in a previous grade level. However, it does mean that all students are entering the SEEd Standards with limited understanding of the three dimensions of science. Basically, all students are starting at the K-2 grade-band level of complexity to some degree. While this may seem daunting to teachers, there are a couple of incredible resources that support the creation of assessments that can be used to measure students’ current knowledge and skills in each of the three dimensions of science. These resources provide a clear way to know where students are on a developmental continuum and what scaffolding they need to move to the next level of understanding.

The first resource is the *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 *framework* for each dimension (SEP, CCC, and DCI) have been organized into tables that were created by the National Science Teaching Association (NSTA, 2013).

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 to 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.

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

- UEN Learn at Home - Science: Student science experiences to consider 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: Guidance for Science Instruction

Soft-Closure Scenario

1. **Recommendations for Instruction:**
    - Implement instruction that focuses on science and engineering practices and crosscutting concepts that fall within the *critical* column as delineated in Section One: Science and Engineering Practices and Crosscutting Concepts
    - Implement instruction that starts with the first standards in each strand and move on sequentially or group standards with like DCIs as time permits as explained in Section One: Disciplinary Core Ideas.
    - Incorporate authentic phenomena from student science experiences into remote-learning instruction: UEN Learn at Home - Science
    - Incorporate grade appropriate readings, phenomena, and thought provoking questions to support student sensemaking into remote instruction: Utah OER Science Textbooks
    - Incorporate virtual simulations that help students investigate science concepts: Phet Simulations

    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:**
    - Implement instruction that focuses on science and engineering practices and crosscutting concepts that fall within the *critical and possibly essential* columns as delineated in Section One: Science and Engineering Practices and Crosscutting Concepts
    - Implement instruction that starts with the first standards in each strand and move on sequentially or group standards with like DCIs as time permits as explained in Section One: Disciplinary Core Ideas.
    - Incorporate authentic phenomena from student science experiences into remote learning instruction: UEN Learn at Home - Science
    - Incorporate grade appropriate readings, phenomena, and thought provoking questions to support student sensemaking into remote instruction: Utah OER Science Textbooks
    - Incorporate virtual simulations that help students investigate science concepts: Phet Simulations

    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.

Small or Staggered Groups and/or Regular School Schedule Scenario

1. **Recommendations for Instruction:**
    - Implement instruction that focuses on science and engineering practices and crosscutting concepts that fall within *all three columns* if possible as delineated in Section One: Science and Engineering Practices and Crosscutting Concepts
    - Implement instruction that starts with the first standards in each strand and move on sequentially or group standards with like DCIs as time permits working toward instructing for all standards as explained in Section One: Disciplinary Core Ideas.
    - Incorporate grade appropriate readings, phenomena, and thought provoking questions to support student sensemaking into remote instruction: Utah OER Science Textbooks
    - Incorporate virtual simulations that help students investigate science concepts: Phet Simulations

    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.

.