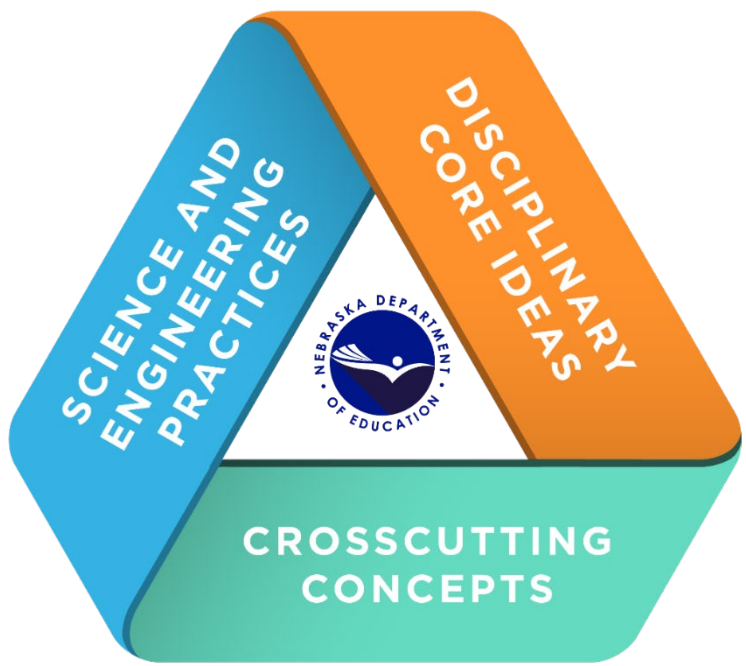
Teacher's Guide to the Nebraska College and Career Ready Standards for Science 2024

Kindergarten



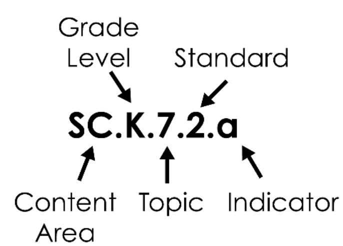
Contents

Content Area Standards Structure

The overall structure of Nebraska's College and Career Ready Standards for Science (CCR-Science) reflects the two-tier structure common across all Nebraska content area standards. The two levels within the structure include **standards** and **indicators**. The **standards** are broad, overarching content-based statements that describe the basic cognitive, affective, or psychomotor expectations of student learning. The standards, across all grade levels, reflect long-term goals for learning. **Indicators** further describe what students must know and be able to do to meet the standard. These performance-based statements provide clear expectations related to student learning in each content area. Additionally, indicators provide guidance related to the assessment of student learning. This guidance is articulated by including ***assessment boundary*** statements.

The CCR-Science standards describe the knowledge and skills that students should learn, but they do not prescribe particular curriculum, lessons, teaching techniques, or activities. Standards describe what students are expected to know and be able to do, while the local curriculum describes how teachers will help students master the standards. A wide variety of instructional resources may be used to meet the state content area standards. Decisions about curriculum and instruction are made locally by individual school districts and classroom teachers. The Nebraska Department of Education provides guidance related to high-quality instructional materials selection and implementation. Please visit the Nebraska Instructional Materials Collaborative.

In addition to a common structure for content area standards, a consistent numbering system is used for content area standards. The numbering system is as follows:



Content Area Standards Overview

Nebraska Revised Statute 79-760.01 requires the State Board of Education to adopt measurable academic content standards for the areas of reading, writing, mathematics, science, and social studies. Standards describe grade-level expectations for given content areas and provide a framework upon which Nebraska districts develop, establish, and implement curriculum. For effective teaching and learning to occur, the content area standards should drive local decisions related to instructional materials, resources, and interim, formative, and summative assessments.

The Nebraska Department of Education has identified quality criteria in the development of content area standards. These criteria ensure that standards are grounded in a strong research base of human cognition, motivation, and teaching and learning and describe essential knowledge and skills for college, career, and civic readiness. The revised science standards, written by teams of Nebraska educators and reviewed by local and national experts, were developed with the following indicators of quality:

Measurable: Standards provide benchmarks against which student progress toward learning goals can be measured.

Appropriately challenging: Standards must build in complexity so that by the end of grade 12, students are prepared for postsecondary education and the workforce.

Connected: Student learning is most effective when it connects knowledge and skills to related topics and authentic applications.

Clearly worded: Content area standards must effectively communicate what students should know and be able to do.

Scaffolded: Indicators in the Nebraska content area standards scaffold student learning by sequencing connected knowledge and skills across grades so that students build and deepen understanding and ability over time.

Specific: Specificity assures that the language used in standards and indicators is sufficiently detailed to be accurately interpreted by educators.

Organization and Structure of College and Career Ready Standards for Science (CCR-Science)

Nebraska's College and Career Ready Standards for Science (CCR-Science) are organized by grade level for grades K-8 and by grade span in high school. K-5 standards are organized to reflect the developmental nature of learning for elementary students and attend to the learning progressions that build foundational understandings of science. By the time students reach middle school (Grades 6-8), they build on this foundation in order to develop more sophisticated understandings of science concepts through high school. The topic progression for the CCR-Science standards is included in Appendix A: Topic Progression.

Within each grade level/span the standards are organized around topics, and each standard addresses one topic. Each CCR-Science standard begins with the common stem: "Gather, analyze, and communicate…" This stem highlights long-term learning goals associated with rigorous science standards and provides guidance for high quality classroom instruction. To facilitate high-quality instruction, students actively gather evidence from multiple sources related to the topics. Evidence is carefully analyzed in order to describe and explain natural phenomena, and then, students communicate their understanding of the content using a variety of tools and strategies. It is important to note that while topics are introduced in a spiraled model, they are connected, and deeper understanding at subsequent grade levels and spans requires foundational understanding of multiple topics.

The indicators reflect the three dimensions of science learning outlined in *A Framework for K-12 Science Education*[1]. Each CCR-Science indicator includes a disciplinary core idea, <u>a crosscutting concept</u> (<u>underline</u>), and a **science and engineering practice** (**bold**).

Disciplinary Core Ideas (DCI)

The disciplinary core ideas are the focused, limited set of science ideas identified in the Framework as necessary for ALL students throughout their education and beyond their K-12 school years to achieve scientific literacy. The limited number of disciplinary core ideas allows more time for students and teachers to engage in the science and engineering practices as they deeply explore science ideas. To allow students to continually build on and revise their knowledge and abilities, the disciplinary core ideas are built on developmental learning progressions (Appendix A).

Crosscutting Concepts (CCC)

The crosscutting concepts are used to organize and make sense of disciplinary core ideas. They serve as tools that bridge disciplinary boundaries and deepen understanding of science content. With grade-appropriate proficiency, students are expected to use patterns (cause and effect, scale, proportion, and quantity), systems and system models (energy and matter, structure and function) and stability and change as they gather, analyze, and communicate scientific understanding. These crosscutting concepts provide structure for synthesizing knowledge from various fields into a coherent and scientifically based view of the world.

Science and Engineering Practices (SEP)

The science and engineering practices are used by students to demonstrate understanding of the disciplinary core ideas and crosscutting concepts. Engaging in the practices of science and engineering helps students understand the wide range of approaches used to investigate natural phenomena and develop solutions to challenges. Students are expected to demonstrate grade-appropriate proficiency in asking questions and defining problems, developing and using models, planning and carrying out investigations, analyzing and interpreting data, using mathematics and computational thinking, constructing explanations and designing solutions, engaging in argument from evidence, and obtaining, evaluating, and communicating information as they gather, analyze, and communicate scientific information.

Each science indicator focuses on one crosscutting concept and one science and engineering practice as an example to guide assessment. Curriculum, instruction, and assessment should reflect authentic science practice and be phenomena-based. Furthermore, curriculum, instruction, and assessment should use crosscutting concepts and science and engineering practices that go beyond what is stated in the indicator to better reflect authentic science practice. Utilizing the range of SEPs and CCCs will support deeper learning and greater understanding of the DCIs.

The following table lists the disciplinary core ideas, <u>crosscutting concepts</u>, and **science and engineering practices**:

Science and Engineering Practices	**Disciplinary Core Ideas**	**Crosscutting Concepts**
• Asking Questions and Defining Problems	LS1: From Molecules to Organisms: Structures and Processes	Patterns
• Developing and Using Models	LS2: Ecosystems: Interactions, Energy, and Dynamics	Cause and Effect
• Planning and Carrying Out Investigations	LS3: Heredity: Inheritance and Variation of Traits	Scale, Proportion, and Quantity
• Analyzing and Interpreting Data	LS4: Biological Evolution: Unity & Diversity	Systems and System Models
• Using Mathematics and Computational Thinking	PS1: Matter and Its Interactions	Energy and Matter
• Constructing Explanations and Designing Solutions	PS2: Motion and Stability: Forces and Interactions	Structure and Function
• Engaging in Argument from Evidence	PS3: Energy	Stability and Change
• Obtaining, Evaluating, and Communicating Information	PS4: Waves and Their Applications in Technologies for Information Transfer	
	ESS1: Earth's Place in the Universe	
	ESS2: Earth's Systems	
	ESS3: Earth and Human Activity	
	ETS1: Engineering Design	

A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas. Washington, DC: The National Academies Press, 2012.

Icon Titles & Descriptions

Nebraska Connections

Opportunities to teach science using topics directly relevant to our state (e.g., Ogallala Aquifer, agriculture, Nebraska-specific flora and fauna, Nebraska's rich geologic history, etc.) are listed throughout the CCR-Science standards as "Nebraska Connections." These connections allow educators to use local, regional, and state-specific contexts for teaching, learning, and assessment. Educators should use these as recommendations for investigation with students. Additionally, assessment developers have the opportunity to use the Nebraska contexts to develop Nebraska-specific examples or scenarios from which students would demonstrate their general understanding. This approach provides the opportunity for educators to draw upon Nebraska's natural environment and rich history and resources in engineering design and scientific research to support student learning.

Educator Support & Resources

Implementation

Effective science teaching, learning, and assessments should integrate disciplinary core ideas, crosscutting concepts, and **science and engineering practices**. Integration of the three dimensions will allow students to explain scientific phenomena, engage in sensemaking, design solutions to problems, and build a foundation upon which they can continue to learn and be able to apply science knowledge and skills within and outside the K-12 education arena. While each indicator incorporates the three dimensions, this alone does not drive student outcomes. Ultimately, student learning depends on how the standards are translated to instructional practices.

To support educators while they explore and implement content standards, the Nebraska Department of Education has developed the Content Area Standards Implementation Framework. The Framework is based on implementation science and includes stages from "Exploration" to "Deep Implementation," the types of work and activities associated with each stage, and roles of educators in ensuring successful implementation. The goal of the framework is to guide the alignment of standards, instruction, materials, and assessment to create a coherent system of learning.

Phenomenon-based Instruction

Three-dimensional instruction offers authentic learning experiences when students engage in describing and explaining the natural world. This involves focusing the conceptual learning on anchoring and investigative phenomena to better comprehend their observations. Students utilize evidence in the sensemaking process to build concepts in their minds. Phenomena are natural, observable events that we can explain or predict using our science knowledge (the singular form of phenomena is phenomenon).

Teachers are encouraged to adopt phenomenon-based instruction to fully engage students in three-dimensional science learning. This method can be summarized in three steps:

1. Introduce a new unit or concept with a phenomenon: Start by presenting a phenomenon that is relevant to students' lives. This engages them in asking questions about their observations and fosters a desire to learn more. Many teachers already use this approach by introducing new units or concepts with tangible examples such as pictures, videos, demonstrations, or laboratory experiences.
2. Engaging in science and engineering practices: Provide opportunities for students to gather and reason about information to explain the phenomenon. Sensemaking represents a shift in science instruction where teachers refrain from giving students direct answers. Instead, they should offer multiple opportunities for students to explore the phenomenon individually and in groups, while scaffolding their learning. This approach supports students in developing an understanding of scientific concepts and constructing their own explanations for the phenomenon.
3. Communicating understanding: Ensure students have multiple opportunities to articulate their thinking about why the phenomenon occurs. To deepen their understanding, check that student explanations progress from simple descriptions of what they observe to more complex explanations and predictions of what they think is happening with the phenomenon.

Throughout this process, teachers should not provide direct answers about the phenomenon. Instead, they should facilitate experiences that help students reach an appropriate understanding. Often, this involves engaging students in scientific arguments where they challenge each other's claims and explanations using their observations and collected evidence.

Teacher Guides

The Teacher Guides were created to provide guidance for developing effective instruction aligned to Nebraska’s College and Career Ready Science Standards. They are intended to support teachers, administrators, science specialists, ESU’s, instructional coaches, parents, and other stakeholders as they plan instruction and assessment at a local level.

The Teacher Guides are meant as a resource document which unwraps the indicators to support teacher’s understanding of the standards. They are not meant to be used by students, and therefore they are not written in student-friendly language.

Nebraska Science Classroom Formative Task Repository

The Nebraska Science Classroom Formative Task Repository is a collection of K-12 formative tasks aligned to the indicator level of the standards. Tasks were developed by Nebraska educators and cover the breadth of the standards giving students an opportunity to provide evidence of what they can know and can do related to that standard.

Graduation Requirements

The high school life science, physical science, and Earth and space science standards are intended for ALL students to have learned by the end of 30 credit hours of high school science courses.

Rule 10

> 003.05 Graduation Requirements. Each high school must require from grades nine through twelve at least 200 credit hours for graduation, for which at least 80 percent must be from the core curriculum. The number of credit hours given for a course may be less than the number of instructional units and may be increased up to 25 percent above the number of instructional units.
>
> > 003.05A3 Science. Thirty credit hours of science with course content that includes biological, earth/space, and physical science concepts with corresponding science inquiry skills and laboratory experience.

Course examples that offer the scope and sequence to include all three domains are included in Appendix B: HS Integrated Science Course Model.

Explanation of the Teacher’s Guide to the Nebraska CCR-Science Standards

Standard Code [Content Area].[Grade Level].[Topic].[Standard]

The standard description is listed here to give broader context to this and other indicators in the standard. The standard description articulates the core ideas and theme. Standards represent significant areas of learning within grade-level progressions and content areas. Each standard introduction is an orientation for the teacher and provides an overall view of the concepts needed for foundational understanding.

Indicator Code [Content Area].[Grade Level].[Topic].[Standard].[Indicator]

Within each standard are indicators. The indicator is listed here as found in the CCR-Science Standards. Indicators in the CCR-Science Standards are written as student performance expectations that describe what students must know and be able to do by the end of an instructional sequence. An indicator represents a proficiency level for that grade. An indicator articulates 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 some indicators within a standard may be more comprehensive than others, all indicators are essential for a comprehensive understanding of a standard’s purpose.

The DCIs will be in ordinary text. The CCCs will be underlined. The SEPs will be in bold. Indicators also include clarification statements and assessment boundaries when needed. Clarification statements offer further clarification to the indicators content or offer examples and are indicated with gray text. Assessment boundaries are the limitations given to the state-developed assessments and are indicated with red text.

NGSS Comparison: [NGSS Code]

The CCR-Science Standards are strongly influenced by the Next Generation Science Standards (NGSS). Teachers can use the NGSS code to find instructional resources. There are many resources that have been created that compare to each NGSS code. It is important to note that the NGSS codes use dashes and end in a number (e.g., 5-PS1-3), and the DCIs use dots and end in a letter (e.g., PS1.A).

Other Indicators in this Standard

Each standard requires all of the indicators to provide the full understanding of the concept knowledge, skills, and lenses needed to demonstrate proficiency for that standard. The indicators included in the standard will be listed here under their code.

Concepts and Skills to Master

Foundation Boxes:

The foundation boxes provide clarity for planning by explicitly and intentionally identifying the three dimensions found in the standard. Teachers should frame their planning around what students will be doing to demonstrate 3D learning. The table identifies the minimum level of complexity expected for proficiency in each of the three dimensions of a standard. Individual classroom instruction can and should use additional Science and Engineering Practices (SEPs) and Crosscutting Concepts (CCCs) to support student sense-making. The information in this table is based on research found in A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas (NRC, 2012), adds specificity on how a standard should be interpreted and provides additional ideas of instructional practices related to the standard. The intent is to help the teacher move students into deeper and more focused use of the SEP, CCC, and DCI. The use of supporting SEPs and CCCs is an integral part of robust instruction. The purpose of supporting SEPs and CCCs is to allow multiple ways to approach knowledge, skills, and abilities. Teachers should use the focal SEPs and CCCs during instruction but may utilize supporting SEPs and CCCs to broaden instruction.

Science and Engineering Practice (SEP)	Crosscutting Concept (CCC)
[Science and Engineering Practice Name]: • The science and engineering practice(s) found in the indicator written in the context of the content (DCI). • Students do and use the Science and Engineering Practice (SEP). Practices refer to the things that scientists and engineers do and how they actively engage in their work. This section provides more clarification for what students should be doing to engage in this practice. There are various ways that each practice can be used, as articulated in the K-12 Framework for Science Education (NRC, 2012). This information primarily comes from the NSTA's SEP Matrix.	[Crosscutting Concept Name]: • The crosscutting concept(s) found in the indicator written in the context of the content (DCI). • Students think and connect through the Crosscutting Concept (CCC) in order to reason. Crosscutting concepts provide a lens to focus student thinking in order to support students to make sense of science and engineering concepts to be able to explain phenomena. Teachers encourage students to frame their thinking around the terminology of the CCCs through questions and classroom discussions. This information primarily comes from the NSTA's CCC Matrix.

Disciplinary Core Idea (DCI)
([DCI Code]): [DCI Name]

- Students know and apply the Disciplinary Core Idea (DCI) in their thinking and reasoning.

These are the core ideas from the K-12 Framework for Science Education (NRC, 2012) that align to this standard. This section is NOT a checklist of content for students to memorize. The purpose of this section is to articulate what core ideas students should know and be able to use to support the explanation of phenomena. If a standard identifies multiple DCIs, this section will be repeated for each core idea. This information primarily comes from the K-12 Framework for Science Education.

Possible Science and/or Engineering Phenomena to Support 3D Instruction

In 3D classroom instruction, a real-world phenomenon centered around a scientific concept or engineering problem is used as the starting point for student learning. The phenomenon encourages students to ask questions, investigate, and ultimately construct explanations for why the phenomenon occurs. Each core guide lists potential phenomena that could be used during instruction. It is important for teachers to understand that the best phenomena are those that are relevant to the context of their students' lives and experiences.

Phenomena are also a critical component of science assessment. When developing classroom assessments, teachers should select different phenomena than those used during standard instruction but require the use of the same concepts. This allows the assessment to measure student proficiency in each of the three dimensions through a novel situation rather than simply assessing students' ability to recall a previous classroom experience.

This document provides a list of possible phenomena; however, teachers should not consider this list all-inclusive. Many appropriate phenomena could be used to investigate and assess each standard.

Evidence Statements

What does it look like to demonstrate proficiency on this indicator?

This section provides statements that delineate what students should be able to know and do to demonstrate proficiency of an indicator. These statements can be used for learning goals, tasks, and assessments during the instructional sequence and should address how the three dimensions interact. These proficiency statements are not intended to be used as curriculum.

Critical Background Knowledge

Grade Band Progressions:

This section illustrates how the three dimensions of science, aligned specifically to an indicator, progress developmentally through grade bands and grade levels. Progressions provide insight into what background knowledge and experience students should have had in prior grades, where teachers should focus science learning in the current grade level, and where students will extend their learning in future grades. Grade band progressions identify where teachers should focus instruction for that grade level in each of the three dimensions. Additionally, progressions are intended to be used to identify areas for student intervention. By looking at previous grade bands, teachers can support students where they are currently and scaffold them to where they need to be by the end of the grade level. The progression table is not intended as a guide for supporting accelerated learning by looking to future grade bands. Accelerated learning should remain in the appropriate grade band, but students could be provided with more depth in their learning experience. This information primarily comes from the NGSS Appendices.

Science and Engineering Practices (SEPs): [SEP name]

The SEPs progress over a student's K-12 science experience. The SEP progressions inform teachers as to how students should be engaging in science and engineering practices. These progressions emphasize the importance of teaching science skills at every grade level because it cannot be assumed that students will develop proficiency in using science and engineering practices independently. With increased developmental ability, students can engage in these practices in more complex ways. Teachers can use the progressions to pre-assess student learning from previous grade bands, adjust instruction, and develop necessary interventions. The science and engineering practices should be addressed to an appropriate developmental level in every grade and science course. In each grade within a grade band, students should be progressing towards mastery of these expectations. Each row of the SEP table delineates a different component of the SEP and how it developmentally progresses.

K-2	**3-5**	**6-8**	**9-12**
[SEP name] in K–2 builds on prior experiences and progresses to ...	[SEP name] in 3–5 builds on K–2 experiences and progresses to ...	[SEP name] in 6– 8 builds on K–5 experiences and progresses to...	[SEP name] in 9-12 builds on K–8 experiences and progresses to college or career experiences.

Crosscutting Concepts (CCCs): [CCC name]

The CCCs progress over a student's K-12 science experience. These progressions inform teachers as to how students should frame their thinking and reasoning. These progressions emphasize the importance of teaching science at every grade level because it cannot be assumed that students will independently be able to use the CCCs to frame their thinking. With increased developmental ability, students will be able to use the crosscutting concepts to think and reason about more complex tasks and phenomena. Teachers can use the progressions to pre-assess student learning from previous grade bands, adjust instruction, and develop interventions as needed. The crosscutting concepts should be addressed to an appropriate developmental level in every grade and science course. In each grade within a grade band, students should be progressing towards mastery of these expectations.

K-2	3-5	6-8	9-12
[CCC name] in K–2 builds on prior experiences and progresses to ...	[CCC name] in 3–5 builds on K–2 experiences and progresses to ...	[CCC name] in 6– 8 builds on K–5 experiences and progresses to...	[CCC name] in 9-12 builds on K–8 experiences and progresses to college or career experiences.

Disciplinary Core Ideas (DCIs): [DCI code] [DCI title]

The core ideas progress over a student's K-12 science experience. These progressions inform teachers as to what core ideas the student should know and be able to use in this grade band. This progression emphasizes the importance of teaching science and engineering at every level because it cannot be assumed that students will develop science and engineering conceptual understanding independently. The core ideas build in complexity as students progress through grade bands. Thus, core ideas must be taught sequentially. Teachers can use the progressions to pre-assess student learning from previous grade bands, adjust instruction, and develop interventions as needed. Note: Most core ideas are taught, at minimum, once within a grade band and not necessarily in sequential grade levels. For example, the DCI PS1.A is taught in 2nd-grade, 5th-grade, 6th-grade, 8th-grade, and chemistry. To clarify this, the provided table identifies the grade and standard for which the DCI is taught in each grade band.

K-2	3-5	6-8	9-12
[NGSS DCI code] in K–2 builds on prior experiences and progresses to ...	[NGSS DCI code] in 3–5 builds on K–2 experiences and progresses to ...	[NGSS DCI code] in 6– 8 builds on K–5 experiences and knowledge and progresses to...	[NGSS DCI code] in 9–12 builds on K–8 experiences and knowledge and progresses to...

Connection to other grade level indicators

This section helps teachers identify potential integration with other indicators that have related disciplinary core ideas at the same grade level or band. When designing curriculum around an anchoring phenomenon and investigative phenomena, identifying how other DCIs relate is pivotal for student understanding of the phenomena and the indicators as significant areas of learning culminating in standards.

Related Cross-Curricular Standards: Current Grade Level

Authentic Connections to Other Content Standards:

This section helps teachers identify potential integration with other content area standards within their grade level. The expectation of the CCR-Science Standards is for all students to be scientifically literate. Scientists use literacy, mathematics, and critical thinking components for gathering, reasoning, and communicating information. In science, students use reading, writing, speaking, listening, and language in ways specific to the discipline of science. ISTE computer science standards are also included when appropriate.

Academic Language Development

Effective science instruction requires discipline-specific communication skills. This means that effective science learning occurs when students are expected to speak, listen, read, and write in ways that are appropriate to science. The tools in this section help teachers facilitate the acquisition of science discourse, which includes academic scientific language. Teaching words or concepts in isolation or prior to experiences that give context (frontloading) robs students of sense-making opportunities that lead to a greater depth of conceptual understanding.

Below is a list of words that students should use during science discourse. These words are not meant to be used as a vocabulary list or to frontload vocabulary prior to instruction. The teacher should introduce these words only after students have first experienced the related concept and used their own words to describe it.

Words to support student discourse related to the Disciplinary Core Ideas (DCIs):

- Supporting discourse words will be listed here.

Sentence stems that utilize academic language:

- Provides a list of sentence frames that scaffold science discourse.

Supporting resources to aide in student discourse:

- STEM Teaching Tool 48: How can teachers guide classroom conversations to support students' science learning?
- STEM Teaching Tool 41: Prompts for Integrating Crosscutting Concepts Into Assessment and Instruction (Download the PDF for example prompts).

Assessment Considerations

Formative Assessment:

A link is provided to the Nebraska-created formative task repository sign-in on the Nebraska Department of Education's website. Exemplar assessments developed by Nebraska teachers are aligned to the indicator. Formative assessments are available for every standard, not every indicator, for grades K-8, and in the domains of physical science, earth science, and life science at the high school level.

Stackable, Instructionally Embedded, Portable Science (SIPS) Assessments:

"This website houses tools, information, and resources developed as part of the Stackable, Instructionally-embedded, Portable Science (SIPS) Assessments project funded for a 36-month period from 2020 through 2023 by a Competitive Grants for State Assessments Grant from the Office of Elementary and Secondary Education at the US Department of Education, awarded to the Nebraska Department of Education." https://sipsassessments.org/

The principled design process found on this website explains how NSCAS tasks and the formative task repository tasks are developed. The SCILLSS Digital Workbook on Designing High Quality Three-dimensional Science Assessments for Classroom Use are found in the "Resources" tab, then select the "Assessment Resources." There are curriculum, instruction, and assessment resources for fifth and eighth grade found in the "Resources" tab, then select "SIPS Resources."

Knowledge, Skills, and Abilities:

These are statements developed from the Evidence Statements when writing tasks that specify what is expected of students to demonstrate (i.e., knowledge, skills, and abilities) to provide evidence that they have learned one or more aspects of the CCR-Science Indicator. These are broad statements that scaffold the logic of the concept and skill development.

Achievement Level Descriptors:

Achievement Level Descriptors are scaled evidence statements of the SEPs and CCCs combined by grade that are used in test score interpretation to determine if a student is performing in the categories of developing, on task, or advanced. Currently these statements are only available in fifth grade and eighth grade.

Kindergarten Teacher's Guide to the Nebraska CCR-Science Standards

The kindergarten standards and indicators help students gather, analyze, and communicate evidence as they formulate answers to questions tailored to student interest and current topics that may include but are not limited to:

What happens if you change how hard you push or pull an object?

Students are able to apply an understanding of the effects of different strengths or different directions of pushes and pulls on the motion of an object to analyze a design solution.

Where do animals live and why do they live there?

Students are also expected to develop understanding of what plants and animals (including humans) need to survive and the relationship between their needs and where they live.

What is the weather like today and how is it different from yesterday?

Students are expected to develop understanding of patterns and variations in local weather and the purpose of weather forecasting to prepare for and respond to severe weather.

Topic Code: SC.K.1 Forces and Interactions: Pushes and Pulls

Standard Code: SC.K.1.1 Gather, analyze, and communicate evidence of forces and their interactions.

The motion of objects can be observed and described. Pushing or pulling on an object can change the speed or direction of an object's motion and can start or stop it. Pushes and pulls can have different strengths and different directions. A bigger push or pull makes things go faster and when objects touch or collide, they push on one another and can change motion.

Indicator Code: SC.K.1.1.a

Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object. Examples of pushes or pulls could include a string attached to an object being pulled, a person pushing an object, a person stopping a rolling ball, and two objects colliding and pushing on each other. ***Assessment is limited to different relative strengths or different directions, but not both at the same time. Assessment does not include non-contact pushes or pulls such as those produced by magnets.***

NGSS Comparison: K-PS2-1

Other Indicators in this Standard

SC.K.1.1.b

Concepts and Skills to Master

Foundation Boxes:

Science and Engineering Practice (SEP)	Crosscutting Concept (CCC)
Planning and Carrying Out Investigations: • Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions. **Connections to the Nature of Science** **Scientific Investigations Use a Variety of Methods** • Scientists use different ways to study the world.	**Cause and Effect:** • Simple tests can be designed to gather evidence to support or refute student ideas about causes.

Disciplinary Core Idea (DCI)

PS2.A: Forces and Motion
- Pushes and pulls can have different strengths and directions.
- Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it.

PS2.B: Types of Interactions
- When objects touch or collide, they push on one another and can change motion.

PS3.C: Relationship Between Energy and Forces
- A bigger push or pull makes things speed up or slow down more quickly.

Possible Science and/or Engineering Phenomena to Support 3D Instruction
- NGSS List of Phenomena
- Phenomena Master List (videos and lessons)
- The Walking Table
- Amazing Slinky Tricks
- GoldieBlox - Toys for Future Engineers (video)
- Stringless Yo Yo
- Bison pushes on car

Evidence Statements

What does it look like to demonstrate proficiency on this indicator?

K.1.1.a Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.

1. **Identifying the phenomenon to be investigated**
   - A. With guidance, students collaboratively identify the phenomenon under investigation, which includes the following idea: the effect caused by different strengths and directions of pushes and pulls on the motion of an object.
   - B. With guidance, students collaboratively identify the purpose of the investigation, which includes gathering evidence to support or refute student ideas about causes of the phenomenon by comparing the effects of different strengths of pushes and pulls on the motion of an object.
2. **Identifying the evidence to address this purpose of the investigation**

A. With guidance, students collaboratively develop an investigation plan to investigate the relationship between the strength and direction of pushes and pulls and the motion of an object (i.e., qualitative measures or expressions of strength and direction, e.g., harder, softer, descriptions* of "which way").

B. Students describe* how the observations they make connect to the purpose of the investigation, including how the observations of the effects on object motion allow causal relationships between pushes and pulls and object motion to be determined.

C. Students predict the effect of the push of pull on the motion of the object, based on prior experiences.

3. Planning the investigation

A. In the collaboratively developed investigation plan, students describe*:
- The object whose motion will be investigated.
- What will be in contact with the object to cause the push or pull.
- The relative strengths of the push or pull that will be applied to the object to start or stop its motion or change its speed.
- The relative directions of the push or pull that will be applied to the object.
- How the motion of the object will be observed and recorded.
- How the push or pull will be applied to vary strength or direction.

4. Collecting the data

A. According to the investigation plan they developed, and with guidance, students collaboratively make observations that would allow them to compare the effect on the motion of the object caused by changes in the strength or direction of the pushes and pulls and record their data.

Critical Background Knowledge

Grade Band Progressions:

Science and Engineering Practices (SEPs): Planning and Carrying Out Investigations

K-2	3-5	6-8	9-12
Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior	Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K– 2	Planning and carrying out investigations in 6-8 builds on K-5 experiences and progresses to include investigations that use	Planning and carrying out investigations in 9-12 builds on K-8 experiences and progresses to include investigations that provide evidence for and test

K-2	3-5	6-8	9-12
experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions. • With guidance, plan and conduct an investigation in collaboration with peers (for K). • Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question. • Evaluate different ways of observing and/or measuring a phenomenon to determine which way can answer a question. • Make observations (firsthand or from media) and/or measurements to collect data that can be used to make comparisons. • Make observations (firsthand or from media) and/or measurements of a proposed object or tool or solution to determine if it solves a problem or meets a goal. • Make predictions based on prior experiences.	experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions. • Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. • Evaluate appropriate methods and/or tools for collecting data. • Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. • Make predictions about what would happen if a variable changes. • Test two different models of the same proposed object, tool, or process to determine which better meets criteria for success.	multiple variables and provide evidence to support explanations or solutions. • Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim. • Conduct an investigation and/or evaluate and/or revise the experimental design to produce data to serve as the basis for evidence that meet the goals of the investigation. • Evaluate the accuracy of various methods for collecting data. • Collect data to produce data to serve as the basis for evidence to answer scientific questions or test design solutions under a range of conditions. • Collect data about the performance of a proposed object, tool, process or system under a range of conditions.	conceptual, mathematical, physical, and empirical models. • Plan an investigation or test a design individually and collaboratively to produce data to serve as the basis for evidence as part of building and revising models, supporting explanations for phenomena, or testing solutions to problems. Consider possible confounding variables or effects and evaluate the investigation's design to ensure variables are controlled. • Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. • Plan and conduct an investigation or test a design solution in a safe and ethical manner including considerations of environmental, social, and personal impacts. • Select appropriate tools to collect, record, analyze, and evaluate data. • Make directional hypotheses that specify what happens to a

K-2	3-5	6-8	9-12
			dependent variable when an independent variable is manipulated. • Manipulate variables and collect data about a complex model of a proposed process or system to identify failure points or improve performance relative to criteria for success or other variables.

Crosscutting Concepts (CCCs): Cause and Effect

K-2	3-5	6-8	9-12
In grades K-2, children recognize that patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.	In grades 3-5, students routinely identify and test causal relationships and use these relationships to explain change. They understand events that occur together with regularity might or might not signify a cause-and-effect relationship.	In grades 6-8, students classify relationships as causal or correlational and recognize that correlation does not necessarily imply causation. They use cause and effect relationships to predict phenomena in natural or designed systems. They also understand that phenomena may have more than one cause, and some cause-and-effect relationships in systems can only be described using probability.	In grades 9-12, students understand that empirical evidence is required to differentiate between cause and correlation and to make claims about specific causes and effects. They suggest cause and effect relationships to explain and predict behaviors in complex natural and designed systems. They also propose causal relationships by examining what is known about smaller scale mechanisms within the system. They recognize changes in systems may have various causes that may not have equal effects.

Disciplinary Core Ideas (DCIs): PS2.A: Forces and Motion, PS2.B: Types of Interactions, PS3.C: Relationship Between Energy and Forces

K-2	3-5	6-8	9-12
PS2.A, PS2.B: Pushes and pulls can have different strengths and direction and can change the speed or direction of its motion or start or stop it.	**PS2.A, PS2.B:** The effect of unbalanced forces on an object, results in a change of motion. Patterns of motion can be used to predict future motion. Some forces act through contact, some forces act even when the objects are not in contact. The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center.	**PS2.A:** The role of the mass of an object must be qualitatively accounted for in any change of motion due to the application of a force. **PS2.B:** Forces that act at a distance involve fields that can be mapped by their relative strength and effect on an object.	**PS2.A:** Newton's 2nd law (F=ma) and the conservation of momentum can be used to predict changes in the motion of macroscopic objects. **PS2.B:** Forces at a distance are explained by fields that can transfer energy and can be described in terms of the arrangement and properties of the interacting objects and the distance between them. These forces can be used to describe the relationship between electrical and magnetic fields.

Related Cross-Curricular Standards: Current Grade Level

ELA Connections:

- LA.K.RI.1 With prompting and support, identify the main topic and key details in an informational text.
- LA.K.RI.2 With prompting and support, identify key individuals, events, or pieces of information in an informational text.
- LA.K.W.6 With prompting and support, identify information from provided sources to answer a question using a combination of drawing, dictating, and/or writing.

Mathematics Connections:

- K.G.1.c Describe the relative positions of shapes in relation to other objects or shapes using terms such as above, below, in front of, behind, and next to.
- K.G.2.a Describe measurable attributes of authentic objects including length, capacity, and weight.

Social Studies Connections:

- SS K.3.1.a Communicate personal directions to describe relative locations of people and objects.
- SS K.3.1.b Identify locations in the school and around the classroom.

- SS K.4.4.b Identify and cite appropriate sources when conducting historical research.

Fine and Performing Arts Connections:

Connection to other grade level indicators

Authentic Connections to Other Content Standards:

Kindergarten Topic Bundle 1 (Pushes and Pulls) - NGSS

SC.K.1.1.a, SC.K.1.1.b

Academic Language Development

Words to support student discourse related to the Disciplinary Core Ideas (DCIs):

- Push
- Pull
- Investigation
- Cause
- Effect
- Motion
- Direction
- Change
- Strength
- Collide
- Faster
- Slower
- Speed

Sentence Stems that utilize academic language:

- When I push harder/softer it causes __________ to move ____________.
- When I pull harder/softer it causes __________ to move ____________.
- When objects collide at faster/slower speeds the effect is ______________.
- When it collides from this direction it causes _____________ to move in _____________ direction.
- When I change _________, then, __________ is affected.

Utah Kindergarten Core Guide

Assessment Considerations

Formative Assessment:

- Formative Task Repository

Stackable, Instructionally Embedded, Portable Science (SIPS) Assessments:

- https://sipsassessments.org/ ***Assessments available for 5th and 8th Grade at this time.**

Knowledge, Skills, and Abilities:

- KSA1: With guidance, plan an investigation to show that pushing or pulling an object can change an object's motion speed or direction.
- KSA2: With guidance, conduct an investigation to demonstrate that when objects collide, they can change the motion of the objects.
- KSA3: With guidance, collect data to support or refute ideas about that quicker changes in motion are caused by bigger pushes and pulls.

Standard Code: SC.K.1.1 Gather, analyze, and communicate evidence of forces and their interactions.

The motion of objects can be observed and described. Pushing or pulling on an object can change the speed or direction of an object's motion and can start or stop it. Pushes and pulls can have different strengths and different directions. A bigger push or pull makes things go faster and when objects touch or collide, they push on one another and can change motion.

Indicator Code: SC.K.1.1.b

Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull. Examples of problems requiring a solution could include having a marble or other object move a certain distance, follow a particular path, and knock down other objects. Examples of solutions could include tools such as a ramp to increase the speed of the object and a structure that would cause an object such as a marble or ball to turn. ***Assessment does not include friction as a mechanism for change in speed.***

NGSS Comparison: K-PS2-1

Other Indicators in this Standard

SC.K.1.1.b

Concepts and Skills to Master

Foundation Boxes:

Science and Engineering Practice (SEP)	Crosscutting Concept (CCC)
Analyzing and Interpreting Data • Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.	**Cause and Effect:** • Simple tests can be designed to gather evidence to support or refute student ideas about causes. **Connections to Engineering, Technology, and Applications of Science** • Scientists and engineers use appropriate mathematical

	concepts and processes to model and solve problems.

Disciplinary Core Idea (DCI)

PS2.A: Forces and Motion
- Pushes and pulls can have different strengths and directions.
- Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it.

ETS1.A: Defining Engineering Problems
- A situation that people want to change or create can be approached as a problem to be solved through engineering. Such problems may have many acceptable solutions.

Possible Science and/or Engineering Phenomena to Support 3D Instruction
- NGSS List of Phenomena
- Phenomena Master list (videos and lessons included)
- Amazing Slinky Tricks
- Amazing Rube Goldberg Machines
- Perplexus Epic 1-125 Demonstration
- Caine's Arcade
- Hot Wheels Mega Track

Evidence Statements

What does it look like to demonstrate proficiency on this indicator?

K.1.1.b Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.

1. **Organizing data**
   A. With guidance, students organize given information using graphical or visual displays (e.g., pictures, pictographs, drawings, written observations, tables, charts). The given information students organize includes:
      - The relative speed or direction of the object before a push or pull is applied (i.e., qualitative measures and expressions of speed and direction, e.g., faster, slower, descriptions* of "which way").

- The relative speed or direction of the object after a push or pull is applied.
- How the relative strength of a push or pull affects the speed or direction of an object (i.e., qualitative measures or expressions of strength, e.g., harder, softer).

2. Identifying relationships

A. Using their organization of the given information, students describe* relative changes in the speed or direction of the object caused by pushes or pulls from the design solution.

3. Interpreting data

A. Students describe* the goal of the design solution.

B. Students describe* their ideas about how the push or pull from the design solution causes the change in the object's motion.

C. Based on the relationships they observed in the data, students describe* whether the push or pull from the design solution causes the intended change in speed or direction of motion of the object.

Critical Background Knowledge

Grade Band Progressions:

Science and Engineering Practices (SEPs): Analyzing and Interpreting Data

K-2	3-5	6-8	9-12
Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations. • Record information (observations, thoughts, and	Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.	Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis. • Construct, analyze, and/or interpret graphical displays of data and/or large data sets to identify linear and nonlinear relationships.	Analyzing data in 9–12 builds on K–8 experiences and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data. • Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make

K-2	3-5	6-8	9-12
ideas). • Use and share pictures, drawings, and/or writings of observations. • Use observations (firsthand or from media) to describe patterns and/or relationships in the natural and designed world(s) in order to answer scientific questions and solve problems. • Compare predictions (based on prior experiences) to what occurred (observable events). • Analyze data from tests of an object or tool to determine if it works as intended.	• Represent data in tables and/or various graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships. • Analyze and interpret data to make sense of phenomena, using logical reasoning, mathematics, and/or computation. • Compare and contrast data collected by different groups in order to discuss similarities and differences in their findings. • Analyze data to refine a problem statement or the design of a proposed object, tool, or process. • Use data to evaluate and refine design solutions.	• Use graphical displays (e.g., maps, charts, graphs, and/or tables) of large data sets to identify temporal and spatial relationships. • Distinguish between causal and correlational relationships in data. • Analyze and interpret data to provide evidence for phenomena. • Apply concepts of statistics and probability (including mean, median, mode, and variability) to analyze and characterize data, using digital tools when feasible. • Consider limitations of data analysis (e.g., measurement error), and/or seek to improve precision and accuracy of data with better technological tools and methods (e.g., multiple trials). • Analyze and interpret data to determine similarities and differences in findings. • Analyze data to define an optimal operational range for a proposed object, tool, process or system that best meets criteria for success.	valid and reliable scientific claims or determine an optimal design solution. • Apply concepts of statistics and probability (including determining function fits to data, slope, intercept, and correlation coefficient for linear fits) to scientific and engineering questions and problems, using digital tools when feasible. • Consider limitations of data analysis (e.g., measurement error, sample selection) when analyzing and interpreting data. • Compare and contrast various types of data sets (e.g., self-generated, archival) to examine consistency of measurements and observations. • Evaluate the impact of new data on a working explanation and/or model of a proposed process or system. • Analyze data to identify design features or characteristics of the components of a proposed process or system to optimize it relative to criteria for success.

Crosscutting Concepts (CCCs): Cause and Effect

K-2	3-5	6-8	9-12
In grades K-2, students learn that events have causes that generate observable patterns. They design simple tests to gather evidence to support or refute their own ideas about causes.	In grades 3-5, students routinely identify and test causal relationships and use these relationships to explain change. They understand events that occur together with regularity might or might not signify a cause-and-effect relationship.	In grades 6-8, students classify relationships as causal or correlational and recognize that correlation does not necessarily imply causation. They use cause and effect relationships to predict phenomena in natural or designed systems. They also understand that phenomena may have more than one cause, and some cause-and-effect relationships in systems can only be described using probability.	In grades 9-12, students understand that empirical evidence is required to differentiate between cause and correlation and to make claims about specific causes and effects. They suggest cause and effect relationships to explain and predict behaviors in complex natural and designed systems. They also propose causal relationships by examining what is known about smaller scale mechanisms within the system. They recognize changes in systems may have various causes that may not have equal effects.

Disciplinary Core Ideas (DCIs): PS2.A: Forces and Motion, ETS1.A: Defining Engineering Problems

K-2	3-5	6-8	9-12
PS2.A, PS2.B: Pushes and pulls can have different strengths and direction and can change the speed	**PS2.A, PS2.B:** The effect of unbalanced forces on an object, results in a change of motion. Patterns of motion can be used to predict future motion. Some forces act through contact,	**PS2.A:** The role of the mass of an object must be qualitatively accounted for in any change of motion due to the application of a force.	**PS2.A:** Newton's 2nd law (F=ma) and the conservation of momentum can be used to predict changes in the motion of macroscopic objects.

K-2	3-5	6-8	9-12
or direction of its motion or start or stop it. **ETS1.A:** A situation that people want to change or create can be approached as a problem to be solved through engineering. Such problems may have many acceptable solutions.	some forces act even when the objects are not in contact. The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center. **ETS1.A:** Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account.	**PS2.B:** Forces that act at a distance involve fields that can be mapped by their relative strength and effect on an object. **ETS1.A:** The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specifications of constraints includes consideration of scientific principles and other relevant knowledge that is likely to limit possible solutions	**PS2.B:** Forces at a distance are explained by fields that can transfer energy and can be described in terms of the arrangement and properties of the interacting objects and the distance between them. These forces can be used to describe the relationship between electrical and magnetic fields. **ETS1.A:** Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them.

Related Cross-Curricular Standards: Current Grade Level

ELA Connections:

- LA.K.RI.1 With prompting and support, identify the main topic and key details in an informational text.
- LA.K.RI.2 With prompting and support, identify key individuals, events, or pieces of information in an informational text.
- LA.K.W.6 With prompting and support, identify information from provided sources to answer a question using a combination of drawing, dictating, and/or writing.

Mathematics Connections:

- K.G.1.c Describe the relative positions of shapes in relation to other objects or shapes using terms such as above, below, in front of, behind, and next to.
- K.G.2.a Describe measurable attributes of authentic objects including length, capacity, and weight.

Social Studies Connections:

- SS K.3.1.a Communicate personal directions to describe relative locations of people and objects.
- SS K.3.1.b Identify locations in the school and around the classroom.
- SS K.4.4.b Identify and cite appropriate sources when conducting historical research.

Fine and Performing Arts Connections:

Connection to other grade level indicators

Authentic Connections to Other Content Standards:

Kindergarten Topic Bundle 1 (Pushes and Pulls) - NGSS

SC.K.1.1.a, SC.K.1.1.b

Academic Language Development

Words to support student discourse related to the Disciplinary Core Ideas (DCIs):

- Push
- Pull
- Investigation
- Cause
- Effect
- Motion
- Direction
- Change
- Strength
- Collide
- Faster
- Slower

- Speed

Sentence Stems that utilize academic language:

- When I push harder/softer it causes __________ to move _____________.
- When I pull harder/softer it causes __________ to move _____________.
- When objects collide at faster/slower speeds the effect is _______________.
- When it collides from this direction it causes ______________ to move in ______________ direction.
- When I change _________, then, __________ is affected.

Utah Kindergarten Core Guide

Assessment Considerations

Formative Assessment:

- Formative Task Repository

Stackable, Instructionally Embedded, Portable Science (SIPS) Assessments:

- https://sipsassessments.org/ *Assessments available for 5th and 8th Grade at this time.

Knowledge, Skills, and Abilities:

- KSA1: With guidance, plan an investigation to show that pushing or pulling an object can change an object's motion speed or direction.
- KSA2: With guidance, conduct an investigation to demonstrate that when objects collide, they can change the motion of the objects.
- KSA3: With guidance, collect data to support or refute ideas about that quicker changes in motion are caused by bigger pushes and pulls.

Topic Code: SC.K.7 Interdependent Relationships in Ecosystems: Animals, Plants, and Their Environment

Standard Code: SC.K.7.2 Gather, analyze, and communicate evidence of interdependent relationships in ecosystems.

Living things (plants and animals, including humans) depend on their surroundings to get what they need, including food, water, shelter, and a favorable temperature. The characteristics of surroundings influence where living things are naturally found. Plants and animals affect and respond to their surroundings.

(Each strand is an overall view describing how the standards tie together thematically.)

Indicator Code: SC.K.7.2.a

Use observations to describe patterns of what plants and animals (including humans) need to survive. Examples of patterns could include that animals need to take in food, but plants do not; the different kinds of food needed by different types of animals; the requirement of plants to have light; and that all living things need water.

NGSS Comparison: K-LS1-1

Other Indicators in this Standard

SC.K.7.2.b, SC.K.7.2.c, SC.K.7.2.d

Concepts and Skills to Master

Foundation Boxes:

Science and Engineering Practice (SEP)	Crosscutting Concept (CCC)
Analyzing and Interpreting Data • Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations. **Connections to the Nature of Science** **Scientific Knowledge is Based on Empirical Evidence** • Scientists look for patterns and order when making observations about the world.	**Patterns:** • Patterns in the natural and human designed world can be observed and used as evidence.

Disciplinary Core Idea (DCI)

LS1.C: **Organization for Matter and Energy Flow in Organisms**

- All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow.

ESS3.C: **Human Impacts on Earth Systems**

- Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living.

Possible Science and/or Engineering Phenomena to Support 3D Instruction

- NGSS List of Phenomena
- Link to List of Phenomena that have links to videos and lessons
- Exploring Microhabitats
- Plant Your Socks
- Dolphins and Humans Fishing Together
- Alligators Survive in Ice
- Corn Cob Sprouting in Water
- Desert Beetle Harvests Water

Evidence Statements

What does it look like to demonstrate proficiency on this indicator?

K.7.2.a Use observations to describe patterns of what plants and animals (including humans) need to survive.

1. **Organizing data**

   A. With guidance, students organize the given data from observations (firsthand or from media) using graphical displays (e.g., pictures, charts), including:

   - Different types of animals (including humans).
   - Data about the foods different animals eat.
   - Data about animals drinking water.
   - Data about plants' need for water (e.g., observations of the effects on plants in a classroom or school when they are not watered, observations of natural areas that are very dry).
   - Data about plants' need for light (e.g., observations of the effect on plants in a classroom when they are kept in the dark for a long time; observations about the presence or absence of plants in very dark places, such as under rocks or porches).

2. **Identifying relationships**

   A. Students identify patterns in the organized data, including that:

   - All animals eat food.
     - a) Some animals eat plants.
     - b) Some animals eat other animals.
     - c) Some animals eat both plants and animals.
     - d) No animals do not eat food.
   - All animals drink water.
   - Plants cannot live or grow if there is no water.
   - Plants cannot live or grow if there is no light.

3. **Interpreting data**

   A. Students describe* that the patterns they identified in the data provide evidence that:

   - Plants need light and water to live and grow.
   - Animals need food and water to live and grow.
   - Animals get their food from plants, other animals, or both.

Critical Background Knowledge

Grade Band Progressions:

Science and Engineering Practices (SEPs): Analyzing and Interpreting Data

K-2	3-5	6-8	9-12
Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations. • Record information (observations, thoughts, and ideas). • Use and share pictures, drawings, and/or writings of observations. • Use observations (firsthand or from media) to describe patterns and/or relationships in the natural and designed world(s) in order to answer scientific questions and solve problems. • Compare predictions (based on prior	Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used. • Represent data in tables and/or various graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships. • Analyze and interpret data to make sense of phenomena, using logical reasoning, mathematics, and/or computation. • Compare and contrast data collected by different groups in order	Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis. • Construct, analyze, and/or interpret graphical displays of data and/or large data sets to identify linear and nonlinear relationships. • Use graphical displays (e.g., maps, charts, graphs, and/or tables) of large data sets to identify temporal and spatial relationships. • Distinguish between causal and correlational relationships in data. • Analyze and interpret data to provide evidence for phenomena. • Apply concepts of statistics and	Analyzing data in 9–12 builds on K–8 experiences and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data. • Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution. • Apply concepts of statistics and probability (including determining function fits to data, slope, intercept, and correlation coefficient for linear fits) to scientific and engineering questions and problems, using digital tools when feasible. • Consider limitations of data

K-2	3-5	6-8	9-12
experiences) to what occurred (observable events). • Analyze data from tests of an object or tool to determine if it works as intended.	to discuss similarities and differences in their findings. • Analyze data to refine a problem statement or the design of a proposed object, tool, or process. • Use data to evaluate and refine design solutions.	probability (including mean, median, mode, and variability) to analyze and characterize data, using digital tools when feasible. • Consider limitations of data analysis (e.g., measurement error), and/or seek to improve precision and accuracy of data with better technological tools and methods (e.g., multiple trials). • Analyze and interpret data to determine similarities and differences in findings. • Analyze data to define an optimal operational range for a proposed object, tool, process or system that best meets criteria for success.	analysis (e.g., measurement error, sample selection) when analyzing and interpreting data. • Compare and contrast various types of data sets (e.g., self-generated, archival) to examine consistency of measurements and observations. • Evaluate the impact of new data on a working explanation and/or model of a proposed process or system. • Analyze data to identify design features or characteristics of the components of a proposed process or system to optimize it relative to criteria for success.

Crosscutting Concepts (CCCs): Patterns

K-2	3-5	6-8	9-12
In grades K-2, children recognize that patterns in the	In grades 3-5, students identify similarities and differences in order to sort	In grades 6-8, students recognize that macroscopic patterns are related to the nature of microscopic	In grades 9-12, students observe patterns in systems at different scales and cite patterns as empirical

K-2	3-5	6-8	9-12
natural and human designed world can be observed, used to describe phenomena, and used as evidence	and classify natural objects and designed products. They identify patterns related to time, including simple rates of change and cycles, and to use these patterns to make predictions.	and atomic-level structure. They identify patterns in rates of change and other numerical relationships that provide information about natural and human designed systems. They use patterns to identify cause and effect relationships and use graphs and charts to identify patterns in data.	evidence for causality in supporting their explanations of phenomena. They recognize classifications or explanations used at one scale may not be useful or need revision using a different scale: thus, requiring improved investigations and experiments. They use mathematical representations to identify certain patterns and analyze patterns of performance in order to reengineer and improve a designed system.

Disciplinary Core Ideas (DCIs): LS1.C: Organization for Matter and Energy Flow in Organisms, ESS3.C: Human Impacts on Earth Systems

K-2	3-5	6-8	9-12
LS1.C: Animals obtain food they need from plants or other animals. Plants need water and light. **ESS3.C:** Things people do can affect the environment, but they can make choices to reduce their impacts.	**LS1.C:** Food provides animals with the materials and energy they need for body repair, growth, warmth, and motion. Plants acquire material for growth chiefly from air, water, and process matter and obtain energy from sunlight, which is used	**LS1.C:** Plants use the energy from light to make sugars through photosynthesis. Within individual organisms, food is broken down through a series of chemical reactions that rearrange molecules and release energy. **ESS3.C:**	**LS1.C:** The hydrocarbon backbones of sugars produced through photosynthesis are used to make amino acids and other molecules that can be assembled into proteins or DNA. Through cellular respiration, matter and energy flow through different organizational levels of an organism as elements are

K-2	3-5	6-8	9-12
	to maintain conditions necessary for survival. **ESS3.C:** Societal activities have had major effects on the land, ocean, atmosphere, and even outer space. Societal activities can also help protect Earth's resources and environments.	Human activities have altered the biosphere, sometimes damaging it, although changes to environments can have different impacts for different living things. Activities and technologies can be engineered to reduce people's impacts on Earth.	recombined to form different products and transfer energy. **ESS3.C:** Sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources, including the development of technologies.

Related Cross-Curricular Standards: Current Grade Level

ELA Connections:

- LA.K.RI.1 With prompting and support, identify the main topic and key details in an informational text.
- LA.K.RI.2 With prompting and support, identify key individuals, events, or pieces of information in an informational text.
- LA.K.W.6 With prompting and support, identify information from provided sources to answer a question using a combination of drawing, dictating, and/or writing.
- LA.K.SL.2 With prompting and support, describe familiar people, places, things, and events, and provide additional detail.
    - c. Explain the purpose of information being presented.
    - e. Use appropriate visual and/or digital tools to support verbal communication.

Mathematics Connections:

- K.G.2.b Directly compare two objects with a measurable attribute in common to describe which object is longer/shorter, heavier/lighter, and has more/less-capacity.

Social Studies Connections:

- SS K.3.1.c Identify geographic tools as representations of local and distant places.
- SS K.3.1.d Identify the difference between land and water on a globe.
- SS K.3.2.a Identify physical characteristics of place.

- SS K.3.2.b Identify human characteristics of place.

Fine and Performing Arts Connections:

- FA 2.1.4.c Explore use of media arts as a collaborative art form to communicate information, experiences, or ideas to others.

Connection to other grade level indicators

Authentic Connections to Other Content Standards:

Kindergarten Topic Model Bundle 2 (Living Things) - NGSS

SC.K.7.2.A, SC.K.7.2.B, SC.K.12.3.A, SC.K.7.2.C, SC.K.12.3.B, SC.K.7.2.D, SC.K.12.3.E

Academic Language Development

Words to support student discourse related to the Disciplinary Core Ideas (DCIs):

- Survive
- Plants
- Animals
- Humans
- Survival needs

Sentence Stems that utilize academic language:

- The pattern seen in the collected data allows me to conclude that ________.
- If ______________ doesn't have ________________ it will cause it to ____________.
- If ______________ does have ________________ it will cause it to ____________.

Utah Kindergarten Core Guide

Assessment Considerations

Formative Assessment:

- Formative Task Repository

Stackable, Instructionally Embedded, Portable Science (SIPS) Assessments:

- https://sipsassessments.org/ *Assessments available for 5th and 8th Grade at this time.

Knowledge, Skills, and Abilities:

- KSA1: Use observations of animals eating and drinking to identify any of the following patterns:
  - animals need to take in food, but plants do not;
  - the different kinds of food needed by different types of animals;
  - the requirement of plants to have light; and that all living things need water.
- KSA2: Observe pictures in a table to identify that plants need water and sunlight to survive.
- KSA3: Use evidence from observations to explain that food and water keep animals alive.

Standard Code: SC.K.7.2 Gather, analyze, and communicate evidence of interdependent relationships in ecosystems.

Living things (plants and animals, including humans) depend on their surroundings to get what they need, including food, water, shelter, and a favorable temperature. The characteristics of surroundings influence where living things are naturally found. Plants and animals affect and respond to their surroundings.

(Each strand is an overall view describing how the standards tie together thematically.)

▶ Indicator Code: SC.K.7.2.b

Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs. Examples of plants and animals changing their environment could include a squirrel digs in the ground to hide its food and tree roots can break concrete.

NGSS Comparison: K-ESS2-2

Other Indicators in this Standard

SC.K.7.2., SC.K.7.2.c, SC.K.7.2.d

Concepts and Skills to Master

Foundation Boxes:

Science and Engineering Practice (SEP)	Crosscutting Concept (CCC)
Engaging in Argument from Evidence • Engaging in argument from evidence in K–2 builds on prior experiences and progresses to comparing ideas and representations about the natural and designed world(s).	Systems and System Models • Systems in the natural and designed world have parts that work together.

Disciplinary Core Idea (DCI)
[ESS2.E](): **Biogeology** • Plants and animals can change their environment. [ESS3.C](): **Human Impacts on Earth Systems** • Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things.
Possible Science and/or Engineering Phenomena to Support 3D Instruction
• NGSS List of Phenomena • Link to List of Phenomena that have links to videos and lessons • Biological Weathering • Woodpecker Homes • Google Maps Timelapse

Evidence Statements

What does it look like to demonstrate proficiency on this indicator?

K.7.2.b Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.

1. **Supported claims**
   A. Students make a claim to be supported about a phenomenon. In their claim, students include the idea that plants and animals (including humans) can change the environment to meet their needs.
2. **Identifying scientific evidence**
   A. Students identify and describe* the given evidence to support the claim, including:
   - Examples of plants changing their environments (e.g., plant roots lifting sidewalks).
   - Examples of animals (including humans) changing their environments (e.g., ants building an ant hill, humans clearing land to build houses, birds building a nest, squirrels digging holes to hide food).
   - Examples of plant and animal needs (e.g., shelter, food, room to grow).
3. **Evaluating and critiquing evidence**
   A. Students describe* how the examples do or do not support the claim.
4. **Reasoning and synthesis**

A. Students support the claim and present an argument by logically connecting various needs of plants and animals to evidence about how plants/animals change their environments to meet their needs. Students include:

- Examples of how plants affect other parts of their systems by changing their environments to meet their needs (e.g., roots push soil aside as they grow to better absorb water).
- Examples of how animals affect other parts of their systems by changing their environments to meet their needs (e.g., ants, birds, rabbits, and humans use natural materials to build shelter; some animals store food for winter).

Critical Background Knowledge

Grade Band Progressions:

Science and Engineering Practices (SEPs): Engaging in Argument from Evidence

K-2	3-5	6-8	9-12
Engaging in argument from evidence in K–2 builds on prior experiences and progresses to comparing ideas and representations about the natural and designed world(s). • Identify arguments that are supported by evidence. • Distinguish between explanations that account for all gathered evidence and those that do not.	Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). • Compare and refine arguments based on an evaluation of the evidence presented. □ Distinguish among facts, reasoned judgment based on	Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s). • Compare and critique two arguments on the same topic and analyze whether they emphasize similar or different evidence and/or interpretations of facts. • Respectfully provide and receive critiques about one's explanations, procedures, models, and questions by	Engaging in argument from evidence in 9–12 builds on K–8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current scientific or historical episodes in science. • Compare and evaluate competing arguments or design solutions in light of currently accepted explanations, new evidence, limitations (e.g., trade-offs), constraints, and ethical issues. • Evaluate the claims, evidence, and/or reasoning behind currently accepted explanations or solutions

K-2	3-5	6-8	9-12
• Analyze why some evidence is relevant to a scientific question and some is not. • Distinguish between opinions and evidence in one's own explanations. • Listen actively to arguments to indicate agreement or disagreement based on evidence, and/or to retell the main points of the argument. • Construct an argument with evidence to support a claim. • Make a claim about the effectiveness of an object, tool, or solution that is supported by relevant evidence.	research findings, and speculation in an explanation. • Respectfully provide and receive critiques from peers about a proposed procedure, explanation, or model by citing relevant evidence and posing specific questions. • Construct and/or support an argument with evidence, data, and/or a model. • Use data to evaluate claims about cause and effect. • Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem.	citing relevant evidence and posing and responding to questions that elicit pertinent elaboration and detail. • Construct, use, and/or present an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. • Make an oral or written argument that supports or refutes the advertised performance of a device, process, or system based on empirical evidence concerning whether or not the technology meets relevant criteria and constraints. • Evaluate competing design solutions based on jointly developed and agreed-upon design criteria.	to determine the merits of arguments. • Respectfully provide and/or receive critiques on scientific arguments by probing reasoning and evidence, challenging ideas, and conclusions, responding thoughtfully to diverse perspectives, and determining additional information required to resolve contradictions. • Construct, use, and/or present an oral and written argument or counterarguments based on data and evidence. • Make and defend a claim based on evidence about the natural world or the effectiveness of a design solution that reflects scientific knowledge and student-generated evidence. • Evaluate competing design solutions to a real-world problem based on scientific ideas and principles, empirical evidence, and/or logical arguments regarding relevant factors (e.g., economic, societal, environmental, ethical considerations).

Crosscutting Concepts (CCCs): Systems and System Models

K-2	3-5	6-8	9-12
In grades K-2, students understand objects and organisms can be described in terms of their parts; and systems in the natural and designed world have parts that work together.	In grades 3-5, students understand that a system is a group of related parts that make up a whole and can carry out functions its individual parts cannot. They can also describe a system in terms of its components and their interactions.	In grades 6-8, students can understand that systems may interact with other systems; they may have sub-systems and be a part of larger complex systems. They can use models to represent systems and their interactions—such as inputs, processes and outputs—and energy, matter, and information flows within systems. They can also learn that models are limited in that they only represent certain aspects of the system under study.	In grades 9-12, students can investigate or analyze a system by defining its boundaries and initial conditions, as well as its inputs and outputs. They can use models (e.g., physical, mathematical, computer models) to simulate the flow of energy, matter, and interactions within and between systems at different scales. They can also use models and simulations to predict the behavior of a system and recognize that these predictions have limited precision and reliability due to the assumptions and approximations inherent in the models. They can also design systems to do specific tasks.

Disciplinary Core Ideas (DCIs): ESS2.E: Biogeology, ESS3.C: Human Impacts on Earth Systems

K-2	3-5	6-8	9-12
ESS2.E Plants and animals can change their local environment.	**ESS2.E** Living things can affect the physical characteristics of their environment.	**ESS2.E** [Content found in LS4.A and LS4.D]	**ESS2.E** The biosphere and Earth's other systems have many interconnections that cause a

K-2	3-5	6-8	9-12
ESS3.C Things people do can affect the environment, but they can make choices to reduce their impacts.	**ESS3.C** Societal activities have had major effects on the land, ocean, atmosphere, and even outer space. Societal activities can also help protect Earth's resources and environments.	**ESS3.C** Human activities have altered the biosphere, sometimes damaging it, although changes to environments can have different impacts for different living things. Activities and technologies can be engineered to reduce people's impacts on Earth.	continual coevolution of Earth's surface and life on it **ESS3.C** Sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources, including the development of technologies.

Related Cross-Curricular Standards: Current Grade Level

ELA Connections:

- LA.K.RI.1 With prompting and support, identify the main topic and key details in an informational text.
- LA.K.RI.2 With prompting and support, identify key individuals, events, or pieces of information in an informational text.
- LA.K.W.6 With prompting and support, identify information from provided sources to answer a question using a combination of drawing, dictating, and/or writing.
- LA.K.SL.2 With prompting and support, describe familiar people, places, things, and events, and provide additional detail.
    - c. Explain the purpose of information being presented.
    - e. Use appropriate visual and/or digital tools to support verbal communication.

Mathematics Connections:

- K.G.2.a Describe measurable attributes of authentic objects including length, capacity, and weight.
- K.G.2.b Directly compare two objects with a measurable attribute in common to describe which object is longer/shorter, heavier/lighter, and has more/less-capacity.

Social Studies Connections:

- SS K.3.2.a Identify physical characteristics of place.
- SS K.3.2.b Identify human characteristics of place.

Fine and Performing Arts Connections:

- FA 2.1.4.c Explore use of media arts as a collaborative art form to communicate information, experiences, or ideas to others.

Connection to other grade level indicators

Authentic Connections to Other Content Standards:

Kindergarten Topic Model Bundle 2 (Living Things) - NGSS

SC.K.7.2.A, SC.K.7.2.B, SC.K.12.3.A, SC.K.7.2.C, SC.K.12.3.B, SC.K.7.2.D, SC.K.12.3.E

Academic Language Development

Words to support student discourse related to the Disciplinary Core Ideas (DCIs):

- Survive
- Plants
- Animals
- Humans
- Survival needs
- Claim
- Evidence

Sentence Stems that utilize academic language:

- _____________ survives well in _______________ because ________________.
- ____________ needs _____________ and they get that from their environment because______________.
- ____________ changes their environment to_____________ because______________.

Utah Kindergarten Core Guide

Assessment Considerations

Formative Assessment:

- Formative Task Repository

Stackable, Instructionally Embedded, Portable Science (SIPS) Assessments:

- https://sipsassessments.org/ *Assessments available for 5th and 8th Grade at this time.

Knowledge, Skills, and Abilities:

- KSA1: Construct an argument supported by evidence for how plants can change the environment to meet their needs.
- KSA2: Construct an argument supported by evidence for how animals, including humans, can change the environment to meet their needs.
- KSA3: Evaluate examples of evidence to describe how they do or do not support the claim.
- KSA4: Support a claim with evidence to explain how plants affect other parts of the system by changing the environment to meet their needs.
- KSA4: Support a claim with evidence to explain how animals, including humans, affect other parts of the system by changing the environment to meet their needs.

Standard Code: SC.K.7.2 Gather, analyze, and communicate evidence of interdependent relationships in ecosystems.

Living things (plants and animals, including humans) depend on their surroundings to get what they need, including food, water, shelter, and a favorable temperature. The characteristics of surroundings influence where living things are naturally found. Plants and animals affect and respond to their surroundings.

Indicator Code: SC.K.7.2.c

Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live. Examples of relationships could include that deer eat buds and leaves; therefore, they usually live in forested areas, and grasses need sunlight, so they often grow in meadows. Plants, animals, and their surroundings make up a system.

NGSS Comparison: K-ESS3-1

Other Indicators in this Standard

SC.K.7.2.a, SC.K.7.2.b, SC.K.7.2.d

Concepts and Skills to Master

Foundation Boxes:

Science and Engineering Practice (SEP)	Crosscutting Concept (CCC)
Developing and Using Models • Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions.	**Systems and System Models** • Systems in the natural and designed world have parts that work together.

Disciplinary Core Idea (DCI)
[ESS3.A](#): Natural Resources • Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do.
Possible Science and/or Engineering Phenomena to Support 3D Instruction
• NGSS List of Phenomena • Link to List of Phenomena that have links to videos and lessons • Why Do Sunflowers Follow the Sun? • Exploring Microhabitats • Exploring Virtual Fieldtrips

Evidence Statements

What does it look like to demonstrate proficiency on this indicator?

K.7.2.c Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.

1. **Components of the model**
   A. From the given model (e.g., representation, diagram, drawing, physical replica, diorama, dramatization, storyboard) of a phenomenon involving the needs of living things and their environments, students identify and describe* the components that are relevant to their representations, including:
   - Different plants and animals (including humans).
   - The places where the different plants and animals live.
   - The things that plants and animals need (e.g., water, air, and land resources such as wood, soil, and rocks).
2. **Relationships**
   A. Students use the given model to represent and describe* relationships between the components, including:
   - The relationships between the different plants and animals and the materials they need to survive (e.g., fish need water to swim, deer need buds and leaves to eat, plants need water and sunlight to grow).
   - The relationships between places where different plants and animals live and the resources those places provide.
   - The relationships between specific plants and animals and where they live (e.g., fish live in water environments, deer live in forests where there are buds and leaves, rabbits live in fields and woods where there is grass to eat and space for burrows for homes, plants live in sunny and moist areas, humans get resources from nature [e.g., building materials

from trees to help them live where they want to live]).

3. **Connections**

A. Students use the given model to represent and describe*, including:

- Students use the given model to describe* the pattern of how the needs of different plants and animals are met by the various places in which they live (e.g., plants need sunlight, so they are found in places that have sunlight; fish swim in water so they live in lakes, rivers, ponds, and oceans; deer eat buds and leaves so they live in the forest).
- Students use the given model to describe* plants and animals, the places in which they live, and the resources found in those places are each part of a system, and that these parts of systems work together and allow living things to meet their needs.

Critical Background Knowledge

Grade Band Progressions:

Science and Engineering Practices (SEPs): Developing and Using Models

K-2	3-5	6-8	9-12
Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions. • Distinguish between a model and the actual object, process, and/or events the model represents.	Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. • Identify limitations of models. • Collaboratively develop and/or revise a model based on evidence that shows the relationships among variables for frequent and regular occurring events.	Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems. • Evaluate limitations of a model for a proposed object or tool. • Develop or modify a model— based on evidence – to match what happens if a variable or component of a system is	Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds. • Evaluate merits and limitations of two different models of the same proposed tool, process, mechanism or system in order to select or revise a model that best fits the evidence or design criteria. Design a test of a model to ascertain its reliability.

K-2	3-5	6-8	9-12
• Compare models to identify common features and differences. • Develop and/or use a model to represent amounts, relationships, relative scales (bigger, smaller), and/or patterns in the natural and designed world(s). • Develop a simple model based on evidence to represent a proposed object or tool.	• Develop a model using an analogy, example, or abstract representation to describe a scientific principle or design solution. • Develop and/or use models to describe and/or predict phenomena. • Develop a diagram or simple physical prototype to convey a proposed object, tool, or process. • Use a model to test cause and effect relationships or interactions concerning the functioning of a natural or designed system.	changed. • Use and/or develop a model of simple systems with uncertain and less predictable factors. • Develop and/or revise a model to show the relationships among variables, including those that are not observable but predict observable phenomena. • Develop and/or use a model to predict and/or describe phenomena. • Develop a model to describe unobservable mechanisms. • Develop and/or use a model to generate data to test ideas about phenomena in natural or designed systems, including those representing inputs and outputs, and those at unobservable scales.	• Develop, revise, and/or use a model based on evidence to illustrate and/or predict the relationships between systems or between components of a system. • Develop and/or use multiple types of models to provide mechanistic accounts and/or predict phenomena and move flexibly between model types based on merits and limitations. • Develop a complex model that allows for manipulation and testing of a proposed process or system. • Develop and/or use a model (including mathematical and computational) to generate data to support explanations, predict phenomena, analyze systems, and/or solve problems.

Crosscutting Concepts (CCCs): Systems and System Models

K-2	3-5	6-8	9-12
In grades K-2, students understand objects and organisms can be described in terms of their parts; and systems in the natural and designed world have parts that work together.	In grades 3-5, students understand that a system is a group of related parts that make up a whole and can carry out functions its individual parts cannot. They can also describe a system in terms of its components and their interactions.	In grades 6-8, students can understand that systems may interact with other systems; they may have sub-systems and be a part of larger complex systems. They can use models to represent systems and their interactions—such as inputs, processes and outputs—and energy, matter, and information flows within systems. They can also learn that models are limited in that they only represent certain aspects of the system under study.	In grades 9-12, students can investigate or analyze a system by defining its boundaries and initial conditions, as well as its inputs and outputs. They can use models (e.g., physical, mathematical, computer models) to simulate the flow of energy, matter, and interactions within and between systems at different scales. They can also use models and simulations to predict the behavior of a system and recognize that these predictions have limited precision and reliability due to the assumptions and approximations inherent in the models. They can also design systems to do specific tasks.

Disciplinary Core Ideas (DCIs): ESS3.A: Natural Resources

K-2	3-5	6-8	9-12
ESS3.A Living things need water, air, and resources from the land,	**ESS3.A** Energy and fuels humans use are derived from natural	**ESS3.A** Humans depend on Earth's land, ocean, atmosphere, and biosphere	**ESS3.A** Resource availability has guided the development of

K-2	3-5	6-8	9-12
and they live in places that have the things they need. Humans use natural resources for everything they do.	sources and their use affects the environment. Some resources are renewable over time, others are not.	for different resources, many of which are limited or not renewable. Resources are distributed unevenly around the planet as a result of past geologic processes.	human society and use of natural resources has associated costs, risks, and benefits.

Related Cross-Curricular Standards: Current Grade Level

ELA Connections:

- LA.K.RI.1 With prompting and support, identify the main topic and key details in an informational text.
- LA.K.RI.2 With prompting and support, identify key individuals, events, or pieces of information in an informational text.
- LA.K.W.6 With prompting and support, identify information from provided sources to answer a question using a combination of drawing, dictating, and/or writing.
- LA.K.SL.2 With prompting and support, describe familiar people, places, things, and events, and provide additional detail.

Mathematics Connections:

- K.G.2.a Describe measurable attributes of authentic objects including length, capacity, and weight.
- K.G.2.b Directly compare two objects with a measurable attribute in common to describe which object is longer/shorter, heavier/lighter, and has more/less-capacity.

Social Studies Connections:

- SS K.3.1.c Identify geographic tools as representations of local and distant places.
- SS K.3.1.d Identify the difference between land and water on a globe.
- SS K.3.2.a Identify physical characteristics of place.
- SS K.3.2.b Identify human characteristics of place.

Fine and Performing Arts Connections:

- FA 2.1.4.c Explore use of media arts as a collaborative art form to communicate information, experiences, or ideas to others.

Connection to other grade level indicators

Authentic Connections to Other Content Standards:

[Kindergarten Topic Model Bundle 2 (Living Things) - NGSS]

SC.K.7.2.A, SC.K.7.2.B, SC.K.12.3.A, SC.K.7.2.C, SC.K.12.3.B, SC.K.7.2.D, SC.K.12.3.E

Academic Language Development

Words to support student discourse related to the Disciplinary Core Ideas (DCIs):

- Plant needs
- Animal needs
- Human needs
- Water
- Air
- land
- Resources

Sentence stems that utilize academic language:

- _____________ survives well in _______________ because ________________.
- ____________ needs _____________ and they get that from their environment because______________.

[Utah Kindergarten Core Guide]

Assessment Considerations

Formative Assessment:

- [Formative Task Repository]

Stackable, Instructionally Embedded, Portable Science (SIPS) Assessments:

- https://sipsassessments.org/ ***Assessments available for 5th and 8th Grade at this time.**

Knowledge, Skills, and Abilities:

- KSA1: Use a given model to identify and describe relevant components including different plants, places where plants live, and needs of plants.
- KSA2: Use a given model to identify and describe relevant components including different animals, places where animals live, and needs of animals.
- KSA3: Use a given model to identify relationships between plants and animals in the system.
- KSA4: Use a given model to describe the pattern of how needs of different plants and animals are met by the various places in which they live.

Standard Code: SC.K.7.2 Gather, analyze, and communicate evidence of interdependent relationships in ecosystems.

Living things (plants and animals, including humans) depend on their surroundings to get what they need, including food, water, shelter, and a favorable temperature. The characteristics of surroundings influence where living things are naturally found. Plants and animals affect and respond to their surroundings.

(Each strand is an overall view describing how the standards tie together thematically.)

▶ Indicator Code: SC.K.7.2.d

Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live. Examples of relationships could include that deer eat buds and leaves; therefore, they usually live in forested areas, and grasses need sunlight, so they often grow in meadows. Plants, animals, and their surroundings make up a system.

NGSS Comparison: K-ESS3-3

Other Indicators in this Standard

SC.K.7.2.a, SC.K.7.2.b, SC.K.7.2.c

Concepts and Skills to Master

Foundation Boxes:

Science and Engineering Practice (SEP)	Crosscutting Concept (CCC)
Obtaining, Evaluating, and Communicating Information • Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information.	**Cause and Effect** Events have causes that generate observable patterns.

Disciplinary Core Idea (DCI)
ESS3.A: Natural Resources • Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do. **ETS1.B: Developing Possible Solutions** • Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people.
Possible Science and/or Engineering Phenomena to Support 3D Instruction
• NGSS List of Phenomena • Link to List of Phenomena that have links to videos and lessons • Precious Plastic • Virtual Field Trips

Evidence Statements

What does it look like to demonstrate proficiency on this indicator?

K.7.2.d Communicate solutions that will increase the positive impact of humans on the land, water, air, and/or other living things in the local environment.

1. **Communicating information**
   A. Students use prior experiences and observations to describe* information about:
      - How people affect the land, water, air, and/or other living things in the local environment in positive and negative ways.
      - Solutions that reduce the negative effects of humans on the local environment.

   B. Students communicate information about solutions that reduce the negative effects of humans on the local environment, including:
2. **Examples of things that people do to live comfortably and how those things can cause changes to the land, water, air, and/or living things in the local environment.**
3. Examples of choices that people can make to reduce negative impacts and the effect those choices have on the local environment.
   A. Students communicate the information about solutions with others in oral and/or written form (which include using models and/or drawings.

Critical Background Knowledge

Grade Band Progressions:

Science and Engineering Practices (SEPs): Obtaining, Evaluating, and Communicating Information

K-2	3-5	6-8	9-12
Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information. • Read grade-appropriate texts and/or use media to obtain scientific and/or technical information to determine patterns in and/or evidence about the natural and designed world(s). • Describe how specific images (e.g., a diagram showing how a machine works) support a scientific or engineering idea. • Obtain information using	Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluating the merit and accuracy of ideas and methods. • Read and comprehend grade appropriate complex texts and/or other reliable media to summarize and obtain scientific and technical ideas and describe how they are supported by evidence. • Compare and/or combine across complex texts and/or other reliable media to support the engagement in other scientific and/or engineering practices.	Obtaining, evaluating, and communicating information in 6–8 builds on K–5 experiences and progresses to evaluating the merit and validity of ideas and methods. • Critically read scientific texts adapted for classroom use to determine the central ideas and/or obtain scientific and/or technical information to describe patterns in and/or evidence about the natural and designed world(s). • Integrate qualitative and/or quantitative scientific and/or technical information in written text with that contained in media and visual displays to clarify claims and findings.	Obtaining, evaluating, and communicating information in 9–12 builds on K–8 experiences and progresses to evaluating the validity and reliability of the claims, methods, and designs. • Critically read scientific literature adapted for classroom use to determine the central ideas or conclusions and/or to obtain scientific and/or technical information to summarize complex evidence, concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. • Compare, integrate, and evaluate sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a scientific question or solve a problem.

K-2	3-5	6-8	9-12
various texts, text features (e.g., headings, tables of contents, glossaries, electronic menus, icons), and other media that will be useful in answering a scientific question and/or supporting a scientific claim. • Communicate information or design ideas and/or solutions with others in oral and/or written forms using models, drawings, writing, or numbers that provide detail about scientific ideas, practices, and/or design ideas.	• Combine information in written text with that contained in corresponding tables, diagrams, and/or charts to support the engagement in other scientific and/or engineering practices. • Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem. • Communicate scientific and/or technical information orally and/or in written formats, including various forms of media as well as tables, diagrams, and charts.	• Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence. • Evaluate data, hypotheses, and/or conclusions in scientific and technical texts in light of competing information or accounts. • Communicate scientific and/or technical information (e.g., about a proposed object, tool, process, system) in writing and/or through oral presentations.	• Gather, read, and evaluate scientific and/or technical information from multiple authoritative sources, assessing the evidence and usefulness of each source. • Evaluate the validity and reliability of and/or synthesize multiple claims, methods, and/or designs that appear in scientific and technical texts or media reports, verifying the data when possible. • Communicate scientific and/or technical information or ideas (e.g., about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (i.e., orally, graphically, textually, mathematically).

Crosscutting Concepts (CCCs): Systems and System Models

K-2	3-5	6-8	9-12
In grades K-2, students understand	In grades 3-5, students understand that a system	In grades 6-8, students can understand that systems may	In grades 9-12, students can investigate or analyze a system by defining its boundaries

K-2	3-5	6-8	9-12
objects and organisms can be described in terms of their parts; and systems in the natural and designed world have parts that work together.	is a group of related parts that make up a whole and can carry out functions its individual parts cannot. They can also describe a system in terms of its components and their interactions.	interact with other systems; they may have sub-systems and be a part of larger complex systems. They can use models to represent systems and their interactions—such as inputs, processes and outputs—and energy, matter, and information flows within systems. They can also learn that models are limited in that they only represent certain aspects of the system under study.	and initial conditions, as well as its inputs and outputs. They can use models (e.g., physical, mathematical, computer models) to simulate the flow of energy, matter, and interactions within and between systems at different scales. They can also use models and simulations to predict the behavior of a system and recognize that these predictions have limited precision and reliability due to the assumptions and approximations inherent in the models. They can also design systems to do specific tasks.

Disciplinary Core Ideas (DCIs): ESS3.A: Natural Resources

K-2	3-5	6-8	9-12
ESS3.A Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do.	**ESS3.A** Energy and fuels humans use are derived from natural sources and their use affects the environment. Some resources are renewable over time, others are not.	**ESS3.A** Humans depend on Earth's land, ocean, atmosphere, and biosphere for different resources, many of which are limited or not renewable. Resources are distributed unevenly around the planet as a result of past geologic processes.	**ESS3.A** Resource availability has guided the development of human society and use of natural resources has associated costs, risks, and benefits.

Related Cross-Curricular Standards: Current Grade Level

ELA Connections:

- LA.K.RI.1 With prompting and support, identify the main topic and key details in an informational text.
- LA.K.RI.2 With prompting and support, identify key individuals, events, or pieces of information in an informational text.
- LA.K.W.6 With prompting and support, identify information from provided sources to answer a question using a combination of drawing, dictating, and/or writing.
- LA.K.SL.2 With prompting and support, describe familiar people, places, things, and events, and provide additional detail.

Mathematics Connections:

- K.G.2.a Describe measurable attributes of authentic objects including length, capacity, and weight.
- K.G.2.b Directly compare two objects with a measurable attribute in common to describe which object is longer/shorter, heavier/lighter, and has more/less-capacity.

Social Studies Connections:

- SS K.3.1.c Identify geographic tools as representations of local and distant places.
- SS K.3.1.d Identify the difference between land and water on a globe.
- SS K.3.2.a Identify physical characteristics of place.
- SS K.3.2.b Identify human characteristics of place.

Fine and Performing Arts Connections:

- FA 2.1.4.c Explore use of media arts as a collaborative art form to communicate information, experiences, or ideas to others.

Connection to other grade level indicators

Authentic Connections to Other Content Standards:

Kindergarten Topic Model Bundle 2 (Living Things) - NGSS

SC.K.7.2.A, SC.K.7.2.B, SC.K.12.3.A, SC.K.7.2.C, SC.K.12.3.B, SC.K.7.2.D, SC.K.12.3.E

Academic Language Development

Words to support student discourse related to the Disciplinary Core Ideas (DCIs):

- Survival
- Human

- Environment
- Natural resources
- Solution
- Sketch
- Design
- Model
- Surrounding
- Respond
- Cause
- effect

Sentence stems that utilize academic language:

- I will know that the solution works when ______________________.
- If I change ______ I predict that _______ will happen.
- These designs are similar because they both _____________.
- These designs are different because they both _____________.

[Utah Kindergarten Core Guide]

Assessment Considerations

Formative Assessment:

- [Formative Task Repository]

Stackable, Instructionally Embedded, Portable Science (SIPS) Assessments:

- https://sipsassessments.org/ ***Assessments available for 5th and 8th Grade at this time.**

Knowledge, Skills, and Abilities:

- KSA1: Use prior experiences and observations to describe how people affect the environment in positive and negative ways.
- KSA2: Communicate information to provide solutions to reduce negative impacts on the environment (in oral or written mode including models or drawings).

Topic Code: SC.K.12 Weather and Climate

Standard Code: SC.K.12.3 Gather, analyze, and communicate evidence of weather and climate.

Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region at a particular time. People measure these conditions to describe and record the weather to identify patterns over time. Weather scientists forecast severe weather so that communities can prepare for and respond to these events. Sunlight warms Earth's surface.

▷Indicator Code: SC.K.12.3.a

Use and share observations of local weather conditions to describe patterns over time. Examples of qualitative observations could include descriptions of the weather (such as sunny, cloudy, rainy, and warm); examples of quantitative observations could include numbers of sunny, windy, and rainy days in a month. Examples of patterns could include that it is usually cooler in the morning than in the afternoon and the number of sunny days versus cloudy days in different months. ***Assessment of quantitative observations limited to whole numbers and relative measures such as warmer/cooler.***

NGSS Comparison: K-ESS2-1

Other Indicators in this Standard

SC.K.12.3.b, SC.K.12.3.c, SC.K.12.3.d, SC.K.12.3.e

Concepts and Skills to Master

Foundation Boxes:

Science and Engineering Practice (SEP)	Crosscutting Concept (CCC)
Analyzing and Interpreting Data • Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations. **Connections to Nature of Science** **Science Knowledge is Based on Empirical Evidence** • Scientists look for patterns and order when making observations about the world.	**Patterns** • Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. •

Disciplinary Core Idea (DCI)
ESS2.D: **Weather and Climate** Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region at a particular time. People measure these conditions to describe and record the weather and to notice patterns over time.

Possible Science and/or Engineering Phenomena to Support 3D Instruction
• NGSS List of Phenomena • Link to List of Phenomena that have links to videos and lessons • World Climographs • Homemade Thermometer • Snowman Melt Timelapse • Windcatchers

Evidence Statements

What does it look like to demonstrate proficiency on this indicator?

K.12.3.A Use and share observations of local weather conditions to describe patterns over time.

1. Organizing data

A. With guidance, students organize data from given observations (firsthand or from media) about local weather conditions using graphical displays (e.g., pictures, charts). The weather condition data include:

- The number of sunny, cloudy, rainy, windy, cool, or warm days.
- The relative temperature at various times of the day (e.g., cooler in the morning, warmer during the day, cooler at night).

2. Identifying relationships

A. Students identify and describe* patterns in the organized data, including:

- The relative number of days of different types of weather conditions in a month.
- The change in the relative temperature over the course of a day.

3. Interpreting data

A. Students describe* and share that:

- Certain months have more days of some kinds of weather than do other months (e.g., some months have more hot days, some have more rainy days).
- The differences in relative temperature over the course of a day (e.g., between early morning and the afternoon, between one day and another) are directly related to the time of day.

Critical Background Knowledge

Grade Band Progressions:

Science and Engineering Practices (SEPs): Analyzing and Interpreting Data

K-2	3-5	6-8	9-12
Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations. • Record information (observations, thoughts, and ideas).	Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used. Represent data in tables	Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis. • Construct, analyze, and/or interpret graphical displays of data and/or large data sets to identify linear and nonlinear relationships.	Analyzing data in 9–12 builds on K–8 experiences and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data. • Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable

K-2	3-5	6-8	9-12
• Use and share pictures, drawings, and/or writings of observations. • Use observations (firsthand or from media) to describe patterns and/or relationships in the natural and designed world(s) in order to answer scientific questions and solve problems. • Compare predictions (based on prior experiences) to what occurred (observable events). • Analyze data from tests of an object or tool to determine if it works as intended.	and/or various graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships. • Analyze and interpret data to make sense of phenomena, using logical reasoning, mathematics, and/or computation. • Compare and contrast data collected by different groups in order to discuss similarities and differences in their findings. • Analyze data to refine a problem statement or the design of a proposed object, tool, or process. • Use data to evaluate and refine design solutions.	• Use graphical displays (e.g., maps, charts, graphs, and/or tables) of large data sets to identify temporal and spatial relationships. • Distinguish between causal and correlational relationships in data. • Analyze and interpret data to provide evidence for phenomena. • Apply concepts of statistics and probability (including mean, median, mode, and variability) to analyze and characterize data, using digital tools when feasible. • Consider limitations of data analysis (e.g., measurement error), and/or seek to improve precision and accuracy of data with better technological tools and methods (e.g., multiple trials). • Analyze and interpret data to determine similarities and differences in findings. • Analyze data to define an optimal operational range for a proposed object, tool, process or system that best meets criteria for success.	scientific claims or determine an optimal design solution. • Apply concepts of statistics and probability (including determining function fits to data, slope, intercept, and correlation coefficient for linear fits) to scientific and engineering questions and problems, using digital tools when feasible. • Consider limitations of data analysis (e.g., measurement error, sample selection) when analyzing and interpreting data. • Compare and contrast various types of data sets (e.g., self-generated, archival) to examine consistency of measurements and observations. • Evaluate the impact of new data on a working explanation and/or model of a proposed process or system. • Analyze data to identify design features or characteristics of the components of a proposed process or system to optimize it relative to criteria for success.

Crosscutting Concepts (CCCs): Patterns

K-2	3-5	6-8	9-12
In grades K-2, children recognize that patterns	In grades 3-5, students identify similarities and differences in	In grades 6-8, students recognize that macroscopic patterns are	In grades 9-12, students observe patterns in systems at different scales

K-2	3-5	6-8	9-12
in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.	order to sort and classify natural objects and designed products. They identify patterns related to time, including simple rates of change and cycles, and to use these patterns to make predictions.	related to the nature of microscopic and atomic-level structure. They identify patterns in rates of change and other numerical relationships that provide information about natural and human designed systems. They use patterns to identify cause and effect relationships and use graphs and charts to identify patterns in data.	and cite patterns as empirical evidence for causality in supporting their explanations of phenomena. They recognize classifications or explanations used at one scale may not be useful or need revision using a different scale: thus, requiring improved investigations and experiments. They use mathematical representations to identify certain patterns and analyze patterns of performance in order to reengineer and improve a designed system.

Disciplinary Core Ideas (DCIs): ESS2.D: Weather and Climate

K-2	3-5	6-8	9-12
ESS2.D: Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region and time. People record weather patterns over time.	**ESS2.D:** Climate describes patterns of typical weather conditions over different scales and variations. Historical weather patterns can be analyzed.	**ESS2.D:** Complex interactions determine local weather patterns and influence climate, including the role of the ocean.	**ESS2.D:** The role of radiation from the sun and its interactions with the atmosphere, ocean, and land are the foundation for the global climate system. Global climate models are used to predict future changes, including changes influenced by human behavior and natural factors.

Related Cross-Curricular Standards: Current Grade Level

ELA Connections:

- LA.K.RI.1 With prompting and support, identify the main topic and key details in an informational text.
- LA.K.RI.2 With prompting and support, identify key individuals, events, or pieces of information in an informational text.
- LA.K.W.6 With prompting and support, identify information from provided sources to answer a question using a combination of drawing, dictating, and/or writing.
- LA.K.SL.2 With prompting and support, describe familiar people, places, things, and events, and provide additional detail.

Mathematics Connections:

- K.N.4.a Represent and explain addition and subtraction as part-whole relationships, with addition as putting together and/or adding to and subtraction as taking apart and/or taking from, using objects, drawings, numbers, and equations.
- K.G.2.a Describe measurable attributes of authentic objects including length, capacity, and weight.
- K.G.2.b Directly compare two objects with a measurable attribute in common to describe which object is longer/shorter, heavier/lighter, and has more/less-capacity.

Social Studies Connections:

- SS K.3.1.c Identify geographic tools as representations of local and distant places.
- SS K.3.1.d Identify the difference between land and water on a globe.
- SS K.3.2.a Identify physical characteristics of place.
- SS K.3.2.b Identify human characteristics of place.

Fine and Performing Arts Connections:

- FA 2.1.4.c Explore use of media arts as a collaborative art form to communicate information, experiences, or ideas to others.

Connection to other grade level indicators

Authentic Connections to Other Content Standards:

[Kindergarten Topic Model Bundle 3 (Patterns and Effects of Sunlight) NGSS]

SC.K.12.3.C, SC.K.12.3.D, SC.K.12.3.A, SC.1.6.2.B

Academic Language Development

Words to support student discourse related to the Disciplinary Core Ideas (DCIs):

- Local
- Observable
- Weather
- Patterns
- Sunny
- Cloudy
- Windy
- Rainy
- Snowy
- Cold
- Warm
- Sunlight
- Temperature
- Predict

Sentence Stems that utilize academic language:

- I observe (notice) the pattern of _________ so tomorrow I predict______________.
- The pattern in the data helps us to know that ________.
- Counting and making graphs could help me to identify patterns of ____________ in the data.
- The pattern of ______is changing over time.
- ____________ is the same as ____________.
- ____________ is different from _____________.
- This week I observed _________. I predict ______________ for next week.
- The temperature this week is getting warmer/colder so tomorrow I predict ____________ because_______.

Utah Kindergarten Core Guide

Assessment Considerations

Formative Assessment:

- https://www.education.ne.gov/assessment/nscas-science/

Stackable, Instructionally Embedded, Portable Science (SIPS) Assessments:

- https://sipsassessments.org ***Assessments available for 5th and 8th Grade at this time.**

Knowledge, Skills, and Abilities:

- KSA1: Organize provided data about local weather using graphical displays (e.g., pictures, charts).
- KSA2: Describe observations and patterns of the provided local weather data.
- KSA3: Interpret and describe differences in patterns of weather throughout the day and year.

Standard Code: SC.K.12.3 Gather, analyze, and communicate evidence of weather and climate.

Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region at a particular time. People measure these conditions to describe and record the weather to identify patterns over time. Weather scientists forecast severe weather so that communities can prepare for and respond to these events. Sunlight warms Earth's surface.

▷Indicator Code: SC.K.12.3.b

Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather. Emphasis is on local forms of severe weather such as blizzards, tornadoes, drought, and floods.

NGSS Comparison: K-ESS3-2

Other Indicators in this Standard

SC.K.12.3.a, SC.K.12.3.c, SC.K.12.3.d, SC.K.12.3.e

Concepts and Skills to Master

Foundation Boxes:

Science and Engineering Practice (SEP)	Crosscutting Concept (CCC)
Obtaining, Evaluating, and Communicating Information • Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information.	**Cause and Effect** • Events have causes that generate observable patterns.

Disciplinary Core Idea (DCI)
ESS3.B: Natural Hazards • Some kinds of severe weather are more likely than others in a given region. Weather scientists forecast severe weather so that the communities can prepare for and respond to these events.
Possible Science and/or Engineering Phenomena to Support 3D Instruction
• NGSS List of Phenomena • Link to List of Phenomena that have links to videos and lessons • Timelapse of a Blizzard • Lightning Strikes Thrice - Empire State Building

Evidence Statements

What does it look like to demonstrate proficiency on this indicator?

K.12.3.b Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.

1. **Addressing phenomena of the natural world**
   A. Students formulate questions about local severe weather, the answers to which would clarify how weather forecasting can help people avoid the most serious impacts of severe weather events.
2. **Identifying the scientific nature of the question**
   A. Students' questions are based on their observations.
3. **Obtaining information**
   A. Students collect information (e.g., from questions, grade appropriate texts, media) about local severe weather warnings (e.g., tornado alerts, hurricane warnings, major thunderstorm warnings, winter storm warnings, severe drought alerts, heat wave alerts), including that:
   - There are patterns related to local severe weather that can be observed (e.g., certain types of severe weather happen more in certain places).
   - Weather patterns (e.g., some events are more likely in certain regions) help scientists predict severe weather before it happens.
   - Severe weather warnings are used to communicate predictions about severe weather.
   - Weather forecasting can help people plan for, and respond to, specific types of local weather (e.g., responses: stay

indoors during severe weather, go to cooling centers during heat waves; preparations: evacuate coastal areas before a hurricane, cover windows before storms).

Critical Background Knowledge

Grade Band Progressions:

Science and Engineering Practices (SEPs): Obtaining, Evaluating, and Communicating Information

K-2	3-5	6-8	9-12
Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information. • Read grade-appropriate texts and/or use media to obtain scientific and/or technical information to determine patterns in and/or evidence about the natural and designed world(s). • Describe how specific images (e.g., a diagram showing how a machine works) support a scientific or engineering idea.	Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluating the merit and accuracy of ideas and methods. • Read and comprehend grade appropriate complex texts and/or other reliable media to summarize and obtain scientific and technical ideas and describe how they are supported by evidence. • Compare and/or combine across complex texts and/or other reliable media to	Obtaining, evaluating, and communicating information in 6–8 builds on K–5 experiences and progresses to evaluating the merit and validity of ideas and methods. • Critically read scientific texts adapted for classroom use to determine the central ideas and/or obtain scientific and/or technical information to describe patterns in and/or evidence about the natural and designed world(s). • Integrate qualitative and/or quantitative scientific and/or technical information in written text with that contained in	Obtaining, evaluating, and communicating information in 9–12 builds on K–8 experiences and progresses to evaluating the validity and reliability of the claims, methods, and designs. • Critically read scientific literature adapted for classroom use to determine the central ideas or conclusions and/or to obtain scientific and/or technical information to summarize complex evidence, concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. • Compare, integrate and evaluate sources of information presented in different media or

K-2	3-5	6-8	9-12
• Obtain information using various texts, text features (e.g., headings, tables of contents, glossaries, electronic menus, icons), and other media that will be useful in answering a scientific question and/or supporting a scientific claim. • Communicate information or design ideas and/or solutions with others in oral and/or written forms using models, drawings, writing, or numbers that provide detail about scientific ideas, practices, and/or design ideas.	support the engagement in other scientific and/or engineering practices. • Combine information in written text with that contained in corresponding tables, diagrams, and/or charts to support the engagement in other scientific and/or engineering practices. • Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem. • Communicate scientific and/or technical information orally and/or in written formats, including various forms of media as well as tables, diagrams, and charts.	media and visual displays to clarify claims and findings. • Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence. • Evaluate data, hypotheses, and/or conclusions in scientific and technical texts in light of competing information or accounts. • Communicate scientific and/or technical information (e.g., about a proposed object, tool, process, system) in writing and/or through oral presentations.	formats (e.g., visually, quantitatively) as well as in words in order to address a scientific question or solve a problem. • Gather, read, and evaluate scientific and/or technical information from multiple authoritative sources, assessing the evidence and usefulness of each source. • Evaluate the validity and reliability of and/or synthesize multiple claims, methods, and/or designs that appear in scientific and technical texts or media reports, verifying the data when possible. • Communicate scientific and/or technical information or ideas (e.g., about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (i.e., orally, graphically, textually, mathematically).

Crosscutting Concepts (CCCs): Cause and Effect

K-2	3-5	6-8	9-12
In grades K-2, students learn that events have causes that generate observable patterns. They design simple tests to gather evidence to support or refute their own ideas about causes.	In grades 3-5, students routinely identify and test causal relationships and use these relationships to explain change. They understand events that occur together with regularity might or might not signify a cause-and-effect relationship.	In grades 6-8, students classify relationships as causal or correlational and recognize that correlation does not necessarily imply causation. They use cause and effect relationships to predict phenomena in natural or designed systems. They also understand that phenomena may have more than one cause, and some cause-and-effect relationships in systems can only be described using probability.	In grades 9-12, students understand that empirical evidence is required to differentiate between cause and correlation and to make claims about specific causes and effects. They suggest cause and effect relationships to explain and predict behaviors in complex natural and designed systems. They also propose causal relationships by examining what is known about smaller scale mechanisms within the system. They recognize changes in systems may have various causes that may not have equal effects.

Disciplinary Core Ideas (DCIs): ESS3.B: Natural Hazards

K-2	3-5	6-8	9-12
ESS3.B: In a region, some kinds of severe weather are more likely than	**ESS3.B:** A variety of hazards result from natural processes; humans	**ESS3.B:** Mapping the history of natural hazards in a region	**ESS3.B:** Natural hazards and other geological events have shaped

K-2	3-5	6-8	9-12
others. Forecasts allow communities to prepare for severe weather.	cannot eliminate hazards but can reduce their impacts.	and understanding related geological forces.	the course of human history at local, regional, and global scales.

Related Cross-Curricular Standards: Current Grade Level

ELA Connections:

- LA.K.RI.1 With prompting and support, identify the main topic and key details in an informational text.
- LA.K.RI.2 With prompting and support, identify key individuals, events, or pieces of information in an informational text.
- LA.K.W.6 With prompting and support, identify information from provided sources to answer a question using a combination of drawing, dictating, and/or writing.
- LA.K.SL.2 With prompting and support, describe familiar people, places, things, and events, and provide additional detail.

Mathematics Connections:

- K.N.4.a Represent and explain addition and subtraction as part-whole relationships, with addition as putting together and/or adding to and subtraction as taking apart and/or taking from, using objects, drawings, numbers, and equations.
- K.G.2.a Describe measurable attributes of authentic objects including length, capacity, and weight.
- K.G.2.b Directly compare two objects with a measurable attribute in common to describe which object is longer/shorter, heavier/lighter, and has more/less-capacity.

Social Studies Connections:

- SS K.3.1.c Identify geographic tools as representations of local and distant places.
- SS K.3.1.d Identify the difference between land and water on a globe.
- SS K.3.2.a Identify physical characteristics of place.
- SS K.3.2.b Identify human characteristics of place.

Fine and Performing Arts Connections:

- FA 2.1.4.c Explore use of media arts as a collaborative art form to communicate information, experiences, or ideas to others.

Connection to other grade level indicators

Authentic Connections to Other Content Standards:

Kindergarten Topic Model Bundle 3 (Patterns and Effects of Sunlight) NGSS

SC.K.12.3.C, SC.K.12.3.D, SC.K.12.3.A, SC.1.6.2.B

Academic Language Development

Words to support student discourse related to the Disciplinary Core Ideas (DCIs):

- Forecast
- Weather
- Patterns
- Typical
- Severe
- Predictable
- Prepare

Sentence stems that utilize academic language:

- The pattern of ______is changing over time.
- We can use the pattern of __________ to help us make a prediction.
- What are some similarities and differences among ______________?
- I can group the data to look for patterns in ____________________.
- Patterns in weather help me to know ___________________ because____________.
- Patterns in severe weather help communities to know ____________________.

Utah Kindergarten Core Guide

Assessment Considerations

Formative Assessment:

- Formative Task Repository

Stackable, Instructionally Embedded, Portable Science (SIPS) Assessments:

- https://sipsassessments.org/ ***Assessments available for 5th and 8th Grade at this time.**

Knowledge, Skills, and Abilities:

- KSA1: Ask relevant questions about local weather based on observations to avoid the most severe impacts.
- KSA2: Collect information regarding severe local weather patterns to forecast and plan for weather events.

Standard Code: SC.K.12.3 Gather, analyze, and communicate evidence of weather and climate.

Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region at a particular time. People measure these conditions to describe and record the weather to identify patterns over time. Weather scientists forecast severe weather so that communities can prepare for and respond to these events. Sunlight warms Earth's surface.

▷Indicator Code: SC.K.12.3.c

Make observations to determine the effect of sunlight on Earth's surface. Examples of Earth's surface could include sand, soil, rocks, and water.

NGSS Comparison: K-PS3-1

Other Indicators in this Standard

SC.K.12.3.a, SC.K.12.3.b, SC.K.12.3.d, SC.K.12.3.e

Concepts and Skills to Master

Foundation Boxes:

Science and Engineering Practice (SEP)	Crosscutting Concept (CCC)
Planning and Carrying Out Investigations • Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions. **Connections to Nature of Science** **Scientific Investigations Use a Variety of Methods** • Scientists use different ways to study the world.	**Cause and Effect** • Events have causes that generate observable patterns.

Disciplinary Core Idea (DCI)
PS3.B: **Conservation of Energy and Energy Transfer** • Sunlight warms Earth's surface.

Possible Science and/or Engineering Phenomena to Support 3D Instruction
• NGSS List of Phenomena • Link to List of Phenomena that have links to videos and lessons • How the Sun Sees You • Windcatchers • Snowman Melt Timelapse

Evidence Statements

What does it look like to demonstrate proficiency on this indicator?

K.12.3.c Make observations to determine the effect of sunlight on Earth's surface.

1. **Identifying the phenomenon to be investigated**
   A. From the given investigation plan, students describe* (with guidance) the phenomenon under investigation, which includes the following idea: sunlight warms the Earth's surface.
   B. Students describe* (with guidance) the purpose of the investigation, which includes determining the effect of sunlight on Earth materials by identifying patterns of relative warmth of materials in sunlight and shade (e.g., sand, soil, rocks, water).
2. Identifying the evidence to address the purpose of the investigation
   A. Based on the given investigation plan, students describe* (with guidance) the evidence that will result from the investigation, including observations of the relative warmth of materials in the presence and absence of sunlight (i.e., qualitative measures of temperature, e.g., hotter, warmer, colder).
   B. Students describe* how the observations they make connect to the purpose of the investigation.
3. **Planning the investigation**
   A. Based on the given investigation plan, students describe* (with guidance):
      - The materials on the Earth's surface to be investigated (e.g., dirt, sand, rocks, water, grass).
      - How the relative warmth of the materials will be observed and recorded.
4. **Collecting the data**
   A. According to the given investigation plan and with guidance, students collect and record data that will allow them to:
      - Compare the warmth of Earth materials placed in sunlight and the same Earth materials placed in shade.
      - Identify patterns of relative warmth of materials in sunlight and in shade (i.e., qualitative measures of temperature, e.g., hotter, warmer, colder).
      - Describe* that sunlight warms the Earth's surface.

Critical Background Knowledge

Grade Band Progressions:

Science and Engineering Practices (SEPs): Planning and Carrying Out Investigations

K-2	3-5	6-8	9-12
Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions. • With guidance, plan and conduct an investigation in collaboration with peers (for K). • Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question. • Evaluate different ways of observing and/or measuring a phenomenon to determine which way can answer a question. • Make observations	Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K– 2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions. • Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. • Evaluate appropriate methods and/or tools for collecting data. • Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a	Planning and carrying out investigations in 6-8 builds on K-5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or solutions. • Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim. • Conduct an investigation and/or evaluate and/or revise the experimental design to produce data to serve as the basis for evidence that meet the goals of the investigation.	Planning and carrying out investigations in 9-12 builds on K-8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models. • Plan an investigation or test a design individually and collaboratively to produce data to serve as the basis for evidence as part of building and revising models, supporting explanations for phenomena, or testing solutions to problems. Consider possible confounding variables or effects and evaluate the investigation's design to ensure variables are controlled. • Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed

K-2	3-5	6-8	9-12
(firsthand or from media) and/or measurements to collect data that can be used to make comparisons. • Make observations (firsthand or from media) and/or measurements of a proposed object or tool or solution to determine if it solves a problem or meets a goal. • Make predictions based on prior experiences.	phenomenon or test a design solution. • Make predictions about what would happen if a variable changes. • Test two different models of the same proposed object, tool, or process to determine which better meets criteria for success.	• Evaluate the accuracy of various methods for collecting data. • Collect data to produce data to serve as the basis for evidence to answer scientific questions or test design solutions under a range of conditions. • Collect data about the performance of a proposed object, tool, process or system under a range of conditions.	to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. • Plan and conduct an investigation or test a design solution in a safe and ethical manner including considerations of environmental, social, and personal impacts. • Select appropriate tools to collect, record, analyze, and evaluate data. Make directional hypotheses that specify what happens to a dependent variable when an independent variable is manipulated. • Manipulate variables and collect data about a complex model of a proposed process or system to identify failure points or improve performance relative to criteria for success or other variables.

Crosscutting Concepts (CCCs): Cause and Effect

K-2	3-5	6-8	9-12
In grades K-2, students learn that events have causes that generate observable patterns. They design simple tests to gather evidence to support or refute their own ideas about causes.	In grades 3-5, students routinely identify and test causal relationships and use these relationships to explain change. They understand events that occur together with regularity might or might not signify a cause-and-effect relationship.	In grades 6-8, students classify relationships as causal or correlational and recognize that correlation does not necessarily imply causation. They use cause and effect relationships to predict phenomena in natural or designed systems. They also understand that phenomena may have more than one cause, and some cause-and-effect relationships in systems can only be described using probability.	In grades 9-12, students understand that empirical evidence is required to differentiate between cause and correlation and to make claims about specific causes and effects. They suggest cause and effect relationships to explain and predict behaviors in complex natural and designed systems. They also propose causal relationships by examining what is known about smaller scale mechanisms within the system. They recognize changes in systems may have various causes that may not have equal effects.

Disciplinary Core Ideas (DCIs): PS3.B: Conservation of Energy and Energy Transfer

K-2	3-5	6-8	9-12
PS3.B: [Content found in PS3.D] Sunlight warms Earth's surface.	**PS3.B:** Moving objects contain energy. The faster the object moves, the more energy it has. Energy can be moved from place to place by	**PS3.B:** Kinetic energy can be distinguished from the various forms of potential energy. Energy changes to and from each type can be tracked through physical or chemical	**PS3.B:** Systems move toward stable states.

K-2	3-5	6-8	9-12
	moving objects, or through sound, light, or electrical currents. Energy can be converted from one form to another form.	interactions. The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter.	

Related Cross-Curricular Standards: Current Grade Level

ELA Connections:

- LA.K.RI.1 With prompting and support, identify the main topic and key details in an informational text.
- LA.K.RI.2 With prompting and support, identify key individuals, events, or pieces of information in an informational text.
- LA.K.W.6 With prompting and support, identify information from provided sources to answer a question using a combination of drawing, dictating, and/or writing.
- LA.K.SL.2 With prompting and support, describe familiar people, places, things, and events, and provide additional detail.

Mathematics Connections:

- K.N.4.a Represent and explain addition and subtraction as part-whole relationships, with addition as putting together and/or adding to and subtraction as taking apart and/or taking from, using objects, drawings, numbers, and equations.
- K.G.2.a Describe measurable attributes of authentic objects including length, capacity, and weight.
- K.G.2.b Directly compare two objects with a measurable attribute in common to describe which object is longer/shorter, heavier/lighter, and has more/less-capacity.

Social Studies Connections:

- SS K.3.1.c Identify geographic tools as representations of local and distant places.
- SS K.3.1.d Identify the difference between land and water on a globe.
- SS K.3.2.a Identify physical characteristics of place.
- SS K.3.2.b Identify human characteristics of place.

Fine and Performing Arts Connections:

- FA 2.1.4.c Explore use of media arts as a collaborative art form to communicate information, experiences, or ideas to others.

Connection to other grade level indicators

Authentic Connections to Other Content Standards:

Kindergarten Topic Model Bundle 3 (Patterns and Effects of Sunlight) NGSS

SC.K.12.3.C, SC.K.12.3.D, SC.K.12.3.A, SC.1.6.2.B

Academic Language Development

Words to support student discourse related to the Disciplinary Core Ideas (DCIs):

- Sunlight
- Shade
- Locations
- Surfaces
- Materials
- Temperature
- Observation
- Data

Sentence stems that utilize academic language:

- If _______ happens, I predict that ________ will occur.
- If a surface is _______________ this will cause ____________.
- Less sunlight will cause ___________ to be ___________.
- _____________ is more/less warm than ______________ when both have the same amount of sunlight.

Utah Kindergarten Core Guide

Assessment Considerations

Formative Assessment:

- https://www.education.ne.gov/assessment/nscas-science/

Stackable, Instructionally Embedded, Portable Science (SIPS) Assessments:

- https://sipsassessments.org/ ***Assessments available for 5th and 8th Grade at this time**.

Knowledge, Skills, and Abilities:

- KSA1: Make observations of the sun warming the Earth's surface.
- KSA2: Use observations of provided data to understand how the sun impacts the Earth's surface.

Standard Code: SC.K.12.3 Gather, analyze, and communicate evidence of weather and climate.

Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region at a particular time. People measure these conditions to describe and record the weather to identify patterns over time. Weather scientists forecast severe weather so that communities can prepare for and respond to these events. Sunlight warms Earth's surface.

▷Indicator Code: SC.K.12.3.d

Use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area. Examples of structures could include umbrellas, canopies, and tents that minimize the warming effect of the sun.

NGSS Comparison: K-PS3-2

Other Indicators in this Standard

SC.K.12.3.a, SC.K.12.3.b, SC.K.12.3.c, SC.K.12.3.e

Concepts and Skills to Master

Foundation Boxes:

Science and Engineering Practice (SEP)	Crosscutting Concept (CCC)
Constructing Explanations and Designing Solutions • Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions	**Cause and Effect** • Events have causes that generate observable patterns.

Disciplinary Core Idea (DCI)
PS3.B: Conservation of Energy and Energy Transfer • Sunlight warms Earth's surface.
Possible Science and/or Engineering Phenomena to Support 3D Instruction
• NGSS List of Phenomena • Link to List of Phenomena that have links to videos and lessons • How the Sun Sees You • Windcatchers • Homemade Thermometers

Evidence Statements

What does it look like to demonstrate proficiency on this indicator?

K.12.3.d Use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area.

1. **Using scientific knowledge to generate design solutions**
   - A. Students use given scientific information about sunlight's warming effect on the Earth's surface to collaboratively design and build a structure that reduces warming caused by the sun.
   - B. With support, students individually describe*:
     - The problem.
     - The design solution.
     - In what way the design solution uses the given scientific information.
2. **Describing* specific features of the design solution, including quantification when appropriate**
   - A. Students describe* that the structure is expected to reduce warming for a designated area by providing shade.
   - B. Students use only the given materials and tools when building the structure.
3. **Evaluating potential solutions**
   - A. Students describe* whether the structure meets the indicators in terms of cause (structure blocks sunlight) and effect (less warming of the surface).

Critical Background Knowledge

Grade Band Progressions:

Science and Engineering Practices (SEPs): Constructing Explanations and Designing Solutions

K-2	3-5	6-8	9-12
Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions. • Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena.	Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. • Construct an explanation of observed relationships (e.g., the distribution of plants in the back yard). • Use evidence (e.g., measurements,	Constructing explanations and designing solutions in 6–8 builds on K– 5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories. • Construct an explanation that includes qualitative or quantitative relationships between variables that predict(s) and/or describe(s) phenomena. • Construct an explanation using models or representations. • Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past	Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories. • Make a quantitative and/or qualitative claim regarding the relationship between dependent and independent variables. • Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as

K-2	3-5	6-8	9-12
• Use tools and/or materials to design and/or build a device that solves a specific problem or a solution to a specific problem. • Generate and/or compare multiple solutions to a problem.	observations, patterns) to construct or support an explanation or design a solution to a problem. • Identify the evidence that supports particular points in an explanation. • Apply scientific ideas to solve design problems. • Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution.	and will continue to do so in the future. • Apply scientific ideas, principles, and/or evidence to construct, revise and/or use an explanation for real world phenomena, examples, or events. • Apply scientific reasoning to show why the data or evidence is adequate for the explanation or conclusion. • Apply scientific ideas or principles to design, construct, and/or test a design of an object, tool, process or system. • Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints. • Optimize performance of a design by prioritizing criteria, making tradeoffs, testing, revising, and retesting.	they did in the past and will continue to do so in the future. • Apply scientific ideas, principles, and/or evidence to provide an explanation of phenomena and solve design problems, taking into account possible unanticipated effects. • Apply scientific reasoning, theory, and/or models to link evidence to the claims to assess the extent to which the reasoning and data support the explanation or conclusion. • Design, evaluate, and/or refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations.

Crosscutting Concepts (CCCs): Cause and Effect

K-2	3-5	6-8	9-12
In grades K-2, students learn that events have causes that generate observable patterns. They design simple tests to gather evidence to support or refute their own ideas about causes.	In grades 3-5, students routinely identify and test causal relationships and use these relationships to explain change. They understand events that occur together with regularity might or might not signify a cause-and-effect relationship.	In grades 6-8, students classify relationships as causal or correlational and recognize that correlation does not necessarily imply causation. They use cause and effect relationships to predict phenomena in natural or designed systems. They also understand that phenomena may have more than one cause, and some cause-and-effect relationships in systems can only be described using probability.	In grades 9-12, students understand that empirical evidence is required to differentiate between cause and correlation and to make claims about specific causes and effects. They suggest cause and effect relationships to explain and predict behaviors in complex natural and designed systems. They also propose causal relationships by examining what is known about smaller scale mechanisms within the system. They recognize changes in systems may have various causes that may not have equal effects.

Disciplinary Core Ideas (DCIs): PS3.B: Conservation of Energy and Energy Transfer

K-2	3-5	6-8	9-12
PS3.B: [Content found in PS3.D] Sunlight warms Earth's surface.	**PS3.B:** Moving objects contain energy. The faster the object moves, the more energy it has. Energy can be moved from place to place by moving objects, or through sound, light, or electrical currents. Energy can be converted from one form to another form.	**PS3.B:** Kinetic energy can be distinguished from the various forms of potential energy. Energy changes to and from each type can be tracked through physical or chemical interactions. The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter.	**PS3.B:** Systems move toward stable states.

Related Cross-Curricular Standards: Current Grade Level

ELA Connections:

- LA.K.RI.1 With prompting and support, identify the main topic and key details in an informational text.
- LA.K.RI.2 With prompting and support, identify key individuals, events, or pieces of information in an informational text.
- LA.K.W.6 With prompting and support, identify information from provided sources to answer a question using a combination of drawing, dictating, and/or writing.
- LA.K.SL.2 With prompting and support, describe familiar people, places, things, and events, and provide additional detail.

Mathematics Connections:

- K.N.4.a Represent and explain addition and subtraction as part-whole relationships, with addition as putting together and/or adding to and subtraction as taking apart and/or taking from, using objects, drawings, numbers, and equations.
- K.G.2.a Describe measurable attributes of authentic objects including length, capacity, and weight.
- K.G.2.b Directly compare two objects with a measurable attribute in common to describe which object is longer/shorter, heavier/lighter, and has more/less-capacity.

Social Studies Connections:

- SS K.3.1.c Identify geographic tools as representations of local and distant places.
- SS K.3.1.d Identify the difference between land and water on a globe.
- SS K.3.2.a Identify physical characteristics of place.
- SS K.3.2.b Identify human characteristics of place.

Fine and Performing Arts Connections:

- FA 2.1.4.c Explore use of media arts as a collaborative art form to communicate information, experiences, or ideas to others.

Connection to other grade level indicators

Authentic Connections to Other Content Standards:

Kindergarten Topic Model Bundle 3 (Patterns and Effects of Sunlight) NGSS

SC.K.12.3.C, SC.K.12.3.D, SC.K.12.3.A, SC.1.6.2.B

Academic Language Development

Words to support student discourse related to the Disciplinary Core Ideas (DCIs):

- Reduce
- Sunlight
- Warm
- Shade
- Effect
- Surface
- Materials
- Sketch
- Design
- Model
- Test
- Compare

Sentence stems that utilize academic language:

- _______ affects _______ by_________.
- Testing shows me that _________ causes _________ because______________.
- These designs are similar because they both _______________.
- These designs are different because they both _______________.
- If I _______________ this will cause ____________.

[Utah Kindergarten Core Guide]

Assessment Considerations

Formative Assessment:

- https://www.education.ne.gov/assessment/nscas-science/

Stackable, Instructionally Embedded, Portable Science (SIPS) Assessments:

- https://sipsassessments.org/ ***Assessments available for 5th and 8th Grade at this time.**

Knowledge, Skills, and Abilities:

- KSA1: With support, define the problem of the warming effects of the sun on an area.
- KSA2: Design and build a structure to reduce the warming effects of the sun.
- KSA3: Evaluate whether the structure reduces the warming effect as intended.

Standard Code: SC.K.12.3 Gather, analyze, and communicate evidence of weather and climate.

Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region at a particular time. People measure these conditions to describe and record the weather to identify patterns over time. Weather scientists forecast severe weather so that communities can prepare for and respond to these events. Sunlight warms Earth's surface.

▷Indicator Code: SC.K.12.3.e

Ask questions, make observations, and gather information about a situation people want to change to **define a simple problem that can be solved** through the development of a new or improved object or tool.

NGSS Comparison: K-ESS2-1

Other Indicators in this Standard

SC.K.12.3.a, SC.K.12.3.b, SC.K.12.3.c, SC.K.12.3.d

Concepts and Skills to Master

Foundation Boxes:

Science and Engineering Practice (SEP)	Crosscutting Concept (CCC)
Asking Questions and Defining Problems • Asking questions and defining problems in grades K–2 builds on prior experiences and progresses to simple descriptive questions that can be tested. • Define a simple problem that can be solved through the development of a new or improved object or tool.	N/A

Disciplinary Core Idea (DCI)
ETS1.A: Defining and Delimiting an Engineering Problem • Asking questions, making observations, and gathering information are helpful in thinking about problems.
Possible Science and/or Engineering Phenomena to Support 3D Instruction
• https://www.ngssphenomena.com/searchable-phenomena NGSS List of Phenomena • https://docs.google.com/document/d/1iu0FmkNBDhDJLUgHgRWcGp72MmLPinMuQlTpjl3Gj6Y/edit#heading=h.2caoa0s42j9q Link to List of Phenomena that have links to videos and lessons • Windcatcher • Sunscreen • Dark vs. Light colors and temperature

Evidence Statements

What does it look like to demonstrate proficiency on this indicator?

K.12.3.E Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

1. **Addressing phenomena of the natural or designed world**
   A. Students ask questions and make observations to gather information about a situation that people want to change. Students' questions, observations, and information gathering are focused on:
      - A given situation that people wish to change.
      - Why people want the situation to change.
      - The desired outcome of changing the situation.
2. **Identifying the scientific nature of the question**
   A. Students' questions are based on observations and information gathered about scientific phenomena that are important to the situation.
3. **Identifying the problem to be solved**
   A. Students use the information they have gathered, including the answers to their questions, observations they have made, and scientific information, to describe* the situation people want to change in terms of a simple problem that can be solved with the development of a new or improved object or tool.

4. **Defining the features of the solution**

A. With guidance, students describe* the desired features of the tool or object that would solve the problem, based on scientific information, materials available, and potential related benefits to people and other living things.

Critical Background Knowledge

Grade Band Progressions:

Science and Engineering Practices (SEPs): Asking Questions and Defining Problems

K-2	3-5	6-8	9-12
Asking questions and defining problems in K–2 builds on prior experiences and progresses to simple descriptive questions that can be tested. • Ask questions based on observations to find more information about the natural and/or designed world(s). • Ask and/or identify questions that can be answered by an	Asking questions and defining problems in 3–5 builds on K–2 experiences and progresses to specifying qualitative relationships. • Ask questions about what would happen if a variable is changed. Identify scientific (testable) and non-scientific (non-testable) questions. • Ask questions that can be investigated and	Asking questions and defining problems in 6–8 builds on K–5 experiences and progresses to specifying relationships between variables and clarifying arguments and models. • Ask questions: • that arise from careful observation of phenomena, models, or unexpected results, to clarify and/or seek additional information. • to identify and/or clarify evidence and/or the premise(s) of an argument. • to determine relationships between independent and dependent variables and relationships in models. • to clarify and/or refine a model, an	Asking questions and defining problems in 9–12 builds on K–8 experiences and progresses to formulating, refining, and evaluating empirically testable questions and design problems using models and simulations. • Ask questions • that arise from careful observation of phenomena, or unexpected results, to clarify and/or seek additional information. • that arise from examining models or a theory, to clarify and/or seek additional information and relationships. • to determine relationships, including quantitative relationships, between independent and dependent variables.

K-2	3-5	6-8	9-12
investigation. • Define a simple problem that can be solved through the development of a new or improved object or tool.	predict reasonable outcomes based on patterns such as cause and effect relationships. • Use prior knowledge to describe problems that can be solved. • Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost.	explanation, or an engineering problem. • that require sufficient and appropriate empirical evidence to answer. • that can be investigated within the scope of the classroom, outdoor environment, and museums and other public facilities with available resources and, when appropriate, frame a hypothesis based on observations and scientific principles. • that challenge the premise(s) of an argument or the interpretation of a data set. • Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions.	• to clarify and refine a model, an explanation, or an engineering problem. • Evaluate a question to determine if it is testable and relevant. • Ask questions that can be investigated within the scope of the school laboratory, research facilities, or field (e.g., outdoor environment) with available resources and, when appropriate, frame a hypothesis based on a model or theory. • Ask and/or evaluate questions that challenge the premise(s) of an argument, the interpretation of a data set, or the suitability of a design. • Define a design problem that involves the development of a process or system with interacting components and criteria and constraints that may include social, technical, and/or environmental considerations.

Crosscutting Concepts (CCCs): N/A

K-2	3-5	6-8	9-12
N/A	N/A	N/A	N/A

Disciplinary Core Ideas (DCIs): [ETS1.A](): Defining and Delimiting an Engineering Problem

K-2	3-5	6-8	9-12
Asking questions, making observations, and gathering information are helpful in thinking about problems.	Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account.	The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that is likely to limit possible solutions.	• Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. • Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. • Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities.

Related Cross-Curricular Standards: Current Grade Level

ELA Connections:

- LA.K.RI.1 With prompting and support, identify the main topic and key details in an informational text.

- LA.K.RI.2 With prompting and support, identify key individuals, events, or pieces of information in an informational text.
- LA.K.W.6 With prompting and support, identify information from provided sources to answer a question using a combination of drawing, dictating, and/or writing.
- LA.K.SL.2 With prompting and support, describe familiar people, places, things, and events, and provide additional detail.

Mathematics Connections:

- K.N.4.a Represent and explain addition and subtraction as part-whole relationships, with addition as putting together and/or adding to and subtraction as taking apart and/or taking from, using objects, drawings, numbers, and equations.
- K.G.2.a Describe measurable attributes of authentic objects including length, capacity, and weight.
- K.G.2.b Directly compare two objects with a measurable attribute in common to describe which object is longer/shorter, heavier/lighter, and has more/less-capacity.

Social Studies Connections:

- SS K.3.1.c Identify geographic tools as representations of local and distant places.
- SS K.3.1.d Identify the difference between land and water on a globe.
- SS K.3.2.a Identify physical characteristics of place.
- SS K.3.2.b Identify human characteristics of place.

Fine and Performing Arts Connections:

- FA 2.1.4.c Explore use of media arts as a collaborative art form to communicate information, experiences, or ideas to others.

Connection to other grade level indicators

Authentic Connections to Other Content Standards:

Kindergarten Topic Model Bundle 3 (Patterns and Effects of Sunlight) NGSS

SC.K.12.3.C, SC.K.12.3.D, SC.K.12.3.A, SC.1.6.2.B

Academic Language Development

Words to support student discourse related to the Disciplinary Core Ideas (DCIs):

- Investigation
- Problem

- Solution
- Situation

Sentence stems that utilize academic language:

- Testing shows me that _________ causes _________ because______________.
- These designs are similar because they both _______________.
- These designs are different because they both _______________.
- If I _______________ this will cause ____________.

Utah Kindergarten Core Guide

Assessment Considerations

Formative Assessment:

- Formative Task Repository

Stackable, Instructionally Embedded, Portable Science (SIPS) Assessments:

- https://sipsassessments.org/ ***Assessments available for 5th and 8th Grade at this time.**

Knowledge, Skills, and Abilities:

- KSA1: Ask relevant questions to gather information on a problem situation.
- KSA2: Describe the situation based on observations that requires change.
- KSA3: With guidance, describe the desired features of the tool/object that would solve the problem based on criteria and constraints.