Grade 2 Teacher’s Guide to the Nebraska College and Career Ready Standards for Science 2024

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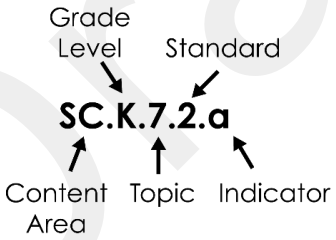
Content Area Standards Structure

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, a crosscutting concept (underline), 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, crosscutting concepts, and **science and engineering practices**:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
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 Obtaining, Evaluating, and Communicating Information	LS1: From Molecules to Organisms: Structures and Processes LS2: Ecosystems: Interactions, Energy, and Dynamics LS3: Heredity: Inheritance and Variation of Traits LS4: Biological Evolution: Unity & Diversity PS1: Matter and Its Interactions PS2: Motion and Stability: Forces and Interactions PS3: Energy 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	 Patterns  Cause and Effect  Scale, Proportion, and Quantity  Systems and System Models  Energy and Matter  Structure and Function  Stability and Change

[1] *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:

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.

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.

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

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 in order to provide an overall view of the concepts needed for foundational understanding.

Indicator

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 are 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 example 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.

Grade 2 Teacher's Guide to the Nebraska CCR-Science Standards

The grade 2 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:

How are materials similar and different from one another and how do the properties of the materials relate to their use?
An understanding of observable properties of materials is developed by students at this level through analysis and classification of different materials.

What do plants need to grow?
Students are expected to develop an understanding of what plants need to grow and how plants depend on animals for seed dispersal and pollination.

How many types of living things live in a place?
Students are expected to compare the diversity of life in different habitats.

How does land change and what causes it to change?
Students are able to apply their understanding of the idea that wind and water can change the shape of land to compare design solutions to slow or prevent such change.

What are the different kinds of land and bodies of water?
Students are able to use information and models to identify and represent the shapes and kinds of land and bodies of water in an area and where water is found on Earth.

Standard

Topic Code: SC.2.3 Structure and Properties of Matter

Standard: SC.2.3.1 Gather, analyze, and communicate evidence of the structure, properties, and interactions of matter.

All things are made of matter which exists with different forms and properties. Matter can be described and classified by its observable properties. Materials with certain properties are well-suited for specific uses. Heating or cooling some types of matter may or may not irreversibly change their properties.

Indicator

Indicator Code: SC.2.3.1.a

Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties. Observations could include color, texture, hardness, and flexibility. Patterns could include the similar properties that different materials share.

NGSS Comparison: 2-PS1-1

Other Indicators in this Standard

SC.2.3.1.b, SC.2.3.1.c, SC.2.3.1.d, SC.2.3.1.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.	**Patterns** • Patterns in the natural and human designed world can be observed.

Disciplinary Core Idea (DCI)

PS1.A: Structure and Properties of Matter
- Different kinds of matter exist and many of them can be either solid or liquid, depending on temperature. Matter can be described and classified by its observable properties.

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 Phenomenon with links to videos and lessons**
- Precious Plastic
- Milk and Soap Experiment
- Reaction in a Bag
- Will it Conduct?
- Sorting rock/minerals/other objects by observations/properties

Evidence Statements

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

2.3.1.a Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.		
1	Identifying the phenomenon under investigation	
	a	Students identify and describe* the phenomenon under investigation, which includes the following idea: different kinds of matter have different properties, and sometimes the same kind of matter has different properties depending on temperature.
	b	Students identify and describe* the purpose of the investigation, which includes answering a question about the phenomenon under investigation by describing* and classifying different kinds of materials by their observable properties.
2	Identifying the evidence to address the purpose of the investigation	
	a	Students collaboratively develop an investigation plan and describe* the evidence that will be collected, including the properties of matter (e.g., color, texture, hardness, flexibility, whether is it a solid or a liquid) of the materials that would allow for classification, and the temperature at which those properties are observed.
	b	Students individually describe* that:
		i. The observations of the materials provide evidence about the properties of different kinds of materials.
		ii. Observable patterns in the properties of materials provide evidence to classify the different kinds of materials.
3	Planning the investigation	
	a	In the collaboratively developed investigation plan, students include:
		i. Which materials will be described* and classified (e.g., different kinds of metals, rocks, wood, soil, powders).

		ii.	Which materials will be observed at different temperatures, and how those temperatures will be determined (e.g., using ice to cool and a lamp to warm) and measured (e.g., qualitatively or quantitatively).
		iii.	How the properties of the materials will be determined.
		iv.	How the materials will be classified (i.e., sorted) by the pattern of the properties.
	b	Students individually describe* how the properties of materials, and the method for classifying them, are relevant to answering the question.	
4	Collecting the data		
	a	According to the developed investigation plan, students collaboratively collect and record data on the properties of the materials.	

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 (firsthand or from media) and/or measurements to collect data that can be used to make comparisons.	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 phenomenon or test a design solution.	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. • Evaluate the accuracy of various methods for collecting data. • Collect data to produce data to serve as the basis for evidence	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 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.

• 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.	• 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.	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.	• 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): Patterns

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 identify similarities and differences in 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.	In grades 6-8, students recognize that macroscopic patterns are 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.	In grades 9-12, students observe patterns in systems at different scales 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): PS1.A: Structure and Properties of Matter

K-2	3-5	6-8	9-12
PS1.A: Matter exists as different substances that have observable different properties. Different properties are suited to different purposes. Objects can be built up from smaller parts.	**PS1.A:** Matter exists as particles that are too small to see, and so matter is always conserved even if it seems to disappear. Measurements of a variety of observable properties can be used to identify particular materials.	**PS1.A:** The fact that matter is composed of atoms and molecules can be used to explain the properties of substances, diversity of materials, states of matter, phase changes, and conservation of matter.	**PS1.A:** The sub-atomic structural model and interactions between electric charges at the atomic scale can be used to explain the structure and interactions of matter, including chemical reactions and nuclear processes. Repeating patterns of the periodic table reflect patterns of outer electrons. A stable molecule has less energy than the same set of atoms separated; one must provide at least this energy to take the molecule apart.

Related Cross-Curricular Standards: Current Grade Level

ELA Connections:

- **LA.2.RI.1** Identify the main topic and key details in a multi-paragraph text.
- **LA.2.RI.2** Describe the connections between individuals, historical events, scientific ideas, or steps in a process.
- **LA.2.RI.3** Determine and explain the author's purpose in an informational text, including what the author wants to answer, explain, or describe.
- **LA.2.RI.4** Explain how text features (titles, headings, table of contents, glossaries, captions, graphs, maps, and/or other visuals) contribute to the meaning of texts.
- **LA.2.RI.5** Compare and contrast the two most important ideas presented by two informational texts on the same topic.
- **LA.2.RI.8** With scaffolding as needed, read and comprehend a wide range of informational texts of appropriate complexity for Grade 2.
- **LA.2.V.2** Interpret an author's use of figurative, connotative, and technical language in grade-level literary and informational text.
- **LA.2.W.5** Write informative/explanatory pieces about a topic or text with supporting facts and details.
- **LA.2.W.6** Locate information from provided sources to answer questions about a topic.
- **LA.2.SL.1** Participate with peers and adults in structured discussions and routines about 2nd grade topics and texts.
- **LA.2.SL.2** Tell a story or recount an experience with appropriate facts and pertinent descriptive details.

Mathematics Connections:

- **2.G.2.a** Measure the length of an object using two different length units and describe how the measurements relate to the size of the specific unit.
- **2.G.2.b** Compare the difference in length of objects using inches and feet or centimeters and meters.
- **2.G.3.a** Identify and use appropriate tools for measuring length.
- **2.G.3.b** Measure and estimate lengths using whole numbers with inches, feet, centimeters, and meters.
- **2.D.1.a** Ask authentic questions to generate data and represent the data using scaled picture graphs with up to four categories.
- **2.D.1.b** Ask authentic questions to generate data and represent the data using bar graphs with up to four categories.
- **2.D.1.c** Create and represent a data set by making a line plot using whole numbers.
- **2.D.2.a** Analyze data using scaled picture graphs or bar graphs with up to four categories. Solve problems including one-step comparison problems, using information from the graphs.

Social Studies Connections:

- SS 2.4.4.b Identify, obtain, and cite appropriate primary and secondary sources for research.

Fine and Performing Arts Connections:

- FA 2.1.1.a Share imaginative ways that media arts can be used to communicate a narrative, experience, or idea (e.g., movie, podcast (glossary), digital art).
- FA 2.1.4.c Explore use of media arts as a collaborative art form to communicate information, experiences, or ideas to others. OBJ
- FA 2.2.1.c Explore and experience the properties of various art media (glossary) through senses and emotions.
- FA 2.2.2.c Communicate a variety of different venues (glossary) to display art (e.g., describe or dramatize to an audience). OBJ
- FA 2.2.3.a Identify and describe a piece of art (e.g., subject matter (glossary), use of color). OBJ
- FA 2.2.3.b Identify use of elements and principles (glossary) in works of art (e.g., recognize use of pattern, symmetry).
- FA 2.2.4.d Identify how images and objects are used to convey a story, familiar experience, or connection to the world.

Connection to other grade level indicators

Authentic Connections to Other Content Standards:

Second Grade Thematic Model Bundle 1 (Matter) NGSS

- SC.2.3.1.a, SC.2.3.1.b, SC.2.3.1.d

Academic Language Development

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

- Matter
- Properties
- Strength
- Color
- Flexibility
- Hardness
- Texture
- Solid
- Liquid
- Temperature
- Classify

Sentence stems that utilize academic language:

- _____ are some similarities of the properties.
- _____ are some differences of the properties.
- The pattern seen in the collected data allows me to conclude (know) that _____.
- I can sort (classify or group) the following patterns of _____ to create groups.
- The following materials can be grouped when using the pattern of _____ found in the data.

Assessment Considerations

Formative Assessment:

- https://www.education.ne.gov/assessment/science-classroom-formative-task-repository-for-grades-5-8/

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:** Identify and describe different materials based on observable properties such as color, texture, and size.
- **KSA2:** Plan and carry out a simple investigation to test and sort materials according to their properties, using tools like magnifying glasses or rulers.
- **KSA3:** Explain how each material was classified and what properties were used to describe and group them, using drawings or simple words.

Standard

Topic Code: SC.2.3 Structure and Properties of Matter

Standard Code: SC.2.3.1 Gather, analyze, and communicate evidence of the structure, properties, and interactions of matter.

All things are made of matter which exists with different forms and properties. Matter can be described and classified by its observable properties. Materials with certain properties are well-suited for specific uses. Heating or cooling some types of matter may or may not irreversibly change their properties.

Indicator

Indicator Code: SC.2.3.1.b

Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose. Examples of properties could include, strength, flexibility, hardness, texture, and absorbency. Assessment of quantitative measurements is limited to length and weight.

NGSS Comparison: 2-PS1-2

Other Indicators in this Standard

SC.2.3.1.a, SC.2.3.1.c, SC.2.3.1.d, SC.2.3.1.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. • Analyze data from tests of an object or tool to determine if it works as intended.	**Cause and Effect** • Simple tests can be designed to gather evidence to support or refute student ideas about causes.
Disciplinary Core Idea (DCI)	
PS1.A: Structure and Properties of Matter • Different properties are suited to different purposes.	
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 Phenomenon with links to videos and lessons** • Will it Conduct? • Precious Plastic • The Ten Most Useful Lego Bricks • Milk and Soap Experiment • Candles melting • Building a bookshelf	

Evidence Statements

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

2.3.1.b	**Analyze data obtained from testing different materials** to determine which materials have the properties that are best suited for an intended purpose.	
1	Organizing data	
	a	Using graphical displays (e.g., pictures, charts, grade-appropriate graphs), students use the given data from tests of different materials to organize those materials by their properties (e.g., strength, flexibility, hardness, texture, ability to absorb).
2	Identifying relationships	
	a	Students describe* relationships between materials and their properties (e.g., metal is strong, paper is absorbent, rocks are hard, sandpaper is rough).
	b	Students identify and describe* relationships between properties of materials and some potential uses purpose (e.g., hardness is good for breaking objects or supporting objects; roughness is good for keeping objects in place; flexibility is good to keep a materials from breaking, but not good for keeping materials rigidly in place).
3	Interpreting data	
	a	Students describe* which properties allow a material to be well suited for a given intended use (e.g., ability to absorb for cleaning up spills, strength for building material, hardness for breaking a nut).
	b	Students use their organized data to support or refute their ideas about which properties of materials allow the object or tool to be best suited for the given intended purpose relative to the other given objects/tools (e.g., students could support the idea that hardness allows a wooden shelf to be better suited for supporting materials placed on it than a sponge would be, based on the patterns relating property to a purpose; students could refute an idea that a thin piece of glass is better suited to be a shelf than a wooden plank would be because it is harder than the wood by using data from tests of hardness and strength to give evidence that the glass is less strong than the wood) .
	c	Students describe* how the given data from the test provided evidence of the suitability of different materials for the intended purpose.

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	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.	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 scientific claims or determine an optimal design solution.

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.	• 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.	• 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	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	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

	might not signify a cause and effect relationship.	relationships in systems can only be described using probability.	mechanisms within the system. They recognize changes in systems may have various causes that may not have equal effects.

Disciplinary Core Ideas (DCIs): PS1.A: Structure and Properties of Matter

K-2	3-5	6-8	9-12
PS1.A: Matter exists as different substances that have observable different properties. Different properties are suited to different purposes. Objects can be built up from smaller parts.	**PS1.A:** Matter exists as particles that are too small to see, and so matter is always conserved even if it seems to disappear. Measurements of a variety of observable properties can be used to identify particular materials.	**PS1.A:** The fact that matter is composed of atoms and molecules can be used to explain the properties of substances, diversity of materials, states of matter, phase changes, and conservation of matter.	**PS1.A:** The sub-atomic structural model and interactions between electric charges at the atomic scale can be used to explain the structure and interactions of matter, including chemical reactions and nuclear processes. Repeating patterns of the periodic table reflect patterns of outer electrons. A stable molecule has less energy than the same set of atoms separated; one must provide at least this energy to take the molecule apart.

Related Cross-Curricular Standards: Current Grade Level

ELA Connections:

- **LA.2.RI.1** Identify the main topic and key details in a multi-paragraph text.
- **LA.2.RI.2** Describe the connections between individuals, historical events, scientific ideas, or steps in a process.
- **LA.2.RI.3** Determine and explain the author's purpose in an informational text, including what the author wants to answer, explain, or describe.
- **LA.2.RI.4** Explain how text features (titles, headings, table of contents, glossaries, captions, graphs, maps, and/or other visuals) contribute to the meaning of texts.
- **LA.2.RI.5** Compare and contrast the two most important ideas presented by two informational texts on the same topic.
- **LA.2.RI.8** With scaffolding as needed, read and comprehend a wide range of informational texts of appropriate complexity for Grade 2.
- **LA.2.V.2** Interpret an author's use of figurative, connotative, and technical language in grade-level literary and informational text.
- **LA.2.W.5** Write informative/explanatory pieces about a topic or text with supporting facts and details.
- **LA.2.W.6** Locate information from provided sources to answer questions about a topic.
- **LA.2.SL.1** Participate with peers and adults in structured discussions and routines about 2nd grade topics and texts.
- **LA.2.SL.2** Tell a story or recount an experience with appropriate facts and pertinent descriptive details.

Mathematics Connections:

- **2.G.2.a** Measure the length of an object using two different length units and describe how the measurements relate to the size of the specific unit.
- **2.G.2.b** Compare the difference in length of objects using inches and feet or centimeters and meters.
- **2.G.3.a** Identify and use appropriate tools for measuring length.
- **2.G.3.b** Measure and estimate lengths using whole numbers with inches, feet, centimeters, and meters.
- **2.D.1.a** Ask authentic questions to generate data and represent the data using scaled picture graphs with up to four categories.
- **2.D.1.b** Ask authentic questions to generate data and represent the data using bar graphs with up to four categories.

- **2.D.1.c** Create and represent a data set by making a line plot using whole numbers.
- **2.D.2.a** Analyze data using scaled picture graphs or bar graphs with up to four categories. Solve problems including one-step comparison problems, using information from the graphs.

Social Studies Connections:

- SS 2.4.4.b Identify, obtain, and cite appropriate primary and secondary sources for research.

Fine and Performing Arts Connections:

- FA 2.1.1.a Share imaginative ways that media arts can be used to communicate a narrative, experience, or idea (e.g., movie, podcast (glossary), digital art).
- FA 2.1.4.c Explore use of media arts as a collaborative art form to communicate information, experiences, or ideas to others.
- FA 2.2.1.c Explore and experience the properties of various art media (glossary) through senses and emotions.
- FA 2.2.2.c Communicate a variety of different venues (glossary) to display art (e.g., describe or dramatize to an audience).
- FA 2.2.3.a Identify and describe a piece of art (e.g., subject matter (glossary), use of color).
- FA 2.2.3.b Identify use of elements and principles (glossary) in works of art (e.g., recognize use of pattern, symmetry).
- FA 2.2.4.d Identify how images and objects are used to convey a story, familiar experience, or connection to the world.

Connection to other grade level indicators

Authentic Connections to Other Content Standards:

Second Grade Thematic Model Bundle 1 (Matter) NGSS

SC.2.3.1.a, SC.2.3.1.b, SC.2.3.1.d

Academic Language Development

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

- Strength
- Color
- Flexibility
- Hardness
- Texture
- Solid
- Liquid
- Temperature
- Classify
- Matter
- Temperature
- Properties
- Structure
- Function
- Purpose

Sentence stems that utilize academic language:

- The _____ is made of _____ which helps it function by _____.
- The property of _____ would be best for its purpose because _____.
- The property of _____ would not work well because _____.
- The _____ properties and structure help the _____ to function because_____.

Assessment Considerations

Formative Assessment:

- https://www.education.ne.gov/assessment/science-classroom-formative-task-repository-for-grades-5-8/

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:** Identify and describe the properties of different materials, such as texture, color, or strength.
- **KSA2:** Test and compare how different materials work for a specific purpose, like building a tower or making a craft.
- **KSA3:** Explain which materials are best for the intended purpose and why, using simple observations and reasons to support their choice.

Standard

Topic: SC.2.3 Structure and Properties of Matter

Standard: SC.2.3.1 Gather, analyze, and communicate evidence of the structure, properties, and interactions of matter.

All things are made of matter which exists with different forms and properties. Matter can be described and classified by its observable properties. Materials with certain properties are well-suited for specific uses. Heating or cooling some types of matter may or may not irreversibly change their properties.

Indicator

Indicator Code: SC.2.3.1.c

Analyze data from tests of two objects, **designed to solve the same problem,** to compare the strengths and weaknesses based on the properties.

NGSS Comparison: K-2-ETS1-3

Other Indicators in this Standard

SC.2.3.1.a, SC.2.3.1.b, SC.2.3.1.d, SC.2.3.1.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. • Analyze data from tests of an object or tool to determine if it works as intended.	
Disciplinary Core Idea (DCI)	
ETS1.C: Optimizing the Design Solution • Because there is always more than one possible solution to a problem, it is useful to compare and test designs.	
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 Phenomenon with links to videos and lessons** • Will it Conduct? • Precious Plastic • The Ten Most Useful Lego Bricks	

Evidence Statements

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

2.3.1.c **Analyze data** from tests of two objects **designed to solve the same problem** to compare the strengths and weaknesses based on properties.		
1	Organizing data	
	a	With guidance, students use graphical displays (e.g., tables, pictographs, line plots) to organize given data from tests of two objects, including data about the features and relative performance of each solution.
2	Identifying relationships	
	a	Students use their organization of the data to find patterns in the data, including:
		i. How each of the objects performed, relative to:
		1. The other object.
		2. The intended performance.
		ii. How various features (e.g., shape, thickness) of the objects relate to their performance (e.g., speed, strength).
3	Interpreting data	
	a	Students use the patterns they found in object performance to describe*:
		i. The way (e.g., physical process, qualities of the solution) each object will solve the problem.
		ii. The strengths and weaknesses of each design.
		iii. Which object is better suited to the desired function, if both solve the problem.

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.	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.	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.	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

• 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.	• 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.	• 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.	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): N/A

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

Disciplinary Core Ideas (DCIs): ETS1.C: Optimizing the Design Solution

K-2	3-5	6-8	9-12
ETSI.C Because there is always more than one possible solution to a problem, it is useful to compare and test designs.	**ETSI.C** Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints.	**ETSI.C** • Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful	**ETSI.C** Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions

		information for the redesign process- that is, some of the characteristics may be incorporated into the new design. • The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution.	about the priority of certain criteria over others (trade-offs) may be needed.

Related Cross-Curricular Standards: Current Grade Level

ELA Connections:

- **LA.2.RI.1** Identify the main topic and key details in a multi-paragraph text.
- **LA.2.RI.2** Describe the connections between individuals, historical events, scientific ideas, or steps in a process.
- **LA.2.RI.3** Determine and explain the author's purpose in an informational text, including what the author wants to answer, explain, or describe.
- **LA.2.RI.4** Explain how text features (titles, headings, table of contents, glossaries, captions, graphs, maps, and/or other visuals) contribute to the meaning of texts.
- **LA.2.RI.5** Compare and contrast the two most important ideas presented by two informational texts on the same topic.
- **LA.2.RI.8** With scaffolding as needed, read and comprehend a wide range of informational texts of appropriate complexity for Grade 2.
- **LA.2.V.2** Interpret an author's use of figurative, connotative, and technical language in grade-level literary and informational text.
- **LA.2.W.5** Write informative/explanatory pieces about a topic or text with supporting facts and details.
- **LA.2.W.6** Locate information from provided sources to answer questions about a topic.
- **LA.2.SL.1** Participate with peers and adults in structured discussions and routines about 2nd grade topics and texts.
- **LA.2.SL.2** Tell a story or recount an experience with appropriate facts and pertinent descriptive details.

Mathematics Connections:

- **2.G.2.a** Measure the length of an object using two different length units and describe how the measurements relate to the size of the specific unit.
- **2.G.2.b** Compare the difference in length of objects using inches and feet or centimeters and meters.
- **2.G.3.a** Identify and use appropriate tools for measuring length.
- **2.G.3.b** Measure and estimate lengths using whole numbers with inches, feet, centimeters, and meters.
- **2.D.1.a** Ask authentic questions to generate data and represent the data using scaled picture graphs with up to four categories.
- **2.D.1.b** Ask authentic questions to generate data and represent the data using bar graphs with up to four categories.
- **2.D.1.c** Create and represent a data set by making a line plot using whole numbers.
- **2.D.2.a** Analyze data using scaled picture graphs or bar graphs with up to four categories. Solve problems including one-step comparison problems, using information from the graphs.

Social Studies Connections:

- SS 2.4.4.b Identify, obtain, and cite appropriate primary and secondary sources for research.

Fine and Performing Arts Connections:

- FA 2.1.1.a Share imaginative ways that media arts can be used to communicate a narrative, experience, or idea (e.g., movie, podcast (glossary), digital art).
- FA 2.1.4.c Explore use of media arts as a collaborative art form to communicate information, experiences, or ideas to others.
- FA 2.2.1.c Explore and experience the properties of various art media (glossary) through senses and emotions.

- FA 2.2.2.c Communicate a variety of different venues (glossary) to display art (e.g., describe or dramatize to an audience). OBJ
- FA 2.2.3.a Identify and describe a piece of art (e.g., subject matter (glossary), use of color). OBJ
- FA 2.2.3.b Identify use of elements and principles (glossary) in works of art (e.g., recognize use of pattern, symmetry).
- FA 2.2.4.d Identify how images and objects are used to convey a story, familiar experience, or connection to the world.

Connection to other grade level indicators

Authentic Connections to Other Content Standards:
Second Grade Thematic Model Bundle 1 (Matter) NGSS
SC.2.3.1.a, SC.2.3.1.b, SC.2.3.1.d

Academic Language Development

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

- Investigate
- Color
- Texture
- Similarities
- Compare
- Design problem
- Observable
- Properties

Sentence stems that utilize academic language

- Investigations show me that _____ causes _____ because_____.
- These designs are similar because they both _____.
- These designs are different because they both _____.
- If I _____ this will cause _____.

Assessment Considerations

Formative Assessment:

- https://www.education.ne.gov/assessment/science-classroom-formative-task-repository-for-grades-5-8/

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:** Identify the different properties (such as size, shape, or material) of two objects designed to solve the same problem.
- **KSA2:** Compare how each object works to solve the problem, noting which object has strengths or weaknesses based on its properties.
- **KSA3:** Explain which object is better at solving the problem and why, using observations and simple reasons to support their comparison.

Standard

Topic: SC.2.3 Structure and Properties of Matter

Standard: SC.2.3.1 Gather, analyze, and communicate evidence of the structure, properties, and interactions of matter.

All things are made of matter which exists with different forms and properties. Matter can be described and classified by its observable properties. Materials with certain properties are well-suited for specific uses. Heating or cooling some types of matter may or may not irreversibly change their properties.

Indicator

Indicator Code: SC.2.3.1.d

Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object. Examples of pieces could include blocks, building bricks, or other assorted small objects.

NGSS Comparison: 2-PS1-3

Other Indicators in this Standard

SC.2.3.1.a, SC.2.3.1.b, SC.2.3.1.c, SC.2.3.1.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.	**Energy and Matter** • Objects may break into smaller pieces and be put together into larger pieces, or change shapes.

Disciplinary Core Idea (DCI)

PS1.A: Structure and Properties of Matter

- Different properties are suited to different purposes.
- A great variety of objects can be built up from a small set of pieces.

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 Phenomenon with links to videos and lessons**
- Precious Plastic
- The Ten Most Useful Lego Bricks
- The Wonderful Tower of Watts
- Lego building and rebuilding
- Jenga

Evidence Statements

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

2.3.1.d	**Make observations to construct an evidence-based account** of how an object made of a small set of pieces can be disassembled and made into a new object.		
1	Articulating the explanation of phenomena		
	a	Students articulate a statement that relates the given phenomenon to a scientific idea, including that an object made of a small set of pieces can be disassembled and made into a new object.	
	b	Students use evidence and reasoning to construct an evidence-based account of the phenomenon.	
2	Evidence		
	a	Students describe* evidence from observations (firsthand or from media), including:	
		i.	The characteristics (e.g., size, shape, arrangement of parts) of the original object.
		ii.	That the original object was disassembled into pieces.
		iii.	That the pieces were reassembled into a new object or objects.
		iv.	The characteristics (e.g., size, shape, arrangement of parts) of the new object or objects.
3	Reasoning		
	a	Students use reasoning to connect the evidence to support an explanation. Students describe* a chain of reasoning that includes:	
		i.	The original object was disassembled into its pieces and is reassembled into a new object or objects.
		ii.	Many different objects can be built from the same set of pieces.
		iii.	Compared to the original object, the new object or objects can have different characteristics, even though they were made of the same set of pieces.

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. • Use tools and/or materials to design and/or build a device	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, observations, patterns) to construct	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.	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

that solves a specific problem or a solution to a specific problem. • Generate and/or compare multiple solutions to a problem.	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.	• 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 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.	(including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as 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): Energy and Matter

K-2	3-5	6-8	9-12
In grades K-2, students observe objects may break into smaller pieces, be put together into larger pieces, or change shapes.	In grades 3-5, students learn matter is made of particles and energy can be transferred in various ways and between objects. Students observe the conservation of matter by tracking matter flows and cycles before and after	In grades 6-8, students learn matter is conserved because atoms are conserved in physical and chemical processes. They also learn within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter. Energy may take different forms (e.g. energy in fields, thermal energy, energy of motion). The transfer of energy can be tracked as	In grades 9-12, students learn that the total amount of energy and matter in closed systems is conserved. They can describe changes of energy and matter in a system in terms of energy and matter flows into, out of, and within that system. They also learn that energy cannot be created or destroyed. It only moves between one place and another place, between objects and/or fields, or

	processes and recognizing the total weight of substances does not change.	energy flows through a designed or natural system.	between systems. Energy drives the cycling of matter within and between systems. In nuclear processes, atoms are not conserved, but the total number of protons plus neutrons is conserved.

Disciplinary Core Ideas (DCIs): PS1.A: Structure and Properties of Matter

K-2	3-5	6-8	9-12
PS1.A: Matter exists as different substances that have observable different properties. Different properties are suited to different purposes. Objects can be built up from smaller parts.	**PS1.A:** Matter exists as particles that are too small to see, and so matter is always conserved even if it seems to disappear. Measurements of a variety of observable properties can be used to identify particular materials.	**PS1.A:** The fact that matter is composed of atoms and molecules can be used to explain the properties of substances, diversity of materials, states of matter, phase changes, and conservation of matter.	**PS1.A:** The sub-atomic structural model and interactions between electric charges at the atomic scale can be used to explain the structure and interactions of matter, including chemical reactions and nuclear processes. Repeating patterns of the periodic table reflect patterns of outer electrons. A stable molecule has less energy than the same set of atoms separated; one must provide at least this energy to take the molecule apart.

Related Cross-Curricular Standards: Current Grade Level

ELA Connections:

- **LA.2.RI.1** Identify the main topic and key details in a multi-paragraph text.
- **LA.2.RI.2** Describe the connections between individuals, historical events, scientific ideas, or steps in a process.
- **LA.2.RI.3** Determine and explain the author's purpose in an informational text, including what the author wants to answer, explain, or describe.
- **LA.2.RI.4** Explain how text features (titles, headings, table of contents, glossaries, captions, graphs, maps, and/or other visuals) contribute to the meaning of texts.
- **LA.2.RI.5** Compare and contrast the two most important ideas presented by two informational texts on the same topic. OBJ
- **LA.2.RI.8** With scaffolding as needed, read and comprehend a wide range of informational texts of appropriate complexity for Grade 2.
- **LA.2.V.2** Interpret an author's use of figurative, connotative, and technical language in grade-level literary and informational text. OBJ
- **LA.2.W.5** Write informative/explanatory pieces about a topic or text with supporting facts and details.
- **LA.2.W.6** Locate information from provided sources to answer questions about a topic.
- **LA.2.SL.1** Participate with peers and adults in structured discussions and routines about 2nd grade topics and texts.
- **LA.2.SL.2** Tell a story or recount an experience with appropriate facts and pertinent descriptive details. OBJ

Mathematics Connections:

- **2.G.2.a** Measure the length of an object using two different length units and describe how the measurements relate to the size of the specific unit.
- **2.G.2.b** Compare the difference in length of objects using inches and feet or centimeters and meters.
- **2.G.3.a** Identify and use appropriate tools for measuring length.
- **2.G.3.b** Measure and estimate lengths using whole numbers with inches, feet, centimeters, and meters.

Social Studies Connections:

- SS 2.4.4.b Identify, obtain, and cite appropriate primary and secondary sources for research.

Fine and Performing Arts Connections:

- FA 2.1.1.a Share imaginative ways that media arts can be used to communicate a narrative, experience, or idea (e.g., movie, podcast (glossary), digital art).
- FA 2.1.4.c Explore use of media arts as a collaborative art form to communicate information, experiences, or ideas to others. OBJ
- FA 2.2.1.c Explore and experience the properties of various art media (glossary) through senses and emotions. OBJ
- FA 2.2.2.c Communicate a variety of different venues (glossary) to display art (e.g., describe or dramatize to an audience). OBJ
- FA 2.2.3.a Identify and describe a piece of art (e.g., subject matter (glossary), use of color). OBJ
- FA 2.2.3.b Identify use of elements and principles (glossary) in works of art (e.g., recognize use of pattern, symmetry).
- FA 2.2.4.d Identify how images and objects are used to convey a story, familiar experience, or connection to the world.

Connection to other grade level indicators

Authentic Connections to Other Content Standards:

Second Grade Thematic Model Bundle 1 (Matter) NGSS

SC.2.3.1.a, SC.2.3.1.b, SC.2.3.1.d

Academic Language Development

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

- Matter
- Solid
- Liquid
- Structure
- Function
- Disassembled
- Reshaped
- Characteristics
- Assembled
- Properties

Sentence stems that utilize academic language:

- The function of each part is _____.
- The property of each part is _____.
- In the model, the function started as _____; now, the function is _____.

Assessment Considerations

Formative Assessment:

- https://www.education.ne.gov/assessment/science-classroom-formative-task-repository-for-grades-5-8/

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:** Identify and name the different pieces that make up an object and describe how these pieces can be rearranged.
- **KSA2:** Disassemble a simple object made of small pieces and put it back together in a new way, showing how the pieces fit together.
- **KSA3:** Explain how the object was taken apart and reassembled into a new shape, using observations and drawings to show the process.

Standard

Topic: SC.2.3 Structure and Properties of Matter

Standard: SC.2.3.1 Gather, analyze, and communicate evidence of the structure, properties, and interactions of matter.

All things are made of matter which exists with different forms and properties. Matter can be described and classified by its observable properties. Materials with certain properties are well-suited for specific uses. Heating or cooling some types of matter may or may not irreversibly change their properties.

Indicator

Indicator Code: SC.2.3.1.e

Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot. Examples of pieces could include blocks, building bricks, or other assorted small objects.

NGSS Comparison: 2-PS1-4

Other Indicators in this Standard

SC.2.3.1.a, SC.2.3.1.b, SC.2.3.1.c, SC.2.3.1.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). ***Connections to Nature of Science*** **Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena** • Scientists search for cause and effect relationships to explain natural events.	**Cause and Effect** • Events have causes that generate observable patterns.

Disciplinary Core Idea (DCI)

PS1.B: Chemical Reactions

- Heating or cooling a substance may cause changes that can be observed. Sometimes these changes are reversible, and sometimes they are not.

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 Phenomenon with links to videos and lessons**
- Elephant Toothpaste
- Slime
- Melting and Freezing Time Lapse
- Brinicles

- Ice Cube Spikes
- Reusable Heat Packs
- Supercooled Water
- Milk and Soap Experiment
- Burning a piece of paper
- Baking a cake chemistry
- Snowflakes
- Popping popcorn
- Melting chocolate chips

Evidence Statements

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

2.3.1.e Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.			
1	Supported claims		
	a	Students make a claim to be supported about a phenomenon. In their claim, students include the idea that some changes caused by heating or cooling can be reversed and some cannot.	
2	Identifying scientific evidence		
	a	Students describe* the given evidence, including:	
		i.	The characteristics of the material before heating or cooling.
		ii.	The characteristics of the material after heating or cooling.
		iii.	The characteristics of the material when the heating or cooling is reversed.
3	Evaluating and critiquing the evidence		
	a	Students evaluate the evidence to determine:	
		i.	The change in the material after heating (e.g., ice becomes water, an egg becomes solid, solid chocolate becomes liquid).
		ii.	Whether the change in the material after heating is reversible (e.g., water becomes ice again, a cooked egg remains a solid, liquid chocolate becomes solid but can be a different shape).
		iii.	The change in the material after cooling (e.g., when frozen, water becomes ice, a plant leaf dies).
		iv.	Whether the change in the material after cooling is reversible (e.g., ice becomes water again, a plant leaf does not return to normal).
	b	Students describe* whether the given evidence supports the claim and whether additional evidence is needed.	
4	Reasoning and synthesis		
	a	Students use reasoning to connect the evidence to the claim. Students describe* the following chain of reasoning:	
		i.	Some changes caused by heating or cooling can be reversed by cooling or heating (e.g., ice that is heated can melt into water, but the water can be cooled and can freeze back into ice [and vice versa]).
		ii.	Some changes caused by heating or cooling cannot be reversed by cooling or heating (e.g., a raw egg that is cooked by heating cannot be turned back into a raw egg by cooling the cooked egg, cookie dough that is baked does not return to its uncooked form when cooled, charcoal that is formed by heating wood does not return to its original form when cooled).

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. • 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.	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 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.	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 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.	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 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 counter-arguments 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): 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): PS1.B: Chemical Reactions

K-2	3-5	6-8	9-12
PS1.B: Heating and cooling substances cause changes that are sometimes reversible and sometimes not.	**PS1.B:** Chemical reactions that occur when substances are mixed can be identified by the emergence of substances with different properties; the total mass remains the same.	**PS1.B:** Reacting substances rearrange to form different molecules, but the number of atoms is conserved. Some reactions release energy and others absorb energy.	**PS1.B:** Chemical processes are understood in terms of collisions of molecules, rearrangement of atoms, and changes in energy as determined by properties of elements involved.

Related Cross-Curricular Standards: Current Grade Level

ELA Connections:

- **LA.2.RI.1** Identify the main topic and key details in a multi-paragraph text.
- **LA.2.RI.2** Describe the connections between individuals, historical events, scientific ideas, or steps in a process.
- **LA.2.RI.3** Determine and explain the author's purpose in an informational text, including what the author wants to answer, explain, or describe.
- **LA.2.RI.4** Explain how text features (titles, headings, table of contents, glossaries, captions, graphs, maps, and/or other visuals) contribute to the meaning of texts.

- **LA.2.RI.5** Compare and contrast the two most important ideas presented by two informational texts on the same topic. OBJ
- **LA.2.RI.8** With scaffolding as needed, read and comprehend a wide range of informational texts of appropriate complexity for Grade 2.
- **LA.2.V.2** Interpret an author's use of figurative, connotative, and technical language in grade-level literary and informational text. OBJ
- **LA.2.W.5** Write informative/explanatory pieces about a topic or text with supporting facts and details.
- **LA.2.W.6** Locate information from provided sources to answer questions about a topic.
- **LA.2.SL.1** Participate with peers and adults in structured discussions and routines about 2nd grade topics and texts.

- **LA.2.SL.2** Tell a story or recount an experience with appropriate facts and pertinent descriptive details. OBJ

Mathematics Connections:

-

Social Studies Connections:

- SS 2.4.4.b Identify, obtain, and cite appropriate primary and secondary sources for research.

Fine and Performing Arts Connections:

- FA 2.1.1.a Share imaginative ways that media arts can be used to communicate a narrative, experience, or idea (e.g., movie, podcast (glossary), digital art).
- FA 2.1.4.c Explore use of media arts as a collaborative art form to communicate information, experiences, or ideas to others.
- FA 2.2.1.c Explore and experience the properties of various art media (glossary) through senses and emotions. OBJ
- FA 2.2.2.c Communicate a variety of different venues (glossary) to display art (e.g., describe or dramatize to an audience). OBJ
- FA 2.2.3.a Identify and describe a piece of art (e.g., subject matter (glossary), use of color). OBJ
- FA 2.2.3.b Identify use of elements and principles (glossary) in works of art (e.g., recognize use of pattern, symmetry).
- FA 2.2.4.d Identify how images and objects are used to convey a story, familiar experience, or connection to the world.

Connection to other grade level indicators

Authentic Connections to Other Content Standards:

Second Grade Thematic Model Bundle 1 (Matter) NGSS

SC.2.3.1.a, SC.2.3.1.b, SC.2.3.1.d

Academic Language Development

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

- Heating
- Cooling
- Changes
- Reversible
- Irreversible
- Properties

Sentence stems that utilize academic language:

- _____ caused the patterns I am observing. I know this because_____.
- When I change _____ in the system, _____ is affected.
- In this situation, even a small change of _____can cause a big effect of _____.
- My claim is _____. My evidence from the investigation is _____.

Assessment Considerations

Formative Assessment:

- https://www.education.ne.gov/assessment/science-classroom-formative-task-repository-for-grades-5-8/

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:** Identify examples of changes that can and cannot be reversed by heating or cooling, such as melting ice or baking a cake.
- **KSA2:** Use simple experiments or examples to show how heating or cooling affects different materials and whether those changes can be reversed.
- **KSA3:** Explain with examples whether a change from heating or cooling can be reversed, using clear reasons and evidence to support their answer.

Standard

Topic: SC.2.7 Interdependent Relationships in Ecosystems

Standard: SC.2.7.2 Gather, analyze, and communicate evidence of interdependent relationships in ecosystems.

Living things (plants and animals, including humans) need water, air, and resources from the land to survive and live in habitats that provide these necessities. The physical characteristics of plants and animals reflect the habitat in which they live. Animals also have modified behaviors that help them survive, grow, and meet their needs. Humans sometimes mimic plant and animal adaptations to survive in their environment.

Indicator

Indicator Code: SC.2.7.2.a

Plan and conduct an investigation to determine if plants need sunlight and water to grow. Assessment is limited to testing one variable at a time.

NGSS Comparison: 2-LS2-1

Other Indicators in this Standard

SC.2.7.2.b, SC.2.7.2.c

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.	**Cause and Effect** • Events have causes that generate observable patterns.

Disciplinary Core Idea (DCI)

LS2.A: Interdependent Relationships in Ecosystems
- Plants depend on water and light to grow.

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 Phenomenon with links to videos and lessons**
- Air Plants - No Soil Needed
- Why Do Sunflowers Follow the Sun?
- Corn Cob Sprouting in Water
- Crown Shyness

Evidence Statements

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

2.7.2.a Plan and conduct an investigation to determine if plants need sunlight and water to grow.

1	Identifying the phenomenon under investigation	
	a	Students identify and describe* the phenomenon and purpose of the investigation, which include answering a question about whether plants need sunlight and water to grow.
2	Identifying the evidence to address the purpose of the investigation	
	a	Students describe* the evidence to be collected, including:
		i. Plant growth with both light and water.
		ii. Plant growth without light but with water.
		iii. Plant growth without water but with light.
		iv. Plant growth without water and without light.
	b	Students describe* how the evidence will allow them to determine whether plants need light and water to grow.
3	Planning the investigation	
	a	Students collaboratively develop an investigation plan. In the investigation plan, students describe* the features to be part of the investigation, including:
		i. The plants to be used.
		ii. The source of light.
		iii. How plants will be kept with/without light in both the light/dark test and the water/no water test.
		iv. The amount of water plants will be given in both the light/dark test and the water/no water test.
		v. How plant growth will be determined (e.g., observations of plant height, number and size of leaves, thickness of the stem, number of branches).
	b	Students individually describe* how this plan allows them to answer the question.
4	Collecting the data	
	a	According to the investigation plan developed, students collaboratively collect and record data on the effects on plant growth by:
		i. Providing both light and water,
		ii. Withholding light but providing water,
		iii. Withholding water but providing light, or
		iv. Withholding both water and light.

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.	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	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.	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.

• 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.	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.	• 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.	• 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 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.	The food of almost any animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants, while decomposers restore some materials back to the soil.	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): LS2.A: Interdependent Relationships in Ecosystems

K-2	3-5	6-8	9-12
LS2.A: Plants depend on water and light to grow, and also depend on animals for pollination or to move their seeds around.	**LS2.A:** The food of almost any animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants, while decomposers restore some materials back to the soil.	**LS2.A:** Organisms and populations are dependent on their environmental interactions both with other living things and with nonliving factors, any of which can limit their growth. Competitive, predatory, and mutually beneficial interactions vary across ecosystems but the patterns are shared.	**LS2.A:** Ecosystems have carrying capacities resulting from biotic and abiotic factors. The fundamental tension between resource availability and organism populations affects the abundance of species in any given ecosystem.

Related Cross-Curricular Standards: Current Grade Level

ELA Connections:

- **LA.2.RI.1** Identify the main topic and key details in a multi-paragraph text.
- **LA.2.RI.2** Describe the connections between individuals, historical events, scientific ideas, or steps in a process.
- **LA.2.RI.3** Determine and explain the author's purpose in an informational text, including what the author wants to answer, explain, or describe.
- **LA.2.RI.4** Explain how text features (titles, headings, table of contents, glossaries, captions, graphs, maps, and/or other visuals) contribute to the meaning of texts.

- **LA.2.RI.5** Compare and contrast the two most important ideas presented by two informational texts on the same topic.

- **LA.2.RI.8** With scaffolding as needed, read and comprehend a wide range of informational texts of appropriate complexity for Grade 2.
- **LA.2.V.2** Interpret an author's use of figurative, connotative, and technical language in grade-level literary and informational text.
- **LA.2.W.5** Write informative/explanatory pieces about a topic or text with supporting facts and details.
- **LA.2.W.6** Locate information from provided sources to answer questions about a topic.
- **LA.2.SL.1** Participate with peers and adults in structured discussions and routines about 2nd grade topics and texts.
- **LA.2.SL.2** Tell a story or recount an experience with appropriate facts and pertinent descriptive details.

Mathematics Connections:

- **2.G.2.a** Measure the length of an object using two different length units and describe how the measurements relate to the size of the specific unit.
- **2.G.2.b** Compare the difference in length of objects using inches and feet or centimeters and meters.
- **2.G.3.a** Identify and use appropriate tools for measuring length.
- **2.G.3.b** Measure and estimate lengths using whole numbers with inches, feet, centimeters, and meters.
- **2.D.1.a** Ask authentic questions to generate data and represent the data using scaled picture graphs with up to four categories.
- **2.D.1.b** Ask authentic questions to generate data and represent the data using bar graphs with up to four categories.
- **2.D.1.c** Create and represent a data set by making a line plot using whole numbers.
- **2.D.2.a** Analyze data using scaled picture graphs or bar graphs with up to four categories. Solve problems including one-step comparison problems, using information from the graphs.

Social Studies Connections:

- SS 2.3.2.a Identify and differentiate between physical and human features of neighborhoods and communities.
- SS 2.3.2.b Describe local places and regions
- SS 2.3.2.c Explain how places and regions change over time.
- SS 2.4.4.b Identify, obtain, and cite appropriate primary and secondary sources for research.

Fine and Performing Arts Connections:

- FA 2.1.1.a Share imaginative ways that media arts can be used to communicate a narrative, experience, or idea (e.g., movie, podcast (glossary), digital art).
- FA 2.1.4.c Explore use of media arts as a collaborative art form to communicate information, experiences, or ideas to others.
- FA 2.2.1.a Experiment and explore ideas and materials (glossary) (e.g., 2D, 3D).
- FA 2.2.2.c Communicate a variety of different venues (glossary) to display art (e.g., describe or dramatize to an audience).
- FA 2.2.4.d Identify how images and objects are used to convey a story, familiar experience, or connection to the world.

Connection to other grade level indicators

Authentic Connections to Other Content Standards:

Second Grade Topic Model Bundle 3 (The Needs of Plants) NGSS

SC.2.7.2.a, SC.2.7.2.b, SC.1.6.2.b

Academic Language Development

Words to support student discourse related to the Disciplinary Core Ideas (DCIs):	**Sentence stems that utilize academic language:**
• Plant • Growth • Cause • Effect • Investigation • Variable	• By looking at patterns in the data, I determined that _____ caused _____. • If _____ happens, I predict that _____ will occur.

Assessment Considerations

Formative Assessment:

- https://www.education.ne.gov/assessment/science-classroom-formative-task-repository-for-grades-5-8/

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:** Understand and describe why plants might need sunlight and water to grow.
- **KSA2:** Plan and carry out a simple experiment to test if plants need sunlight or water, such as setting up two groups of plants with different conditions.
- **KSA3:** Observe and explain the results of the experiment, showing whether the plants grew well with sunlight and water and what happened to plants without them.

Standard

Topic Code: SC.2.7 Interdependent Relationships in Ecosystems
Standard Code: SC.2.7.2 Gather, analyze, and communicate evidence of interdependent relationships in ecosystems.

Living things (plants and animals, including humans) need water, air, and resources from the land to survive and live in habitats that provide these necessities. The physical characteristics of plants and animals reflect the habitat in which they live. Animals also have modified behaviors that help them survive, grow, and meet their needs. Humans sometimes mimic plant and animal adaptations to survive in their environment.

Indicator

Indicator Code: SC.2.7.2.b

Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.

NGSS Comparison: 2-LS2-2

Other Indicators in this Standard

SC.2.7.2.a, SC.2.7.2.c

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.	**Structure and Function** • The shape and stability of structures of natural and designed objects are related to their function(s).

Disciplinary Core Idea (DCI)

LS2.A: Interdependent Relationships in Ecosystems
- Plants depend on animals for pollination or to move their seeds around.

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

- **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 Phenomenon with links to videos and lessons**
- Plant Your Socks
- The Mystery of the Missing Bees

- How Do Plant Seeds Travel?
- Seed Dispersal By Animals
- Seed Dispersal By Water
- Hitchhiking seeds
- Helicopter seeds
- Coconut floats

Evidence Statements

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

2.7.2.b Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.		
1	Components of the model	
	a	Students develop a simple model that mimics the function of an animal in seed dispersal or pollination of plants. Students identify the relevant components of their model, including those components that mimic the natural structure of an animal that helps it disperse seeds (e.g., hair that snares seeds, squirrel cheek pouches that transport seeds) or that mimic the natural structure of an animal that helps it pollinate plants (e.g., bees have fuzzy bodies to which pollen sticks, hummingbirds have bills that transport pollen). The relevant components of the model include:
		i. Relevant structures of the animal.
		ii. Relevant structures of the plant.
		iii. Pollen or seeds from plants.
2	Relationships	
	a	In the model, students describe* relationships between components, including evidence that the developed model mimics how plant and animal structures interact to move pollen or disperse seeds.
		i. Students describe* the relationships between components that allow for movement of pollen or seeds.
		ii. Students describe* the relationships between the parts of the model they are developing and the parts of the animal they are mimicking.
3	Connections	
	a	Students use the model to describe*:
		i. How the structure of the model gives rise to its function.
		ii. Structure-function relationships in the natural world that allow some animals to disperse seeds or pollinate plants.

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)	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.	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.	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.

that represent concrete events or design solutions. • Distinguish between a model and the actual object, process, and/or events the model represents. • 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.	• Collaboratively develop and/or revise a model based on evidence that shows the relationships among variables for frequent and regular occurring events. • 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.	• 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 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.	• 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. • 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): Structure and Function

K-2	3-5	6-8	9-12
In grades K-2, students observe the shape and stability of structures of natural and designed objects are related to their function(s).	In grades 3-5, students learn different materials have different substructures, which can sometimes be observed; and substructures have shapes and parts that serve functions	In grades 6-8, students model complex and microscopic structures and systems and visualize how their function depends on the shapes, composition, and relationships among its parts. They analyze many complex natural and designed structures and systems to determine how they function. They design structures to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used.	In grades 9-12, students investigate systems by examining the properties of different materials, the structures of different components, and their interconnections to reveal the system's function and/or solve a problem. They infer the functions and properties of natural and designed objects and systems from their overall structure, the way their components are shaped and used, and the molecular substructures of their various materials.

Disciplinary Core Ideas (DCIs): LS2.A: Interdependent Relationships in Ecosystems, ETS1.B: Developing Possible Solutions

K-2	3-5	6-8	9-12
LS2.A: Plants depend on water and light to grow, and also depend on animals for pollination or to move their seeds around. **ETS1.B:** • 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.	**LS2.A:** The food of almost any animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants, while decomposers restore some materials back to the soil. **ETS1.B:** • Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. • Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved. • At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs.	**LS2.A:** Organisms and populations are dependent on their environmental interactions both with other living things and with nonliving factors, any of which can limit their growth. Competitive, predatory, and mutually beneficial interactions vary across ecosystems but the patterns are shared. **ETS1.B:** • A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. • There are systematic processes for evaluating solutions with respect to how well they meet criteria and constraints of a problem. • Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. • Models of all kinds are important for testing solutions.	**LS2.A:** Ecosystems have carrying capacities resulting from biotic and abiotic factors. The fundamental tension between resource availability and organism populations affects the abundance of species in any given ecosystem. **ETS1.B:** • When evaluating solutions it is important to take into account a range of constraints including cost, safety, reliability, and aesthetics and to consider social, cultural, and environmental impacts. • Both physical models and computers can be used in various ways to aid in the engineering design process. Computers are useful for a variety of purposes, such as running simulations to test different ways of solving a problem or to see which one is most efficient or economical; and in making a persuasive presentation to a client about how a given design will meet his or her needs.

Related Cross-Curricular Standards: Current Grade Level

ELA Connections:

- **LA.2.RI.1** Identify the main topic and key details in a multi-paragraph text.
- **LA.2.RI.2** Describe the connections between individuals, historical events, scientific ideas, or steps in a process.
- **LA.2.RI.3** Determine and explain the author's purpose in an informational text, including what the author wants to answer, explain, or describe.
- **LA.2.RI.4** Explain how text features (titles, headings, table of contents, glossaries, captions, graphs, maps, and/or other visuals) contribute to the meaning of texts.

- **LA.2.RI.5** Compare and contrast the two most important ideas presented by two informational texts on the same topic.
- **LA.2.RI.8** With scaffolding as needed, read and comprehend a wide range of informational texts of appropriate complexity for Grade 2.
- **LA.2.V.2** Interpret an author's use of figurative, connotative, and technical language in grade-level literary and informational text.

- **LA.2.W.5** Write informative/explanatory pieces about a topic or text with supporting facts and details.
- **LA.2.W.6** Locate information from provided sources to answer questions about a topic.
- **LA.2.SL.1** Participate with peers and adults in structured discussions and routines about 2nd grade topics and texts.
- **LA.2.SL.2** Tell a story or recount an experience with appropriate facts and pertinent descriptive details.

Mathematics Connections:

-

Social Studies Connections:

- SS 2.3.2.b Describe local places and regions.
- SS 2.4.4.b Identify, obtain, and cite appropriate primary and secondary sources for research.

Fine and Performing Arts Connections:

- FA 2.1.1.a Share imaginative ways that media arts can be used to communicate a narrative, experience, or idea (e.g., movie, podcast (glossary), digital art).
- FA 2.1.4.c Explore use of media arts as a collaborative art form to communicate information, experiences, or ideas to others.
- FA 2.2.1.a Experiment and explore ideas and materials (glossary) (e.g., 2D, 3D).
- FA 2.2.2.c Communicate a variety of different venues (glossary) to display art (e.g., describe or dramatize to an audience).
- FA 2.2.4.d Identify how images and objects are used to convey a story, familiar experience, or connection to the world.

Connection to other grade level indicators

Authentic Connections to Other Content Standards:

Second Grade Topic Model Bundle 3 (The Needs of Plants) NGSS

SC.2.7.2.a, SC.2.7.2.b, SC.1.6.2.b

Academic Language Development

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

- Seeds
- Survival
- Environment
- Habitat
- Structure
- Function
- Reproduce
- Pollinate
- Disperse
- Plants
- Animals

Sentence stems that utilize academic language:

- The _____ structures allow the plant to reproduce or move its seeds by_____.
- The _____structures help _____ to function because_____.
- These structures help the organism to_____(describe function).

Assessment Considerations

Formative Assessment:

- https://www.education.ne.gov/assessment/science-classroom-formative-task-repository-for-grades-5-8/

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:** Understand and describe how animals help spread seeds or pollinate plants.

- **KSA2:** Create a simple model using materials like clay or paper to show how an animal moves seeds or pollen from one place to another.
- **KSA3:** Explain how the model works and how it represents the way an animal helps with seed spreading or pollination.

Standard

Topic Code: SC.2.7 Interdependent Relationships in Ecosystems
Standard Code: SC.2.7.2 Gather, analyze, and communicate evidence of interdependent relationships in ecosystems.

Living things (plants and animals, including humans) need water, air, and resources from the land to survive and live in habitats that provide these necessities. The physical characteristics of plants and animals reflect the habitat in which they live. Animals also have modified behaviors that help them survive, grow, and meet their needs. Humans sometimes mimic plant and animal adaptations to survive in their environment.

Indicator

Indicator Code: SC.2.7.2.c

Make observations of plants and animals **to compare** the diversity of life in different habitats. Emphasis is on the diversity of living things in each of a variety of different habitats. Assessment does not include specific animal and plant names in specific habitats.

NGSS Comparison: 2-LS4-1

Other Indicators in this Standard

SC.2.7.2.a, SC.2.7.2.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 Nature of Science*** **Scientific Knowledge is Based on Empirical Evidence** • Scientists look for patterns and order when making observations about the world.	
Disciplinary Core Idea (DCI)	
LS4.D: Biodiversity and Humans • There are many different kinds of living things in any area, and they exist in different places on land and in water.	
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.7n1lmgq179is **Link to List of Phenomenon with links to videos and lessons**
- Exploring Microhabitats
- Air Plants - No Soil Needed
- Biodiversity for 2nd Graders
- African Savannah Virtual Field Trip
- Nebraska animals in various Nebraska regions
- When you are in different parts of the city/neighborhood, you see many different types of animals and plants.
- There are different insects under the rocks than on the blacktop.

Evidence Statements

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

2.7.2.c Make observations of plants and animals **to compare** the diversity of life in different habitats.		
1	Identifying the phenomenon under investigation	
	a	Students identify and describe* the phenomenon and purpose of the investigation, which includes comparisons of plant and animal diversity of life in different habitats.
2	Identifying the evidence to address the purpose of the investigation	
	a	Based on the given plan for the investigation, students describe* the following evidence to be collected:
		i. Descriptions* based on observations (firsthand or from media) of habitats, including land habitats (e.g., playground, garden, forest, parking lot) and water habitats (e.g., pond, stream, lake).
		ii. Descriptions* based on observations (firsthand or from media) of different types of living things in each habitat (e.g., trees, grasses, bushes, flowering plants, lizards, squirrels, ants, fish, clams).
		iii. Comparisons of the different types of living things that can be found in different habitats.
	b	Students describe* how these observations provide evidence for patterns of plant and animal diversity across habitats.
3	Planning the investigation	
	a	Based on the given investigation plan, students describe* how the different plants and animals in the habitats will be observed, recorded, and organized.
4	Collecting the data	
	a	Students collect, record, and organize data on different types of plants and animals in the habitats.

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,	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	Planning and carrying out investigations in 6-8 builds on K-5 experiences and progresses to include investigations that use multiple	Planning and carrying out investigations in 9-12 builds on K-8 experiences and progresses to include investigations that provide evidence for

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.	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.	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.	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 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): N/A

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

Disciplinary Core Ideas (DCIs): LS4.D: Biodiversity and Humans

K-2	3-5	6-8	9-12
LS4.D: A range of different organisms lives in different places.	**LS4.D:** Populations of organisms live in a variety of habitats. Change in those habitats affects the organisms living there.	**LS4.D:** Changes in biodiversity can influence humans' resources and ecosystem services they rely on.	**LS4.D:** Biodiversity is increased by formation of new species and reduced by extinction. Humans depend on biodiversity but also have adverse impacts on it. Sustaining biodiversity is essential to supporting life on Earth.

Related Cross-Curricular Standards: Current Grade Level

ELA Connections:

- **LA.2.RI.1** Identify the main topic and key details in a multi-paragraph text.
- **LA.2.RI.2** Describe the connections between individuals, historical events, scientific ideas, or steps in a process.
- **LA.2.RI.3** Determine and explain the author's purpose in an informational text, including what the author wants to answer, explain, or describe.
- **LA.2.RI.4** Explain how text features (titles, headings, table of contents, glossaries, captions, graphs, maps, and/or other visuals) contribute to the meaning of texts.
- **LA.2.RI.5** Compare and contrast the two most important ideas presented by two informational texts on the same topic.
- **LA.2.RI.8** With scaffolding as needed, read and comprehend a wide range of informational texts of appropriate complexity for Grade 2.
- **LA.2.V.2** Interpret an author's use of figurative, connotative, and technical language in grade-level literary and informational text.
- **LA.2.W.5** Write informative/explanatory pieces about a topic or text with supporting facts and details.
- **LA.2.W.6** Locate information from provided sources to answer questions about a topic.
- **LA.2.SL.1** Participate with peers and adults in structured discussions and routines about 2nd grade topics and texts.
- **LA.2.SL.2** Tell a story or recount an experience with appropriate facts and pertinent descriptive details.

Mathematics Connections:

- **2.D.1.a** Ask authentic questions to generate data and represent the data using scaled picture graphs with up to four categories.
- **2.D.1.b** Ask authentic questions to generate data and represent the data using bar graphs with up to four categories.
- **2.D.1.c** Create and represent a data set by making a line plot using whole numbers.
- **2.D.2.a** Analyze data using scaled picture graphs or bar graphs with up to four categories. Solve problems including one-step comparison problems, using information from the graphs.

Social Studies Connections:

- SS 2.3.1.a Compare and contrast maps and globes.
- SS 2.3.1.b Identify and describe locations in neighborhoods.
- SS 2.3.1.e Explain why things are located where they are in neighborhoods.
- SS 2.3.2.a Identify and differentiate between physical and human features of neighborhoods and communities.
- SS 2.3.2.b Describe local places and regions.
- SS 2.3.2.c Explain how places and regions change over time.
- SS 2.3.3.d Describe how people adapt to their physical environment.
- SS 2.4.4.b Identify, obtain, and cite appropriate primary and secondary sources for research.

Fine and Performing Arts Connections:

- FA 2.1.1.a Share imaginative ways that media arts can be used to communicate a narrative, experience, or idea (e.g., movie, podcast (glossary), digital art).
- FA 2.1.4.c Explore use of media arts as a collaborative art form to communicate information, experiences, or ideas to others.
- FA 2.2.1.a Experiment and explore ideas and materials (glossary) (e.g., 2D, 3D).
- FA 2.2.2.c Communicate a variety of different venues (glossary) to display art (e.g., describe or dramatize to an audience).
- FA 2.2.4.d Identify how images and objects are used to convey a story, familiar experience, or connection to the world.

Connection to other grade level indicators

Authentic Connections to Other Content Standards:

Second Grade Topic Model Bundle 3 (The Needs of Plants) NGSS

- SC.2.7.2.a, SC.2.7.2.b, SC.1.6.2.b

Academic Language Development

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

- Survival
- Structure
- Function
- Environment
- Habitat
- Plants
- Animals

Sentence stems that utilize academic language:

- The _____structures help _____ to function by_____.
- The _____structures allow an organism to survive within this environment.
- These structures help the organism to_____(describe function).

Assessment Considerations

Formative Assessment:

- https://www.education.ne.gov/assessment/science-classroom-formative-task-repository-for-grades-5-8/

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:** Identify and name different plants and animals found in various habitats.
- **KSA2:** Observe and describe the variety of plants and animals in different places, such as forests, ponds, or gardens.
- **KSA3:** Compare the types of plants and animals in each habitat and explain how they are different or similar.

Standard

Topic Code: SC.2.13 Earth's Systems: Processes That Shape the Earth

Standard Code: SC.2.13.3 Gather, analyze, and communicate evidence of the processes that shape the earth.

Earth has an ancient history of slow and gradual surface changes, punctuated with quick but powerful geologic events like volcanic eruptions, flooding, and earthquakes. Water and wind play a significant role in changing Earth's surface. The effects of wind and water can cause both slow and quick changes to the surface of the Earth. Scientists and engineers design solutions to slow or prevent wind or water from changing the land.

Indicator

Indicator Code: SC.2.13.3.a

Use information from several sources to provide evidence that Earth events can occur quickly or slowly. Examples of events and timescales could include volcanic explosions and earthquakes, which happen quickly and erosion of rocks, which occurs slowly. Assessment does not include quantitative measurements of timescales.

NGSS Comparison: 2-ESS1-1

Other Indicators in this Standard

SC.2.13.3.b, SC.2.13.3.c, SC.2.13.3.d

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.	**Stability and Change** • Things may change slowly or rapidly.

Disciplinary Core Idea (DCI)

ESS1.C: The History of Planet Earth
- Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe.

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 Phenomenon with links to videos and lessons**
- How Was the Grand Canyon Formed?
- Augmented Reality Sandbox
- Epic Mudslide Caught on Camera
- Niagra Falls Collapse
- Sinkhole Swallows Trees
- Volcanoes

- Earthquakes
- Sandstorms
- Sand dunes and sand dune migration
- Nebraska Sandhills
- An earthquake makes a crack in a road.
- There is dirt on the blacktop by the hill that was not there yesterday.
- After a rainstorm, a river looks different.
- Goblin Valley has many unique rock formations.
- When you look at the mountains from a distance, you can see high points and low points.

Evidence Statements

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

2.13.3.a Use information from several sources to provide evidence that Earth events can occur quickly or slowly.		
1	Articulating the explanation of phenomena	
	a	Students articulate a statement that relates the given phenomenon to a scientific idea, including that Earth events can occur very quickly or very slowly.
	b	Students use evidence and reasoning to construct an evidence-based account of the phenomenon.
2	Evidence	
	a	Students describe* the evidence from observations (firsthand or from media; e.g., books, videos, pictures, historical photos), including:
		i. That some Earth events occur quickly (e.g., the occurrence of flood, severe storm, volcanic eruption, earthquake, landslides, erosion of soil).
		ii. That some Earth events occur slowly.
		iii. Some results of Earth events that occur quickly.
		iv. Some results of Earth events that occur very slowly (e.g., erosion of rocks, weathering of rocks).
		v. The relative amount of time it takes for the given Earth events to occur (e.g., slowly, quickly, hours, days, years).
	b	Students make observations using at least three sources
3	Reasoning	
	a	Students use reasoning to logically connect the evidence to construct an evidence-based account. Students describe* their reasoning, including:
		i. In some cases, Earth events and the resulting changes can be directly observed; therefore those events must occur rapidly.
		ii. In other cases, the resulting changes of Earth events can be observed only after long periods of time; therefore these Earth events occur slowly, and change happens over a time period that is much longer than one can observe.

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. • 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.	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, 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.	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 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.	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 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): Stability and Change

K-2	3-5	6-8	9-12
In grades K-2, students observe some things stay the same while other things change, and things may change slowly or rapidly.	In grades 3-5, students measure change in terms of differences over time, and observe that change may occur at different rates. Students learn some systems appear stable, but over long periods of time they will eventually change.	In grades 6-8, students explain stability and change in natural or designed systems by examining changes over time, and considering forces at different scales, including the atomic scale. Students learn changes in one part of a system might cause large changes in another part, systems in dynamic equilibrium are stable due to a balance of feedback mechanisms, and stability might be disturbed by either sudden events or gradual changes that accumulate over time.	In grades 9-12, students understand much of science deals with constructing explanations of how things change and how they remain stable. They quantify and model changes in systems over very short or very long periods of time. They see some changes are irreversible, and negative feedback can stabilize a system, while positive feedback can destabilize it. They recognize systems can be designed for greater or lesser stability.

Disciplinary Core Ideas (DCIs): ESS1.C: The History of Planet Earth

K-2	3-5	6-8	9-12
ESS1.C: Some events on Earth occur very quickly; others can occur very slowly	**ESS1.C:** Certain features on Earth can be used to order events that have occurred in a landscape	**ESS1.C:** Rock strata and the fossil record can be used as evidence to organize the relative occurrence of major historical events in Earth's history.	**ESS1.C:** The rock record resulting from tectonic and other geoscience processes as well as objects from the solar system can provide evidence of Earth's early history and the relative ages of major geologic formations.

Related Cross-Curricular Standards: Current Grade Level

ELA Connections:

- **LA.2.RI.1** Identify the main topic and key details in a multi-paragraph text.
- **LA.2.RI.2** Describe the connections between individuals, historical events, scientific ideas, or steps in a process.
- **LA.2.RI.3** Determine and explain the author's purpose in an informational text, including what the author wants to answer, explain, or describe.
- **LA.2.RI.4** Explain how text features (titles, headings, table of contents, glossaries, captions, graphs, maps, and/or other visuals) contribute to the meaning of texts.

- **LA.2.RI.5** Compare and contrast the two most important ideas presented by two informational texts on the same topic.
- **LA.2.RI.8** With scaffolding as needed, read and comprehend a wide range of informational texts of appropriate complexity for Grade 2.
- **LA.2.V.2** Interpret an author's use of figurative, connotative, and technical language in grade-level literary and informational text.
- **LA.2.W.5** Write informative/explanatory pieces about a topic or text with supporting facts and details.
- **LA.2.W.6** Locate information from provided sources to answer questions about a topic.
- **LA.2.SL.1** Participate with peers and adults in structured discussions and routines about 2nd grade topics and texts.
- **LA.2.SL.2** Tell a story or recount an experience with appropriate facts and pertinent descriptive details.

Mathematics Connections:

- **2.G.5.b** Identify and write time to five-minute intervals using analog and digital clocks and both a.m. and p.m.

Social Studies Connections:

- SS 2.2.1.a. Justify a decision made by providing evidence of possible gains and losses.
- SS 2.3.1.a Compare and contrast maps and globes.
- SS 2.3.1.b Identify and describe locations in neighborhoods.
- SS 2.3.1.c Identify and apply map elements.
- SS 2.3.1.d Locate communities, Nebraska, and the United States on maps and globes.
- SS 2.3.2.a Identify and differentiate between physical and human features of neighborhoods and communities.
- SS 2.3.2.b Describe local places and regions.
- SS 2.3.2.c Explain how places and regions change over time.
- SS 2.3.3.a Identify examples of Earth's physical processes.
- SS 2.3.3.b Describe how seasonal weather patterns, natural hazards, and natural resources affect human activities.
- SS 2.3.3.d Describe how people adapt to their physical environment.
- SS 2.4.4.b Identify, obtain, and cite appropriate primary and secondary sources for research.

Fine and Performing Arts Connections:

- FA 2.1.1.a Share imaginative ways that media arts can be used to communicate a narrative, experience, or idea (e.g., movie, podcast (glossary), digital art).
- FA 2.1.4.c Explore use of media arts as a collaborative art form to communicate information, experiences, or ideas to others.
- FA 2.2.1.a Experiment and explore ideas and materials (glossary) (e.g., 2D, 3D).
- FA 2.2.2.c Communicate a variety of different venues (glossary) to display art (e.g., describe or dramatize to an audience).
- FA 2.2.4.d Identify how images and objects are used to convey a story, familiar experience, or connection to the world.

Connection to other grade level indicators

Authentic Connections to Other Content Standards:

Second Grade Topic Bundle 2 (Changes to the Land) NGSS

- SC.2.3.1.b, SC.2.3.1.d, SC.2.13.3.a, SC.2.13.3.b, SC.2.13.3.c, SC.2.3.1.c

Academic Language Development

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

- Earth's surface
- fast change (volcanic eruptions, earthquakes, landslide)
- slow change (erosion)
- Stable
- Unstable

Sentence stems that utilize academic language:

- The things that stay the same are _____.
- The things that change are _____.
- The things that are changing slowly in this system are _____.
- The things that are changing quickly in this system are _____.
- The _____(event) changed this system by _____.
- _____ was affected by the change of _____.
- _____ are causing this system to be unstable.

Assessment Considerations

Formative Assessment:

- https://www.education.ne.gov/assessment/science-classroom-formative-task-repository-for-grades-5-8/

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:** Identify and describe Earth events that happen quickly (like eruptions) and slowly (like erosion).
- **KSA2:** Use drawings or simple examples to show the difference between fast and slow Earth events.
- **KSA3:** Explain how some Earth events occur quickly and others slowly using examples.

Standard

Topic: SC.2.13 Earth's Systems: Processes That Shape the Earth

Standard: SC.2.13.3 Gather, analyze, and communicate evidence of the processes that shape the earth.

Earth has an ancient history of slow and gradual surface changes, punctuated with quick but powerful geologic events like volcanic eruptions, flooding, and earthquakes. Water and wind play a significant role in changing Earth's surface. The effects of wind and water can cause both slow and quick changes to the surface of the Earth. Scientists and engineers design solutions to slow or prevent wind or water from changing the land.

Indicator

Indicator Code: SC.2.13.3.b

Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land. Examples of solutions could include different designs of dikes and windbreaks to hold back wind and water, and different designs for using shrubs, grass, and trees to hold back the land.

NGSS Comparison: 2-ESS2-1

Other Indicators in this Standard

SC.2.13.3.a, SC.2.13.3.c, SC.2.13.3.d

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.	**Stability and Change** • Things may change slowly or rapidly. ***Connections to Engineering, Technology, and Applications of Science*** **Influence of Engineering, Technology, and Science on Society and the Natural World** • Developing and using technology has impacts on the natural world.

	Connections to Nature of Science **Science Addresses Questions About the Natural and Material World** • Scientists study the natural and material world.

Disciplinary Core Idea (DCI)

ESS2.A: Earth Materials and Systems
- Wind and water can change the shape of the land.

ETS1.C: Optimizing the Design Solution
- Because there is always more than one possible solution to a problem, it is useful to compare and test designs.

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**
- How Was the Grand Canyon Formed?
- Why Do Rivers Curve?
- Epic Mudslide Caught on Camera
- Erosion Lab
- Switchbacks on trails
- Prevention of landslides
- Erosion prevention
- Windbreaks
- Dust Bowl
- Changing coastlines

Evidence Statements

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

2.13.3.b Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.		
1	Using scientific knowledge to generate design solutions	
	a	Students describe* the given problem, which includes the idea that wind or water can change the shape of the land by washing away soil or sand.
	b	Students describe* at least two given solutions in terms of how they slow or prevent wind or water from changing the shape of the land.
2	Describing* specific features of the design solution, including quantification where appropriate	
	a	Students describe* the specific expected or required features for the solutions that would solve the given problem, including:
		i. Slowing or preventing wind or water from washing away soil or sand.
		ii. Addressing problems created by both slow and rapid changes in the environment (such as many mild rainstorms or a severe storm and flood).
3	Evaluating potential solutions	
	a	Students evaluate each given solution against the desired features to determine and describe* whether and how well the features are met by each solution.
	b	Using their evaluation, students compare the given solutions to each other.

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. • 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.	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, 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.	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 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.	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 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,

		• Optimize performance of a design by prioritizing criteria, making tradeoffs, testing, revising, and retesting.	prioritized criteria, and tradeoff considerations.

Crosscutting Concepts (CCCs): Stability and Change

K-2	3-5	6-8	9-12
In grades K-2, students observe some things stay the same while other things change, and things may change slowly or rapidly.	In grades 3-5, students measure change in terms of differences over time, and observe that change may occur at different rates. Students learn some systems appear stable, but over long periods of time they will eventually change.	In grades 6-8, students explain stability and change in natural or designed systems by examining changes over time, and considering forces at different scales, including the atomic scale. Students learn changes in one part of a system might cause large changes in another part, systems in dynamic equilibrium are stable due to a balance of feedback mechanisms, and stability might be disturbed by either sudden events or gradual changes that accumulate over time.	In grades 9-12, students understand much of science deals with constructing explanations of how things change and how they remain stable. They quantify and model changes in systems over very short or very long periods of time. They see some changes are irreversible, and negative feedback can stabilize a system, while positive feedback can destabilize it. They recognize systems can be designed for greater or lesser stability.

Disciplinary Core Ideas (DCIs): ESS2.A: Earth Materials and Systems, ETS1.C: Optimizing the Design Solution

K-2	3-5	6-8	9-12
ESS2.A: Wind and water change the shape of the land. **ETS1.C:** • Because there is always more than one possible solution to a problem, it is useful to compare and test designs.	**ESS2.A:** Four major Earth systems interact. Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, organisms, and gravity break rocks, soils, and sediments into smaller pieces and move them around **ETS1.C:** • Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints.	**ESS2.A:** Energy flows and matter cycles within and among Earth's systems, including the sun and Earth's interior as primary energy sources. Plate tectonics is one result of these processes. **ETS1.C:** • Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process- that is, some of the characteristics may be incorporated into the new design.	**ESS2.A:** Feedback effects exist within and among Earth's systems. **ETS1.C:** • Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others (trade-offs) may be needed.

		• The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to a greater refinement and ultimately to an optimal solution.	

Related Cross-Curricular Standards: Current Grade Level

ELA Connections:

- **LA.2.RI.1** Identify the main topic and key details in a multi-paragraph text.
- **LA.2.RI.2** Describe the connections between individuals, historical events, scientific ideas, or steps in a process.
- **LA.2.RI.3** Determine and explain the author's purpose in an informational text, including what the author wants to answer, explain, or describe.
- **LA.2.RI.4** Explain how text features (titles, headings, table of contents, glossaries, captions, graphs, maps, and/or other visuals) contribute to the meaning of texts.
- **LA.2.RI.5** Compare and contrast the two most important ideas presented by two informational texts on the same topic.
- **LA.2.RI.8** With scaffolding as needed, read and comprehend a wide range of informational texts of appropriate complexity for Grade 2.
- **LA.2.V.2** Interpret an author's use of figurative, connotative, and technical language in grade-level literary and informational text.
- **LA.2.W.5** Write informative/explanatory pieces about a topic or text with supporting facts and details.
- **LA.2.W.6** Locate information from provided sources to answer questions about a topic.
- **LA.2.SL.1** Participate with peers and adults in structured discussions and routines about 2nd grade topics and texts.
- **LA.2.SL.2** Tell a story or recount an experience with appropriate facts and pertinent descriptive details.

Mathematics Connections:

Social Studies Connections:

- SS 2.2.1.a. Justify a decision made by providing evidence of possible gains and losses.
- SS 2.3.1.a Compare and contrast maps and globes.
- SS 2.3.1.b Identify and describe locations in neighborhoods.
- SS 2.3.1.c Identify and apply map elements.
- SS 2.3.1.d Locate communities, Nebraska, and the United States on maps and globes.
- SS 2.3.2.a Identify and differentiate between physical and human features of neighborhoods and communities.
- SS 2.3.2.b Describe local places and regions.
- SS 2.3.2.c Explain how places and regions change over time.
- SS 2.3.3.a Identify examples of Earth's physical processes.
- SS 2.3.3.b Describe how seasonal weather patterns, natural hazards, and natural resources affect human activities.
- SS 2.3.3.d Describe how people adapt to their physical environment.
- SS 2.4.4.b Identify, obtain, and cite appropriate primary and secondary sources for research.

Fine and Performing Arts Connections:

- FA 2.1.1.a Share imaginative ways that media arts can be used to communicate a narrative, experience, or idea (e.g., movie, podcast (glossary), digital art).
- FA 2.1.4.c Explore use of media arts as a collaborative art form to communicate information, experiences, or ideas to others.
- FA 2.2.1.a Experiment and explore ideas and materials (glossary) (e.g., 2D, 3D).
- FA 2.2.2.c Communicate a variety of different venues (glossary) to display art (e.g., describe or dramatize to an audience).

- FA 2.2.4.d Identify how images and objects are used to convey a story, familiar experience, or connection to the world.

Connection to other grade level indicators

Authentic Connections to Other Content Standards:
Second Grade Topic Bundle 2 (Changes to the Land) NGSS
SC.2.3.1.b, SC.2.3.1.d, SC.2.13.3.a, SC.2.13.3.b, SC.2.13.3.c, SC.2.3.1.c

Academic Language Development

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

- Wind
- Water
- Earth's surface
- Change
- Prevent
- Problem
- Design
- Model
- Test
- Compare
- Solution
- Stable
- Unstable

Sentence stems that utilize academic language:

- The _____(event) changed this system by _____.
- _____ in the system may be affected over time.
- _____ is how the solutions are similar.
- _____ is how the solutions are different.
- _____ are causing this system to be unstable.
- To make this design more stable, I could _____.

Assessment Considerations

Formative Assessment:

- https://www.education.ne.gov/assessment/science-classroom-formative-task-repository-for-grades-5-8/

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:** Students will identify and name different ways to prevent wind or water from changing the land, such as using dikes, windbreaks, or planting trees and grass.
- **KSA2:** Students will describe how each method works to protect the land from wind or water, using simple words and pictures to show their understanding.
- **KSA3:** Students will choose which method they think works best for keeping the land the same and explain their choice in their own words.

Standard

Topic: SC.2.13 Earth's Systems: Processes That Shape the Earth
Standard: SC.2.13.3 Gather, analyze, and communicate evidence of the processes that shape the earth.

Earth has an ancient history of slow and gradual surface changes, punctuated with quick but powerful geologic events like volcanic eruptions, flooding, and earthquakes. Water and wind play a significant role in changing Earth's surface. The effects of wind and water can cause both slow and quick changes to the surface of the Earth. Scientists and engineers design solutions to slow or prevent wind or water from changing the land.

Indicator

Indicator Code: SC.2.13.3.c

Develop a model to represent the shapes and kinds of land and bodies of water in an area. Assessment does not include quantitative scaling in models.

NGSS Comparison: 2-ESS2-2

Other Indicators in this Standard

SC.2.13.3.a, SC.2.13.3.b, SC.2.13.3.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	**Patterns** • Patterns in the natural world can be observed.
Disciplinary Core Idea (DCI)	
ESS2.B: Plate Tectonics and Large-Scale System Interactions • Maps show where things are located. One can map the shapes and kinds of land and water in any area.	
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 Phenomenon with links to videos and lessons** • Augmented Reality Sandbox • Glacier National Park is Melting Away • In the spring, rivers may flood. • Water and wind are eroding the cliffs where buildings are.	

Evidence Statements

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

2.13.3.c **Develop a model to represent** the shapes and kinds of land and bodies of water in an area.		
1	Components of the model	
	a	Students develop a model (i.e., a map) that identifies the relevant components, including components that represent both land and bodies of water in an area.
2	Relationships	
	a	In the model, students identify and describe* relationships between components using a representation of the specific shapes and kinds of land (e.g., playground, park, hill) and specific bodies of water (e.g., creek, ocean, lake, river) within a given area.
	b	Students use the model to describe* the patterns of water and land in a given area (e.g., an area may have many small bodies of water; an area may have many different kinds of land that come in different shapes).
3	Connections	

	a	Students describe* that because they can map the shapes and kinds of land and water in any area, maps can be used to represent many different types of areas.

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. • 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.	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. • 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.	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 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	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. • 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,

		representing inputs and outputs, and those at unobservable scales.	predict phenomena, analyze systems, and/or solve problems.

Crosscutting Concepts (CCCs): Patterns

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 identify similarities and differences in 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.	In grades 6-8, students recognize that macroscopic patterns are 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.	In grades 9-12, students observe patterns in systems at different scales 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.B: Plate Tectonics and Large-Scale System Interactions

K-2	3-5	6-8	9-12
ESS2.B: Maps show where things are located. One can map the shapes and kinds of land and water in any area.	**ESS2.B:** Earth's physical features occur in patterns, as do earthquakes and volcanoes. Maps can be used to locate features and determine patterns in those events.	**ESS2.B:** Plate tectonics is the unifying theory that explains movements of rocks at Earth's surface and geological history. Maps are used to display evidence of plate movement.	**ESS2.B:** Radioactive decay within Earth's interior contributes to thermal convection in the mantle.

Related Cross-Curricular Standards: Current Grade Level

ELA Connections:

- **LA.2.RI.1** Identify the main topic and key details in a multi-paragraph text.
- **LA.2.RI.2** Describe the connections between individuals, historical events, scientific ideas, or steps in a process.
- **LA.2.RI.3** Determine and explain the author's purpose in an informational text, including what the author wants to answer, explain, or describe.
- **LA.2.RI.4** Explain how text features (titles, headings, table of contents, glossaries, captions, graphs, maps, and/or other visuals) contribute to the meaning of texts.

- **LA.2.RI.5** Compare and contrast the two most important ideas presented by two informational texts on the same topic.
- **LA.2.RI.8** With scaffolding as needed, read and comprehend a wide range of informational texts of appropriate complexity for Grade 2.
- **LA.2.V.2** Interpret an author's use of figurative, connotative, and technical language in grade-level literary and informational text.
- **LA.2.W.5** Write informative/explanatory pieces about a topic or text with supporting facts and details.
- **LA.2.W.6** Locate information from provided sources to answer questions about a topic.
- **LA.2.SL.1** Participate with peers and adults in structured discussions and routines about 2nd grade topics and texts.
- **LA.2.SL.2** Tell a story or recount an experience with appropriate facts and pertinent descriptive details.

Mathematics Connections:

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Social Studies Connections:

- SS 2.2.1.a. Justify a decision made by providing evidence of possible gains and losses.
- SS 2.3.1.a Compare and contrast maps and globes.
- SS 2.3.1.b Identify and describe locations in neighborhoods.
- SS 2.3.1.c Identify and apply map elements.
- SS 2.3.1.d Locate communities, Nebraska, and the United States on maps and globes.
- SS 2.3.2.a Identify and differentiate between physical and human features of neighborhoods and communities.
- SS 2.3.2.b Describe local places and regions.
- SS 2.3.2.c Explain how places and regions change over time.
- SS 2.3.3.a Identify examples of Earth's physical processes.
- SS 2.3.3.b Describe how seasonal weather patterns, natural hazards, and natural resources affect human activities.
- SS 2.3.3.d Describe how people adapt to their physical environment.
- SS 2.4.4.b Identify, obtain, and cite appropriate primary and secondary sources for research.

Fine and Performing Arts Connections:

- FA 2.1.1.a Share imaginative ways that media arts can be used to communicate a narrative, experience, or idea (e.g., movie, podcast (glossary), digital art).
- FA 2.1.4.c Explore use of media arts as a collaborative art form to communicate information, experiences, or ideas to others.
- FA 2.2.1.a Experiment and explore ideas and materials (glossary) (e.g., 2D, 3D).
- FA 2.2.2.c Communicate a variety of different venues (glossary) to display art (e.g., describe or dramatize to an audience).
- FA 2.2.4.d Identify how images and objects are used to convey a story, familiar experience, or connection to the world.

Connection to other grade level indicators

Authentic Connections to Other Content Standards:

Second Grade Topic Bundle 2 (Changes to the Land) NGSS

SC.2.3.1.b, SC.2.3.1.d, SC.2.13.3.a, SC.2.13.3.b, SC.2.13.3.c, SC.2.3.1.c

Academic Language Development

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

- Patterns
- landforms (valleys, canyons, mountains, floodplains)
- water on Earth (Manmade dams, sandbagging, windbreaks, terracing)
- Liquid
- Solid

Sentence stems that utilize academic language:

- I can observe (notice) the pattern of _____ presented in the maps we created.
- I can observe (notice) the pattern of _____in the maps we are viewing.
- The pattern seen in the map allows me to know that _____.

• Ice • Maps • Location • Models	• Some similarities are_____. • Some differences are_____. • I can sort (classify or group) the following landforms by _____.

Assessment Considerations

Formative Assessment:

- https://www.education.ne.gov/assessment/science-classroom-formative-task-repository-for-grades-5-8/

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 a simple model using materials like clay, paper, or sand to show different shapes of land (such as mountains and valleys) and bodies of water (like rivers and lakes) in an area.
- **KSA2:** Label the different parts of your model to show where the land and water are, using words or pictures to explain what each part represents.
- **KSA3:** Describe your model and explain the kinds of land and water you included and their locations.

Standard

Topic Code: SC.2.13 Earth's Systems: Processes That Shape the Earth
Standard Code: SC.2.13.3 Gather, analyze, and communicate evidence of the processes that shape the earth.

Earth has an ancient history of slow and gradual surface changes, punctuated with quick but powerful geologic events like volcanic eruptions, flooding, and earthquakes. Water and wind play a significant role in changing Earth's surface. The effects of wind and water can cause both slow and quick changes to the surface of the Earth. Scientists and engineers design solutions to slow or prevent wind or water from changing the land.

Indicator

Indicator Code: SC.2.13.3.d

Obtain information to identify where water is found on Earth and that it can be solid or liquid.

NGSS Comparison: 2-ESS2-2

Other Indicators in this Standard

SC.2.13.3.a, SC.2.13.3.b, SC.2.13.3.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	**Patterns** • Patterns in the natural world can be observed.
Disciplinary Core Idea (DCI)	

ESS2.C: The Roles of Water in Earth's Surface Processes

- Water is found in the ocean, rivers, lakes, and ponds. Water exists as solid ice and in liquid form.

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**
- Glacier National Park is Melting Away
- Early maps of the World
- 3D mapping projection
- Glaciers - time lapse or over large time
- Deltas
- Snowfall and snow melt
- Water is represented in different ways on maps for a reason.

Evidence Statements

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

2.13.3.d Obtain information to identify where water is found on Earth and that it can be solid or liquid.	
Obtaining information	
a	Students use books and other reliable media as sources for scientific information to answer scientific questions about:
	i. Where water is found on Earth, including in oceans, rivers, lakes, and ponds.
	ii. The idea that water can be found on Earth as liquid water or solid ice (e.g., a frozen pond, liquid pond, frozen lake).
	iii. Patterns of where water is found, and what form it is in.
Evaluating Information	
a	Students identify which sources of information are likely to provide scientific information (e.g., versus opinion).

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	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	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	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

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 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.	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. • 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.	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. 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.	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. • 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): Patterns

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	In grades 3-5, students identify similarities and differences in order to sort and classify natural objects and designed products. They identify patterns related to time, including simple rates of change	In grades 6-8, students recognize that macroscopic patterns are 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	In grades 9-12, students observe patterns in systems at different scales 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

phenomena, and used as evidence.	and cycles, and to use these patterns to make predictions.	use patterns to identify cause and effect relationships, and use graphs and charts to identify patterns in data.	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.C: The Roles of Water in Earth's Surface Processes

K-2	3-5	6-8	9-12
ESS2.C: Water is found in many types of places and in different forms on Earth.	**ESS2.C:** Most of Earth's water is in the ocean and much of the Earth's fresh water is in glaciers or underground.	**ESS2.C:** Water cycles among land, ocean, and atmosphere, and is propelled by sunlight and gravity. Density variations of sea water drive interconnected ocean currents. Water movement causes weathering and erosion, changing landscape features.	**ESS2.C:** The planet's dynamics are greatly influenced by water's unique chemical and physical properties.

Related Cross-Curricular Standards: Current Grade Level

ELA Connections:

- **LA.2.RI.1** Identify the main topic and key details in a multi-paragraph text.
- **LA.2.RI.2** Describe the connections between individuals, historical events, scientific ideas, or steps in a process.
- **LA.2.RI.3** Determine and explain the author's purpose in an informational text, including what the author wants to answer, explain, or describe.
- **LA.2.RI.4** Explain how text features (titles, headings, table of contents, glossaries, captions, graphs, maps, and/or other visuals) contribute to the meaning of texts.
- **LA.2.RI.5** Compare and contrast the two most important ideas presented by two informational texts on the same topic.
- **LA.2.RI.8** With scaffolding as needed, read and comprehend a wide range of informational texts of appropriate complexity for Grade 2.
- **LA.2.V.2** Interpret an author's use of figurative, connotative, and technical language in grade-level literary and informational text.
- **LA.2.W.5** Write informative/explanatory pieces about a topic or text with supporting facts and details.
- **LA.2.W.6** Locate information from provided sources to answer questions about a topic.
- **LA.2.SL.1** Participate with peers and adults in structured discussions and routines about 2nd grade topics and texts.
- **LA.2.SL.2** Tell a story or recount an experience with appropriate facts and pertinent descriptive details.

Mathematics Connections:

- **N/A**

Social Studies Connections:

- SS 2.2.1.a. Justify a decision made by providing evidence of possible gains and losses.
- SS 2.3.1.a Compare and contrast maps and globes.
- SS 2.3.1.b Identify and describe locations in neighborhoods.
- SS 2.3.1.c Identify and apply map elements.
- SS 2.3.1.d Locate communities, Nebraska, and the United States on maps and globes.

- SS 2.3.2.a Identify and differentiate between physical and human features of neighborhoods and communities.
- SS 2.3.2.b Describe local places and regions.
- SS 2.3.2.c Explain how places and regions change over time.
- SS 2.3.3.a Identify examples of Earth's physical processes.
- SS 2.3.3.b Describe how seasonal weather patterns, natural hazards, and natural resources affect human activities.
- SS 2.3.3.d Describe how people adapt to their physical environment.
- SS 2.4.4.b Identify, obtain, and cite appropriate primary and secondary sources for research.

Fine and Performing Arts Connections: OBJ

- FA 2.2.1.c Explore and experience the properties of various art media (glossary) through senses and emotions.
- FA 2.2.1.d Explore elements of art and principles (glossary) of design to brainstorm visual possibilities. (e.g., use color and shape to create pattern).
- FA 2.2.2.a Present an artist statement (glossary) through formal or informal communication (e.g., written, verbal).
- FA 2.2.2.c Communicate a variety of different venues (glossary) to display art (e.g., describe or dramatize to an audience).

Connection to other grade level indicators

Authentic Connections to Other Content Standards:

Second Grade Topic Bundle 2 (Changes to the Land) NGSS

SC.2.3.1.b, SC.2.3.1.d, SC.2.13.3.a, SC.2.13.3.b, SC.2.13.3.c, SC.2.3.1.c

Academic Language Development

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

- water on Earth (oceans, rivers, lakes, ponds)
- Patterns
- landforms (valleys, canyons, mountains, floodplains)
- Liquid
- Solid
- Ice
- Maps
- Location

Sentence stems that utilize academic language:

- I can observe (notice) the pattern of _____ presented in the maps we created.
- I can observe (notice) the pattern of _____in the maps we are viewing.
- The pattern seen in the map allows me to know that _____.
- Some similarities are_____.
- Some differences are_____.
- I can sort (classify or group) the following landforms by _____.

Assessment Considerations

Formative Assessment:

- https://www.education.ne.gov/assessment/science-classroom-formative-task-repository-for-grades-5-8/

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:** Have students point out where water can be found on Earth, such as oceans, rivers, lakes, and ice, using a map or pictures.
- **KSA2:** Explain the difference between solid water, like ice, and liquid water, like water in a glass, using drawings or words.
- **KSA3:** Share examples of water you see around you, like ice cubes in the freezer or water from the tap.