Science Learning

Foreword

The purpose of this document is to support educators in engaging students in authentic science learning during remote or blended learning. Children are naturally curious; during this unprecedented time, we need to foster these curiosities through the use of real-world phenomena. Effective science learning should involve students figuring out science instead of learning about facts. Sensemaking, actively investigating how the world works, and designing solutions to problems, are the main goals of the Illinois Learning Standards for Science (NGSS). **Engaging students in the science and engineering practices, rather than pre-teaching information and lecturing, should be the focus of learning whether in the classroom or during remote instruction**. Through the use of the science and engineering practices students figure out science concepts and design solutions, as well as engage in science as a scientist and engineering as an engineer.

Students should be working to make sense of phenomena in the world around them and make connections between the different scientific concepts that help to explain these phenomena. Presenting or observing phenomena can take on many forms: students may make observations outside or in their home, they may watch a live demonstration, they may watch a video clip of a phenomena, or they may observe images. The primary goal is to allow students to observe a phenomenon in order to figure it out. How students figure out the phenomena requires a focus on the Science & Engineering Practices so students are thinking and doing science in different ways (e.g. investigations, data analysis and sense-making, etc.). The eight science and engineering practices are:

1. **Asking Questions and Defining Problems**- A practice of science is to ask and refine questions that lead to descriptions and explanations of how the natural and designed world(s) works and which can be empirically tested.
2. **Planning and Carrying out Investigations-** Scientists and engineers plan and carry out investigations in the field or laboratory, working collaboratively as well as individually. Their investigations are systematic and require clarifying what counts as data and identifying variables or parameters.
3. **Using Mathematical and Computational Thinking-** In both science and engineering, mathematics and computation are fundamental tools for representing physical variables and their relationships. They are used for a range of tasks such as constructing simulations; solving equations exactly or approximately; and recognizing, expressing, and applying quantitative relationships.
4. **Developing and Using Models-** A practice of both science and engineering is to use and construct models as helpful tools for representing ideas and explanations. These tools include diagrams, drawings, physical replicas, mathematical representations, analogies, and computer simulations.
5. **Analyzing and Interpreting Data-** Scientific investigations produce data that must be analyzed in order to derive meaning. Because data patterns and trends are not always obvious, scientists use a range of tools—including tabulation, graphical interpretation,

visualization, and statistical analysis—to identify the significant features and patterns in the data. Scientists identify sources of error in the investigations and calculate the degree of certainty in the results.

6. **Constructing Explanations and Designing Solutions-** The end-products of science are explanations and the end-products of engineering are solutions. The goal of science is the construction of theories that provide explanatory accounts of the world. A theory becomes accepted when it has multiple lines of empirical evidence and greater explanatory power of phenomena than previous theories.
7. **Engaging in Argument from Evidence-** Argumentation is the process by which evidence-based conclusions and solutions are reached. In science and engineering, reasoning and argument based on evidence are essential to identifying the best explanation for a natural phenomenon or the best solution to a design problem.
8. **Obtaining, Evaluating, and Communication of Information-** Scientists and engineers must be able to communicate clearly and persuasively the ideas and methods they generate. Critiquing and communicating ideas individually and in groups is a critical professional activity.

Students in grades K-12 should engage in all eight practices over each grade band. Practices grow in complexity and sophistication across the grades. The eight practices are not separate; they intentionally overlap and interconnect. As explained by Bell, et al. (2012), the practice of asking questions may lead to the practice of modeling or planning and carrying out an investigation, which may lead to analyzing and interpreting data. Just as it is important for students to carry out each of the individual practices, it is important for them to see the connections among the eight practices. Due to the complicated nature of remote and blended learning, the elements of the Science and Engineering practices are able to be meaningfully utilized across all environments. For a more detailed description of the Science and Engineering Practices, and to view their progressions across grade bands, please review NGSS Appendix F.

The intent of these recommendations is to stay in line with the integrity of three-dimensional learning. The Three Dimensions of the NGSS were designed to be used together. The overarching goal of the NGSS is to engage students in using the Science and Engineering Practices (SEP) through the lens of a Cross-Cutting Concept (CCC) in order to figure out the content within the Disciplinary Core Ideas (DCI). Districts and teachers should select the Disciplinary Core Ideas from the overarching standards that best support student conceptual learning.

Science Education Shifts

During blended or classroom learning, science instructional practices should continue to engage students with doing science much like a scientist does. The table below illustrates examples of such instructional practices.

Science Learning Should look Less Like	Science Learning Will Look More Like

Rote memorization of facts and terminology	Facts and terminology learned as needed while developing explanations and designing solutions supported by evidence-based arguments and reasoning
Learning of ideas disconnected from questions about phenomena	Systems thinking and modeling to explain phenomena and to give a context for the ideas to be learned
Teachers providing information to the whole class	Students conducting investigations, solving problems, and engaging in discussions with teachers' guidance
Teachers posing questions with only one right answer	Students discussing open-ended questions that focus on the strength of the evidence used to generate claims
Students reading textbooks and answering questions at the end of the chapter	Students reading multiple sources, including science-related magazine and journal and web-based resources; students developing summaries of information.
Pre-planned outcome for "cookbook" laboratories or hands-on activities	Multiple investigations driven by students' questions with a range of possible outcomes that collectively lead to a deep understanding of established core scientific ideas
Worksheets	Students writing of journals, reports, posters, and media presentations that explain and argue
Oversimplification of activities for students who are perceived to be less able to do science and engineering	Provisions of supports so that all students can engage in sophisticated science and engineering practices

Priority Standards - PreK

Whether in the classroom or engaged in distance learning, teachers should prioritize Goal 11 and select the core ideas under goal 12 that best support student conceptual learning. *In the example that follows, a segment of a unit is presented to illustrate how teachers can lead students through the use of the Science and Engineering Practices outlined in Goal 11.*

Overarching Standards

Goal 12 Explore concepts and information about the physical, earth, and life sciences.

Example:

Disciplinary Core Ideas and Elements	Phenomenon-based Key Questions	Science and Engineering Practices (Goal 11)	Interdisciplinary Connections
12.F Explore changes related to the weather and seasons.	Why do the leaves change color?	**Plan and Carry Out Investigations** Work with students to create a fair investigation observing local trees.	**3.A.ECa** With teacher assistance, ask and answer questions about details in a nonfiction book

	Why do leaves fall to the ground? Do all leaves fall off?	**Observe** Using a graphic organizer, collect, and describe information from student observations. **Generate Conclusions** Generate explanations and communicate ideas and/or conclusions about their investigations**.**	**10.A.ECb** Gather data about themselves and their surroundings to answer meaningful questions.

Priority Standards - Kindergarten

Whether in the classroom or engaged in distance learning, teachers should select elements from the Disciplinary Core Ideas under each of the following overarching standards that best support student conceptual learning. Performance Expectations can be used as examples of assessment scaffolds. In the example that follows, a segment of a storyline is presented to illustrate how teachers can lead students through the use of the Science and Engineering Practices.

Overarching Standards
K-PS2: Motion and Stability: Forces & Interactions
K-PS3: Energy
K-LS1: From Molecules to Organisms: Structures & Processes
K-ESS2: Earth's Systems
K-ESS3: Earth and Human Activity

Example

Disciplinary Core Ideas and Elements	Phenomenon-based Key Questions	Science and Engineering Practices	Interdisciplinary Connections
PS2.A: Forces and Motion Pushes and pulls can have different strengths and directions.	Why does the soccer ball change directions when it is kicked?	**Planning and Carrying out Investigations** Plan an investigation to figure out the relationship between kick strength and how much the ball changes direction. **Modeling**	**SL.K.3** Students ask questions about differences in a soccer ball's behavior when kicked with different forces. **K.MD.A.1** Students can describe measurable aspects of the soccer ball, such as its speed or direction of motion.

		Students draw models of the paths a soccer ball follows when kicked with different strengths. They use arrows to show relative speed.	

Priority Standards - 1st

Whether in the classroom or engaged in distance learning, teachers should select elements from the Disciplinary Core Ideas under each of the following overarching standards that best support student conceptual learning. Performance Expectations can be used as examples of assessment scaffolds. *In the example that follows, a segment of a storyline is presented to illustrate how teachers can lead students through the use of the Science and Engineering Practices.*

Overarching Standards

1-PS4: Waves and their Applications in Technologies for Information Transfer

1-LS1: From Molecules to Organisms: Structures & Processes

1-LS3: Heredity: Inheritance and Variation of Traits

1-ESS1: Earth's Place in the Universe

Example

Disciplinary Core Ideas and Elements	Phenomenon-based Key Questions	Science and Engineering Practices	Interdisciplinary Connections
LS3.A Inheritance of traits Young animals are very much, but not exactly like, their parents. Plants are also very much, but not exactly, like their parents.	Why is the puppy tan when one of his parents is white and one of his parents is black?	**Constructing Explanation and Designing Solutions** Using a venn diagram students explain the similarities and differences between offspring and their parents.	**RI.1.3** Describe the connection between two individuals, events, ideas, or pieces of information in a text. **MP.2** Reason abstractly and quantitatively. Students can look at the puppy family history (data) to notice that many more dogs have had floppy ears than pointy ears and write an explanation for which type of ears puppies are likely to have.

Priority Standards - 2nd

Whether in the classroom or engaged in distance learning, teachers should select the Disciplinary Core Ideas under each of the following standards that best support student conceptual learning. Performance Expectations can be used as examples of assessment scaffolds. *In the example* *that follows, a segment of a storyline is presented to illustrate how teachers can lead students through the use of the Science and Engineering Practices.*

Overarching Standards
2-PS1: Matter and its Interactions
2-LS2: Ecosystems: Interactions, Energy, and Dynamics
2-LS4: Biological Evolution: Unity Diversity
2-ESS1: Earth's Place in the Universe
2-ESS2: Earth's Systems

Example

Disciplinary Core Ideas and Elements	**Phenomenon-based Key Questions**	**Science and Engineering Practices**	**Interdisciplinary Connections**
ESS1.C: The History of Planet Earth Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe.	Why does the earth form large cracks? How is a valley formed?	**Constructing Explanations and Designing Solutions** Students construct an explanation of how the earth changes overtime, by explaining the effects of erosion.	**RI.2.3** Describe the connection between a series of historical events. Students can read texts about the stages of volcano formation and describe the cause and effect relationship between the tectonic plates moving and lava entering the Earth's crust. **MP.4** Model with mathematics. Put volcano formation events on a timeline to model how slowly the Earth changes over time.

Priority Standards - 3rd

Whether in the classroom or engaged in distance learning, teachers should select the Disciplinary Core Ideas under each of the following standards that best support student conceptual learning. Performance Expectations can be used as examples of assessment scaffolds. In the example that follows, a segment of a storyline is presented to illustrate how teachers can lead students through the use of the Science and Engineering Practices.

Overarching Standards
3-PS2: Motion and Stability: Forces and Interactions
3-LS1: From Molecules to Organisms: Structure and Processes
3-LS2: Ecosystems: Interactions, Energy, and Dynamics
3-LS3: Heredity: Inheritance and Variation of Traits

[3-LS4: Biological Evolution: Unity and Diversity](#)
[3-ESS2: Earth's Systems](#)
[3-ESS3: Earth and Human Activity](#)

Example

Disciplinary Core Ideas and Elements	**Phenomenon-based Key Questions**	**Science and Engineering Practices**	**Interdisciplinary Connections**
PS2.B: Types of Interactions Electric and magnetic forces between a pair of objects do not require that the object be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distance apart and, for forces between two magnets, on their orientation relative to each other.	How does the distance between magnets change the strength of the force? How does the location of magnets affect the direction of the magnetic force?	**Asking Questions and Defining Problems** Students engage with magnets and various materials to make observations and ask questions about the different properties of magnets. **Planning and Carrying out Investigations** Students plan and conduct an investigation to determine different properties of magnets based off of their initial observations.	**RI.3.1** Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. **RI.3.3** Describe the relationship between a series of scientific ideas or concepts using language that pertains to cause and effect.

Priority Standards - 4th

Whether in the classroom or engaged in distance learning, teachers should select the Disciplinary Core Ideas under each of the following standards that best support student conceptual learning. Performance Expectations can be used as examples of assessment scaffolds. *In the example that follows, a segment of a storyline is presented to illustrate how teachers can lead students through the use of the Science and Engineering Practices.*

Overarching Standards
[4-PS3: Energy](#)
[4-PS4: Waves and their Applications in Technologies for Information Transfer](#)
[4-LS1: From Molecules to Organisms: Structures and Processes](#)
[4-ESS1: Earth's Place in the Universe](#)
[4-ESS2: Earth's Systems](#)
[4-ESS3: Earth and Human Activity](#)

Example

Disciplinary Core Ideas and Elements	Phenomenon-based Key Questions	Science and Engineering Practices	Interdisciplinary Connections
ESS2.B: Plate Tectonics and Large-Scale System interactions The locations of deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges.	Why have I never seen a volcano in my town?	**Analyze and Interpret Data** Students will work to plot a data set from recent volcanic eruptions around the world to reveal patterns that suggest relationships. **Engage in Arguments from Evidence** Students will use their findings to explain and predict where they think a volcano may begin to form next.	**RI.4.7** Interpret information presented visually, orally, or quantitatively and explain how the information contributes to an understanding. **MP4** Model with mathematics.

Priority Standards - 5th

Whether in the classroom or engaged in distance learning, teachers should select the Disciplinary Core Ideas under each of the following standards that best support student conceptual learning. Performance Expectations can be used as examples of assessment scaffolds. *In the example that follows, a segment of a storyline is presented to illustrate how teachers can lead students through the use of the Science and Engineering Practices.*

Overarching Standards

5-PS1: Matter and its Interactions
5-PS2: Motion and Stability: Forces and Interactions
5-PS3: Energy
5-LS1: From Molecules to Organisms: Structures and Processes
5-LS2: Ecosystems: Interactions, Energy, and Dynamics
5-ESS1: Earth's Place in the Universe
5-ESS2: Earth's Systems

5-ESS3: Earth and Human Activity

Example

Disciplinary Core Ideas and Elements	Phenomenon-based Key Questions	Science and Engineering Practices	Interdisciplinary Connections
ESS2.C The Roles of Water in Earth's Surface Processes Nearly all of Earth's available water is in the ocean. Most fresh water is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere.	Why do we need to conserve water? How much water is in the world? How much fresh water is in the world?	**Developing and Using Modes** Students will use various materials to develop a model, to illustrate the amounts of fresh water in the world. **Analyzing and Interpreting Data** Students will use data from world maps to determine the relative amounts of fresh, salt, and frozen water.	**RI.5.7** Draw on information from multiple print or digital resources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. **MP.2** Reason abstractly and quantitatively. **MP.4** Model with mathematics.

Science Learning: Middle School

Priority Standards - Physical Science

Whether in the classroom or engaged in distance learning, teachers should select Elements of Disciplinary Core Ideas under each of the following overarching standards that best support student conceptual learning. Performance Expectations can be used as examples of assessment frameworks.

Overarching Standards

MS-PS1: Matter and Its Interactions

MS-PS2: Motion and Stability: Forces and Interactions

MS-PS3: Energy

MS-PS4: Waves and their Applications in Technologies for Information Transfer

Example: Thermal Energy

Getting Started by Observing Phenomena	Students **engage in an investigation** to collect observational data. Students make observations about the rate at which ice melts in a typical fast food cup vs a double walled "fancy" cup.

 Photo:https://www.openscied.org/6-2-thermal-energy-overview/	Students **discuss their observations** and include other related phenomena in which they have noticed the temperature change. Students generate and share a list of these phenomena.
Generating Questions to Investigate	After exploring phenomena, students **ask questions** to investigate in their teams. Students begin by brainstorming a list of questions. The students collaboratively select essential questions.
Making Sense of Initial Thoughts	Students create **initial models** explaining the how and why of the phenomenon of temperature changes in the cups. Students are asked to represent their initial thinking by writing, drawing, and sharing their own initial models.
Gathering Evidence to Answer Questions	Using students' questions and initial models, students **plan and carry out investigations** to gather more evidence regarding the phenomena. • Students **design and evaluate** different cup designs to test the effects of specific features when compared to the control cups. • Students **analyze temperature data** in order to find patterns and relationships between temperature change and cup design. • Students **utilize simulations** to visualize particle behavior. • Students use digital resources to **collect evidence through research.**
Making Sense of Evidence	Students **make sense** of the phenomena by discussing the evidence they collected through **investigations, data analysis, simulations, and research**. These discussions enable the students to **engage in argument** from evidence and take place after each learning experience. Students discuss and make **revisions to their model** in order to help them make sense of the phenomena from the evidence collected. During these discussions, students **revise their initial models** and **ask new questions** to drive learning forward. These new questions may require further **investigation** in order to reach a sufficient **explanation** of the phenomenon.
Communicate Findings and Conclusions	Students complete a gallery walk where they **critique and provide feedback** on the models and explanations of their peers. After students provide and receive feedback from

	others, they **revise their models** and **construct a final explanation** of the phenomenon.

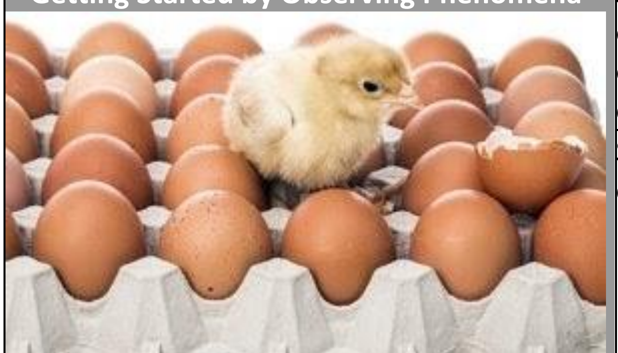
Priority Standards - Life Science

Whether in the classroom or engaged in distance learning, teachers should select Elements of Disciplinary Core Ideas under each of the following overarching standards that best support student conceptual learning. Performance Expectations can be used as examples of assessment frameworks.

Overarching Standards

MS-LS1: From Molecules to Organisms: Structures and Processes
MS-LS2: Ecosystems: Interactions, Energy, and Dynamics
MS-LS3: Heredity: Inheritance and Variation of Traits
MS-LS4: Biological Evolution: Unity and Diversity

Example: Cells and Development

Getting Started by Observing Phenomena  Photo: https://www.nextgenstorylines.org/how-do-eggs-become-chickens-and-other-living-things	Students **engage in an investigation** to collect observational data. To do this, students make observations of chicken eggs that hatch into chicks and eggs that do not hatch.
	Students **discuss their observations** of a hen caring for her eggs.
Generating Questions to Investigate	After exploring phenomena, students **ask questions** about what chicken eggs need in order to hatch and what is happening inside of the eggs. Students begin by brainstorming a list of questions. The students collaboratively select essential questions for investigation.
Making Sense of Initial Thoughts	Students create **initial models** explaining what is occurring in an egg that hatches into a chick and an egg that does not hatch. Students represent this initial thinking by writing, drawing, and sharing their own initial models to create a class consensus model.
Gathering Evidence to Answer Questions	Using students' questions and initial models, students decide how and what they will investigate.

	• Students **collect evidence** through print research and digital resources by reading about the conditions necessary for eggs to hatch. • Students **conduct an investigation** by completing egg dissection of a store-bought egg. • Students **utilize simulations** to explore the embryonic development of chickens and other living organisms. • Students use microscopes and/or **digital resources** to observe cellular structures and **analyze data** about cell division.
Making Sense of Evidence	Students **make sense** of the phenomena by discussing the evidence they collected through **investigations, data analysis, simulations, and research**. These discussions enable the students to **engage in argument** from evidence and take place after each learning experience. Students discuss and make **revisions to their model** in order to help them make sense of the phenomena from the evidence collected. During these discussions, students **revise their initial models** and **ask new questions** to drive learning forward. These new questions may require further **investigation** in order to reach a sufficient **explanation** of the phenomenon.
Communicate Findings and Conclusions	Based on the evidence from their learning experiences, students modify their **initial models** to generate final models that explain how chickens grow and hatch from eggs.

Priority Standards - Earth and Space Science

Whether in the classroom or engaged in distance learning, teachers should select Elements of Disciplinary Core Ideas under each of the following overarching standards that best support student conceptual learning. Performance Expectations can be used as examples of assessment frameworks.

Overarching Standards
MS-ESS1: Earth's Place in the Universe
MS-ESS2: Earth's Systems
MS-ESS3: Earth and Human Activity

Example: Earth in Space

Getting Started by Observing Phenomena	Students **engage in an investigation** to collect observational data. Students observe the sky noticing patterns in the moon, sun, and stars.
	Students **discuss their observations** and include other curious phenomena found in the sky such as eclipses, seasons, asteroids, planets, and so on. Students generate and share a list of these phenomena.
Generating Questions to Investigate	After exploring phenomena, students **ask questions** to investigate in their teams. Students begin by brainstorming a list of questions. The students collaboratively select essential questions.
Making Sense of Initial Thoughts	Students create **initial models** explaining the how and why of phenomena related to the moon, Earth, and sun. Students are asked to represent their initial thinking by writing, drawing, and sharing their own initial models.
Gathering Evidence to Answer Questions	Using students' questions and initial models, students decide how and what they will **investigate**.
	• Students **analyze data** collected from sky observations. • Students **conduct an investigation to model** patterns of motion in the Earth, Moon, Sun System in order to explain the phenomena. • Students utilized **simulations** to analyze patterns of motion in the Earth, Moon, Sun System. • Students **collect evidence** through print research and digital resources in order to explain the phenomena. .
Making Sense of Evidence	Students **make sense** of the phenomena by discussing the evidence they collected through **investigations, data analysis, simulations, and research**. These discussions enable the students to **engage in argument** from evidence and take place after each learning experience. Students discuss and make **revisions to their model** in order to help them make sense of the phenomena from the evidence collected. During these discussions, students **revise their initial models** and **ask new questions** to drive learning forward. These new questions may require further **investigation** in order to reach a sufficient **explanation** of the phenomenon.
Communicate Findings and Conclusions	Based on the evidence from their learning experiences, students modify their **initial models** to **explain** phenomena related to the moon, Earth, and sun.

Science Learning: High School

Priority Standards - Physical Science

Whether in the classroom or engaged in distance learning, teachers should select Elements of Disciplinary Core Ideas under each of the following overarching standards that best support student conceptual learning. Performance Expectations can be used as examples of assessment frameworks. In the example that follows, a segment of a storyline is presented to illustrate how teachers can lead students through the use of the Science and Engineering Practices.

Overarching Standards

HS-PS1 Matter and its Interactions

HS-PS2: Motion and Stability: Forces and Interactions

HS-PS3: Energy

HS-PS4: Waves and their Applications in Technologies in Information Transfer

Example

PS 1.B Chemical Reactions

1. Phenomenon: An endothermic reaction (lab demo) https://www.youtube.com/watch?v=GQkJI-Nq3Os
2. **Asking questions**: Students ask questions about phenomenon and share questions with others via a driving question board or an online sharing tool of your choice. Students will pose questions that ask about how mixing two liquids can make something freeze or if the substances are dangerous by themselves. Discuss what signs indicate a chemical reaction, rather than a physical change. This can lead to the concept of chemical processes, energy, collisions of molecules and the rearrangements of atoms into new molecules.
3. **Planning and Carrying Out an Investigation**: Students can use basic household items to model the reaction they saw in the video using baking soda, pink lemonade powder, salt and water.
4. **Obtaining, Evaluating, and Communicating Information**: Students use collected data to support their claim and share with their peers. Teachers may pose new questions regarding their findings such as: Does the amount of salt affect the temperature at the end of the experiment? Do all salts react to absorb heat when mixed with water? Students may then revise their experiment to determine whether these variables had an impact on their results and share this new information.
5. Continuing the story: This may lead to activities that involve developing and using models (using materials at home or technology tools) to explain the structure and function of molecules involved in these reactions and explain how they may change.

Priority Standards - Life Science

Whether in the classroom or engaged in distance learning, teachers should select Elements of Disciplinary Core Ideas under each of the following overarching standards that best support student conceptual learning. Performance Expectations can be used as examples of assessment frameworks. In the example that follows, a segment of a storyline is presented to illustrate how teachers can lead students through the use of the Science and Engineering Practices.

Overarching Standards

HS-LS1: From Molecules to Organisms: Structure & Processes
HS-LS2: Ecosystems: Interactions, Energy, and Dynamics
HS-LS3: Heredity: Inheritance and Variation of Traits
HS-LS4: Biological Evolution: Unity and Diversity

Example

LS 2.D Social Interactions and Group Behavior

1. Phenomenon: Lions versus Water Buffalo https://youtu.be/LU8DDYz68kM
2. **Asking questions**: Students ask questions about phenomenon and share questions with others via a driving question board or an online sharing tool of your choice. Students will pose questions that ask about the lions or water buffalo and how they are behaving in the clip. This can lead to the concept of some organisms living in groups.
3. **Planning and Carrying Out an Investigation**: Students may go outside to make observations of organisms that also live in groups (insects, birds, etc). Students should consider whether these organisms are living in groups for the same reasons as the lions or water buffalo. Teachers may offer methods for collecting data or allow students to create their own. What patterns do they see? What claims can students make about their behavior of the animals they observed outside?
4. **Engaging in Argument from Evidence**: Students share their observations and any data collected to explain how their data supports their claim. Students may present their evidence and explain how their evidence supports their claim in a myriad of ways using the technology available to the teacher.
5. Continuing the story: This may lead to activities around genetics that enable students to figure out how the lions are related to one another and/or activities around macromolecules and energy where students can distinguish what these different species consume.

Priority Standards - Earth and Space Science

Whether in the classroom or engaged in distance learning, teachers should select Elements of Disciplinary Core Ideas under each of the following overarching standards that best support student conceptual learning. Performance Expectations can be used as examples of assessment frameworks. In the example that follows, a segment of a storyline is presented to illustrate how teachers can lead students through the use of the Science and Engineering Practices.

Overarching Standards

HS-ESS1: Earth's Place in the Universe
HS-ESS2: Earth's Systems
HS-ESS3: Earth and Human Activity

Example

ESS 2.C The Roles of Water in Earth's Surface Processes

1. Phenomenon: Time Lapse: The Power of Water https://youtu.be/N8C9OaBRW2g

2. **Asking questions**: Students ask questions about phenomenon and share questions with others via a driving question board or an online sharing tool of your choice. Students will pose questions that ask about the effects of weathering. This can lead to the concept of water properties and erosion. What did they observe? Why did that happen?
3. **Planning and Carrying Out an Investigation**: Students will fill a plastic water bottle or hard plastic container completely full of water and put a lid on tightly. They will freeze it overnight and make observations the next day. What did they observe? Why did that happen?
4. **Engaging in Argument from Evidence**: Students share their observations and any data collected to explain how their data supports their claim. Students may present their evidence and explain how their evidence supports their claim in a myriad of ways using the technology available to the teacher and students.
5. Continuing the story: This may lead to activities around modeling land formation as seen on a walk with their family and a discussion of the role water plays in the weather or human sustainability when it comes to water use in the home.