South Lyon Community Schools

2nd Grade

Science

Curriculum

Binder

2019-20

NEXT GENERATION SCIENCE STANDARDS
For States, By States

SCIENCE EDUCATION IN THE 21ST CENTURY

Why K–12 Science Standards Matter—and why the time is right to develop Next Generation Science Standards

Why Next Generation Science Standards (NGSS)?

- It has been 15 years since science standards were revised. Since that time, many advances have occurred in the fields of science and science education, as well as in the innovation-driven economy.
- The U.S. has a leaky K–12 STEM talent pipeline, with too few students entering STEM majors and careers at every level—from those with relevant postsecondary certificates to PhD's. We need new science standards that stimulate and build interest in STEM.
- We can't successfully prepare students for college, careers and citizenship unless we set the right expectations and goals. While standards alone are no silver bullet, they do provide the necessary foundation for local decisions around curriculum, assessments, and instruction.
- Implementing improved K–12 science standards will better prepare high school graduates for the rigors of college and careers. In turn, employers will be able to hire workers with strong science-based skills—including specific content areas but also skills such as critical thinking and inquiry-based problem solving.

What Are the Next Generation Science Standards?

- The Next Generation Science Standards (NGSS) will create K–12 science standards through a collaborative state-led process.
- The NGSS will be arranged in a coherent manner across grades and provide all students access to a challenging science education, and be based on the *Framework for K–12 Science Education,* developed by the National Research Council, the staffing arm of the National Academy of Sciences.
- Every NGSS standard has three prongs: content, scientific and engineering practices and cross-cutting concepts. The integration of rigorous content and application reflects how science is practiced in the real world.

How Are the NGSS Being Developed?

- The NGSS are being developed in a two-step process in partnership with the National Research Council (NRC), the National Science Teachers Association (NSTA), the American Association for the Advancement of Science (AAAS) and Achieve.
- The *first step* was the development of the *Framework for K–12 Science Education* by the National Academies of Science that identified the broad ideas and practices in natural sciences and engineering that all students should be familiar with by the time they graduate from high school.
- The *second step* is the development of standards based on the *Framework,* which will engage science educators and experts from around the country who will serve as writers and

will produce drafts of the standards. Achieve is managing this process on behalf of the lead states.

- Twenty-six states are lead state partners in the NGSS development effort.
- There will be two open comment periods where feedback on the draft standards will be open for public comment. The first will occur late spring 2012 and the second will be in the fall of 2012.
- The NGSS are expected to be completed by early 2013. It will then be up to state to determine whether and when to consider adopting the NGSS as their states' science standards.
- States working together to develop and implement NGSS standards makes good common sense—it offers opportunities for states to share best practices, leverage economies of scale in the education marketplace, and will ensure all students—in any state and any district that adopts them—gain the knowledge and skills they need for success in college and careers.

The Urgency for Next Generation Science Standards:

- In 2007, a Carnegie Corporation of New York/Institute for Advanced Study commission of researchers and public and private leaders concluded that *"the nation's capacity to innovate for economic growth and the ability of American workers to thrive in the modern workforce depend on a broad foundation of math and science learning, as do our hopes for preserving a vibrant democracy and the promise of social mobility that lie at the heart of the American dream."*
- Unfortunately, science and mathematics achievement continues to lag compared to our international competitors, and this lag has already begun to impact the competitiveness of young Americans as well as the competitiveness of the U.S. in the global economy.

  For example:

  - The U.S. ranked 17th in science and 25th in mathematics on the 2009 PISA assessment. Less than 10 percent of U.S. students scored at one of the top two of six performance levels.
  - More than a third of eighth-graders scored below basic on the 2009 NAEP Science assessment.
  - U.S. high-tech manufacturing industries continue to have a larger share of global output than any other economy, but the U.S. global share fell from 34% in 1998 to 28% in 2010.
  - The U.S. share of global high tech exports dropped from 19% to 15% in 2010; at the same time China's share of global high tech goods exports more than tripled, from 6% in 1995 to 22% in 2010, making it the single largest exporting country for high tech products.

Preparing Students for a Lifetime of Success

Understanding New Science Standards for Grades K-2

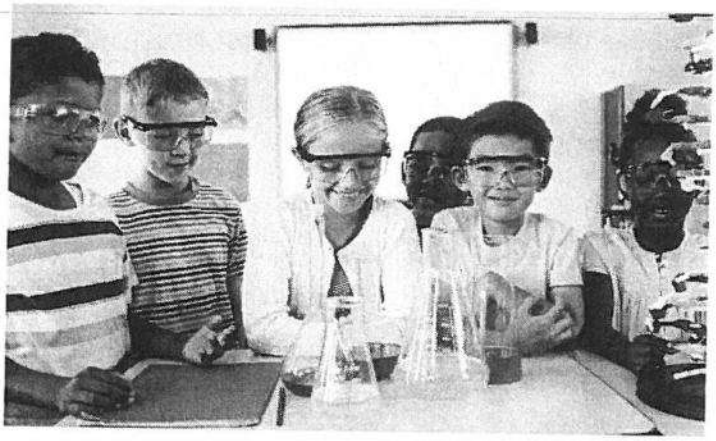
How will we prepare students for academic success?

Many states have adopted new standards based on the Next Generation Science Standards (NGSS) because they understand that a robust science education in elementary school will pave the way for increased opportunities in middle school, high school, and college.

The NGSS enable teachers to offer all students interactive science instruction that promotes analysis and interpretation of data, critical thinking, problem solving, and connections across science disciplines—with a high set of expectations for achievement in grades K-2.

A quality science education can help expand opportunities for all students.

The science standards complement English/Language Arts and mathematics standards, enabling classroom instruction to reflect a clearer picture of the real world, where solving problems often requires skills and knowledge from multiple disciplines. Further, these standards are designed to provide an equitable, high-quality science education to all students.



What is our vision for science education?

The NGSS reflect the latest research and advances in modern science. In order to equip students to think critically, analyze information, and solve complex problems, the standards are arranged such that—from elementary through high school—students have multiple opportunities to build on the knowledge and skills gained during each grade, by revisiting important concepts and expanding their understanding of connections across scientific domains. Parents should understand that while some content might be similar to the past, it may look different from how they were taught.

As the science standards are implemented in schools and districts, they will enable students to:

- Develop a deeper understanding of science beyond memorizing facts, and
- Experience similar scientific and engineering practices as those used by professionals in the field.

How will students learn science in the classroom?

Each year, students should be able to demonstrate greater capacity for connecting knowledge across, and between, the physical sciences, life sciences, earth and space sciences, and engineering design.

During grades K–2, your child will begin to form connections between concepts and skills such as understanding relationships between objects, planning and carrying out investigations, and constructing explanations.

Upon completion of grades K–2, your child should have a deeper understanding of:

- Motion and properties of matter;
- Relationship between sound and vibrating materials;
- Factors that impact what plants and animals need to survive; and
- How objects can be changed or improved through engineering.

Physical Sciences

Physical sciences during grades K–2 may explore questions including:

- How does pushing or pulling an object change the speed or direction of its motion?
- How do objects change motion when they touch or collide?
- What are some effects of sunlight on earth's surface?

Life Sciences

Life Sciences during grades K–2 may explore questions including:

- What do plants and animals need to live and grow?
- How does the insect survive the winter if the plant is dead?
- How are parents and their children similar and different?

Earth and Space Sciences

Earth and space sciences during grades K–2 may explore questions including:

- What are the different kinds of lands and bodies of water?
- Why is it usually cooler in the mornings than in the afternoons?
- What objects are in the sky and how do they seem to move?

Engineering Design

Engineering design during grades K–2 may explore questions including:

- What is a local example of engineering design?
- What materials were used to construct the project?
- What kinds of problems can be solved through engineering?

For additional information about academic expectations for students in Grades K-2, visit **www.nextgenscience.org/parentguides.**

How can you support your child's success?

Although this new approach to teaching and learning K–12 science is different than the past, you can still actively support your child's success in the classroom!

1. Speak to your child's teacher(s) or principal about how these important changes affect your school.
2. Ask your child's teacher thoughtful questions based on the information provided in this brochure.
3. Learn how you can help the teacher(s) reinforce classroom instruction at home.

Classroom activities in Elementary School will look less like this:	And look more like this:
Students have infrequent exposure to science instruction or related activities.	Students engage with science concepts as a core part of instruction and are encouraged to connect lessons to their own personal experiences.
Students memorize the general structure and properties of matter.	Students use water and butter to investigate how some changes caused by heating or cooling can be reversed while others cannot.
Students examine insects or bugs on the playground or during special events such as science fairs.	Students observe the life cycles of beetles, butterflies, and pea plants to identify patterns that are common to all living things.
Students draw static pictures of the sun to demonstrate where it is at different times of the day.	Students support claims about the movement of the sun by identifying an outdoor object that receives direct sunlight, then tracing an outline of its shadow at three different times during the day.
Students have infrequent exposure to discussions or activities related to engineering design.	Students consider or apply engineering design principles throughout each grade level.
Student discussions and activities are disconnected from mathematics or English/Language Arts instruction.	Student discussions and activities are thoughtfully integrated with mathematics and English/Language Arts instruction.

About NGSS: Reshaping Science Education for All Students

To better prepare American students for college and careers, schools need to ensure that quality science education is accessible to all students—regardless of ethnicity or zip code.

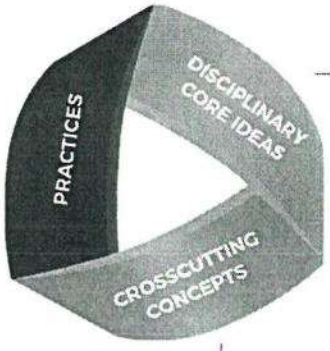
In an effort to bolster America's competitive edge in an increasingly global economy, 26 states led the development of the Next Generation Science Standards (NGSS) by working with teachers, higher education, business, and practicing scientists. This collaborative process produced a set of high quality, college- and career-ready K–12 academic standards that set meaningful expectations for student performance and achievement in science. The NGSS are rich in both content and practice and arranged in a coherent manner across all disciplines and grades.

Fact: "Standards" are not "curriculum". "Standards" provide clarity about *what students should know and be able to do by the end of each grade level.* "Curriculum" refers to *how students meet those expectations.* Please contact your child's teacher or school if you have questions about their curriculum.

Three Dimensions of Science Learning

The NGSS emphasizes three distinct, yet equally important dimensions that help students learn science. Each dimension is integrated into the NGSS and—combined—the three dimensions build a powerful foundation to help students build a cohesive understanding of science over time.

Standard behaviors that scientists and engineers use to explain the world or solve problems



Fundamental scientific knowledge

Frameworks for scientific thinking across disciplines

Support your child's success in the classroom!

2nd Grade

Structure and Properties of Matter

2-PS1-1 Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

2-PS1-2 Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose. *

2-PS1-3 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.

2-PS1-4 Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.

Interdependent Relationships in Ecosystems

2-LS2-1 Plan and conduct an investigation to determine if plants need sunlight and water to grow. **

2-LS2-2 Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants. *

2-LS4-1 Make observations of plants and animals to compare the diversity of life in different habitats. **

Earth's Systems: Processes that Shape the Earth

2-ESS1-1 Use information from several sources to provide evidence that Earth events can occur quickly or slowly. *

2-ESS2-1 Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land. * **

2-ESS2-2 Develop a model to represent the shapes and kinds of land and bodies of water in an area.

 *2-ESS2-2 MI Develop a model to represent the state of Michigan and the Great Lakes, or a more local land area and water body.*

2-ESS2-3 Obtain information to identify where water is found on Earth and that it can be solid or liquid. **

 *2-ESS2-3 MI Obtain information to identify where fresh water is found on Earth, including the Great Lakes and Great Lakes Basin.*

* - Integrates traditional science content with engineering.  - Includes a Michigan specific performance expectation.
**- Allow for local, regional, or Michigan specific contexts or examples in teaching and assessment.

2nd Grade

Engineering Design

K-2-ETS1-1 Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

K-2-ETS1-2 Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

K-2-ETS1-3 Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

* - Integrates traditional science content with engineering. - Includes a Michigan specific performance expectation.
**- Allow for local, regional, or Michigan specific contexts or examples in teaching and assessment.

How to Read the *Next Generation Science Standards (NGSS)*

The Next Generation Science Standards (NGSS) are distinct from prior science standards in three essential ways.

1) Performance. Prior standards documents listed what students should "know" or "understand." These ideas needed to be translated into performances that could be assessed to determine whether or not students met the standard. Different interpretations sometimes resulted in assessments that were not aligned with curriculum and instruction. The NGSS has avoided this difficulty by developing *performance expectations* that state what students should be able to do in order to demonstrate that they have met the standard, thus providing the same clear and specific targets for curriculum, instruction, and assessment.

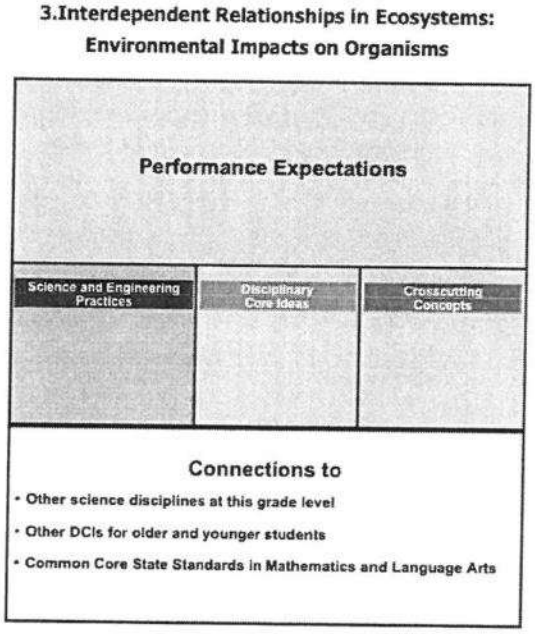
2) Foundations. Each performance expectation incorporates all three dimensions from the *Framework*—a science or engineering practice, a core disciplinary idea, and a crosscutting concept.

3) Coherence. Each set of performance expectations lists connections to other ideas within the disciplines of science and engineering, and with Common Core State Standards in Mathematics and English Language Arts.

This chapter describes how these three unique characteristics are embodied in the format of the standards, beginning with the "system architecture."

System Architecture

As shown in the illustration at right, each set of performance expectations has a title. Below the title is a box containing the performance expectations. Below that are three foundation boxes, which list (from left to right) the specific science and engineering practices, disciplinary core ideas (DCIs), and crosscutting concepts that were combined to produce the performance expectations (PEs) above. The bottom section lists connections to other related DCIs at the same grade level, to related DCIs for younger and older students, and to related Common State Standards in mathematics and language arts. These sections are described in further detail below.



Performance Expectations

Performance expectations are the assessable statements of what students should know and be able to do. Some states consider these performance expectations alone to be "the standards," while other states also include the content of the three foundation boxes and connections to be included in "the standard." The writing team is neutral on that issue. The essential point is that all students should be held accountable for demonstrating their achievement of all PEs, which are written to allow for multiple means of assessment.

The last sentence in the above paragraph—that *all students* should be held accountable for demonstrating their achievement of *all performance expectations*—deserves special attention because it is a fundamental departure from prior standards documents, especially at the high school level where it has become customary for students to take courses in some but not all science disciplines. The NGSS takes the

position that a scientifically literate person understands and is able to apply core ideas in *each* of the major science disciplines, and that they gain experience in the practices of science and engineering and crosscutting concepts. In order for this to be feasible the writing team has limited the core ideas included in the performance expectations to just those listed in the *Framework*.

The NGSS writers initially attempted to include all of the disciplinary core ideas (DCIs) verbatim from the *Framework* in the performance expectations, but found that the resulting statements were bulky and reduced readers' comprehension of the standards. Instead, the performance expectations were written to communicate a "big idea" that combined content from the three foundation boxes. In the final phase of development we further limited the number of performance expectations with input from our state teams, to ensure that this set of PEs is achievable at some reasonable level of proficiency by the vast majority of students.

Some states have standards that include concepts that are not found in the NGSS. However, in most cases not all students in those states are expected to take courses in all three areas of science and engineering. The NGSS are for all students, and all students are expected to achieve proficiency with respect to all of the performance expectations in the NGSS.

A second essential point is that the NGSS performance expectations should not limit the curriculum. Students interested in pursuing science further (through Advanced Placement or other advanced courses) should have the opportunity to do so. The NGSS performance expectations provide a foundation for rigorous advanced courses in science or engineering that some students may choose to take.

A third point is that the performance expectations are not a set of instructional or assessment tasks. They are statements of what students should be able to do ***after*** instruction. Decisions on how best to help students meet these PEs are left to states, districts, and teachers.

In the example below, notice how the performance expectation combines the skills and ideas that students need to learn, while it suggests ways of assessing whether or not second graders have the capabilities and understandings specified in the three foundation boxes.

2.Structure and Properties of Matter

2.Structure and Properties of Matter

Students who demonstrate understanding can:

2-PS1-2. Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.* [Clarification Statement: Examples of properties could include, strength, flexibility, hardness, texture, and absorbency.] [Assessment Boundary: Assessment of quantitative measurements is limited to length.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
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. (2-PS1-2)	**PS1.A: Structure and Properties of Matter** ▪ Different properties are suited to different purposes. (2-PS1-2)	**Cause and Effect** ▪ Simple tests can be designed to gather evidence to support or refute student ideas about causes. (2-PS1-2) ***Connections to Engineering, Technology, and Applications of Science*** **Influence of Engineering, Technology, and Science on Society and the Natural World** ▪ Every human-made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world. (2-PS1-2)

Connections to other DCIs in second grade: N/A

Articulation of DCIs across grade-levels: **5.PS1.A** (2-PS1-2)

Common Core State Standards Connections:

ELA/Literacy –

RI.2.8 Describe how reasons support specific points the author makes in a text. *(2-PS1-2)*

W.2.7 Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations). (2-PS1-2)

W.2.8 Recall information from experiences or gather information from provided sources to answer a question. (2-PS1-2)

Mathematics –

MP.2 Reason abstractly and quantitatively. *(2-PS1-2)*

MP.4 Model with mathematics. *(2-PS1-2)*

MP.5 Use appropriate tools strategically. *(2-PS1-2)*

2.MD.D.10 Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph. *(2-PS1-2)*

As shown in the example, most of the performance expectations are followed by one or two additional statements in smaller type. These include *clarification statements*, which supply examples or additional clarification to the performance expectations; and a*ssessment boundary statements*, which specify the limits to large scale assessment.

Notice that one of the DCIs was "moved from K-2." That means the writing team decided that a DCI that the *Framework* specified for end of second grade could be more easily assessed if combined with the other ideas specified for third grade. This was only done in a limited number of cases.

Also, notice that the code for this performance expectation (2-PS1-2) is indicated in each of the three foundation boxes to illustrate the specific practices, disciplinary core ideas, and crosscutting concepts on which it is built. Since most of the standards have several PEs, the codes make it easy to see how the information in the foundation boxes is used to construct each performance expectation.

The codes for the performance expectations were derived from the *Framework*. As with the titles, the first digit indicates a grade K-5, or specifies MS (middle school) or HS (high school). The next alpha-numeric code specifies the discipline, core idea and sub-idea. All of these codes are shown in the table below, derived from the *Framework*. Finally, the number at the end of each code indicates the order in which that statement appeared as a DCI in the *Framework*.

Physical Science	Life Science	Earth and Space Science
PS1 Matter and Its Interactions	**LS1 From Molecules to Organisms: Structures and Processes**	**ESS1 Earth's Place in the Universe**
PS1A Structure and Properties of matter	LS1A Structure and Function	ESS1A The Universe and Its Stars
PS1B Chemical Reactions	LS1B Growth and Development of Organisms	ESS1B Earth and the Solar System
PS1C Nuclear Processes	LS1C Organization for Matter and Energy Flow in Organisms	ESS1C The History of Planet Earth
PS2 Motion and Stability: Forces and Interactions	LS1D Information Processing	**ESS2 Earth's Systems**
PS2A Forces and Motion	**LS2 Ecosystems: Interactions, Energy, and Dynamics**	ESS2A Earth Materials and Systems
PS2B Types of Interactions	LS2A Interdependent Relationships in Ecosystems	ESS2B Plate Tectonics and Large-Scale System Interactions
PS2C Stability and Instability in Physical Systems	LS2B Cycles of Matter and Energy Transfer in Ecosystems	ESS2C The Roles of Water in Earth's Surface Processes
PS3 Energy	LS2C Ecosystem Dynamics, Functioning, and Resilience	ESS2D Weather and Climate
PS3A Definitions of Energy	LS2D Social Interactions and Group Behavior	ESS2E Biogeology
PS3B Conservation of Energy and Energy Transfer	**LS3 Heredity: Inheritance and Variation of Traits**	**ESS3 Earth and Human Activity**
PS3C Relationship Between Energy and Forces	LS3A Inheritance of Traits	ESS3A Natural Resources
PS3D Energy and Chemical Processes in Everyday Life	LS3B Variation of Traits	ESS3B Natural Hazards
PS4 Waves and Their Applications in Technologies for Information Transfer	**LS4 Biological Evolution: Unity and Diversity**	ESS3C Human Impacts on Earth Systems
PS4 Waves and Their Applications in Technologies for Information Transfer	LS4A Evidence of Common Ancestry	ESS3D Global Climate Change
PS4A Wave Properties	LS4B Natural Selection	
PS4B Electromagnetic Radiation	LS4C Adaptation	
PS4C Information Technologies and Instrumentation	LS4D Biodiversity and Humans	

NEXT GENERATION SCIENCE STANDARDS
For States, By States

Foundation Boxes

While the performance expectations can stand alone, a more coherent and complete view of what students should be able to do comes when the performance expectations are viewed in tandem with the contents of the foundation boxes that lie just below the performance expectations. These three boxes include the practices, core disciplinary ideas, and crosscutting concepts, derived from the *Framework*, that were used to construct this set of performance expectations.

Disciplinary Core Ideas (DCIs). The orange box in the middle includes statements that are taken from the *Framework* about the most essential ideas in the major science disciplines that all students should understand during 13 years of school. Including these detailed statements was very helpful to the NGSS writing team as they analyzed and "unpacked" the disciplinary core ideas and sub-ideas to reach a level that is helpful in describing what each student should understand about each sub-idea at the end of grades 2, 5, 8, and 12. Although they appear in paragraph form in the Framework, here they are bulleted to be certain that each statement is distinct.

Science and Engineering Practices. The blue box on the left includes just the science and engineering practices used to construct the performance expectations in the box above. These statements are derived from and grouped by the eight categories detailed in the *Framework* to further explain the science and engineering practices important to emphasize in each grade band. Most sets of performance expectations emphasize only a few of the practice categories; however, all practices are emphasized within a grade band. Teachers should be encouraged to utilize several practices in any instruction, and need not be limited by the performance expectation, which is only intended to guide assessment.

Crosscutting Concepts. The green box on the right includes statements derived from the *Framework's* list of crosscutting concepts, which apply to one or more of the performance expectations in the box above. Most sets of PEs limit the number of crosscutting concepts so as focus on those that are readily apparent when considering the DCIs. However all are emphasized within a grade band. Again, the list is not exhaustive nor is it intended to limit instruction. Aspects of the Nature of Science relevant to the standard are also listed in this box, as are the interdependence of science and engineering, and the influence of engineering, technology, and science on society and the natural world. Although these are not crosscutting concepts in the same sense as the others, they are best taught and assessed in the context of specific science ideas, so they are also listed in this box.

Connection Boxes

Three Connection Boxes, below the Foundation Boxes, are designed to support a coherent vision of the standards by showing how the performance expectations in each standard connect to other PEs in science, as well as to common core state standards. The three boxes include:

Connections to other DCIs in this grade level. This box contains the names of DCIs that have related disciplinary core ideas at the same grade level. For example, both Physical Science and Life Science performance expectations contain core ideas related to Photosynthesis, and could be taught in relation to one another. Ideas within the same main DCI as the performance expectation (e.g., PS1.C for HS-PS1-1) are not included in the connection box, nor are ideas within the same topic arrangement as a performance expectation (e.g., HS.ESS2.B for HS-ESS1-6).

Articulation of DCIs across grade levels. This box contains the names of DCIs that either 1) provide a foundation for student understanding of the core ideas in this performance expectation (usually at prior grade levels) or 2) build on the foundation provided by the core ideas in this performance expectations (usually at subsequent grade levels).

Connections to the Common Core State Standards. This box contains the coding and names of pre-requisite or connected Common Core State Standards in English Language Arts & and Literacy and Mathematics that align to the performance expectations. For example, performance expectations that require student use of exponential notation will align to the corresponding CCSS mathematics standards. An effort has been made to ensure that the mathematical skills that students need for science were taught in a previous year where possible. Italicized performance expectation names indicate that the common core standard is not pre-requisite knowledge, but could be connected to that performance expectation.

Color Coding

Online versions of the standards display color coding of the words within each performance expectation that represent the three dimensions: blue for Science and Engineering Practices, orange for Disciplinary Core Ideas, and green for Crosscutting Concepts. Clarification Statements and Assessment Boundaries are in red. Because some of the words used in the performance expectation represented both a crosscutting concept and the disciplinary core idea it was not possible to color-code both simultaneously.

Printed and PDF versions of the standards do not have color coding of the three dimensions. In these cases the connections between individual performance expectations and the statements in the foundation boxes will be shown by including the relevant codes after each statement in the foundation boxes.

Title. The organization of the NGSS is based on the core ideas in the major fields of natural science from *A Framework for K-12 Science Education* (NRC 2012), plus one set of PEs for engineering. For the elementary level, from Kindergarten to grade five, sets of performance expectations are assigned to specific grades. A numeral at the start of a title indicates the grade level; so the title in the example above is a third grade standard. Titles for middle school (grades 6-8) standards begin with "MS" and those for high school standards (grades 9-12) begin with "HS."

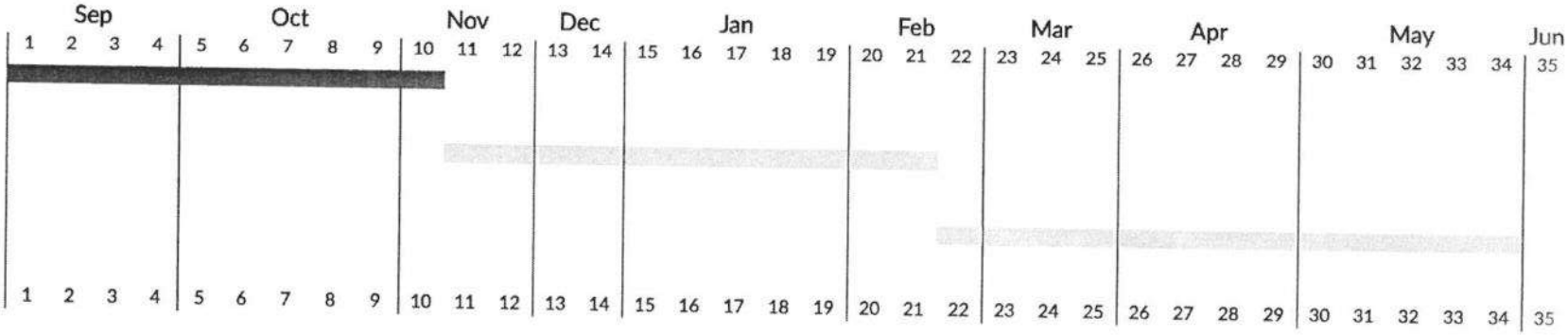
The titles also reveal the organization of the standards, which is based on the core ideas in the disciplines from the *Framework*. The *Framework* lists 11 core ideas, four in life science, four in physical science, and three in Earth and Space Science. The core ideas are divided into a total of 39 sub-ideas, and each sub-idea is elaborated in a list of what students should understand about that sub-idea at the end of grades 2, 5, 8, and 12. We have called these grade-specific statements Disciplinary Core Ideas (DCIs).

At the beginning of the process, the writers examined all of the DCIs in the *Framework* to eliminate redundant statements, find natural connections among DCIs, and develop PEs that were appropriate for the different grade levels. The result was a topical clustering of DCIs that usually, but did not always correspond to the core ideas identified in the *Framework*. This structure provided the original basis of the standards and has continued through the process. Below is a list of all clusters of PEs. The list does not indicate any particular order within each grade level or band, so the following list should not be considered a scope and sequence document for the purpose of curriculum planning and development.

South Lyon Community Schools
Science 2 NGSS

South Lyon Community Schools - Elementary > Grade 2 > Science > Science 2 NGSS

Collaboration



South Lyon Community Schools
Science 2 NGSS

Structure and Properties of Matter

Collaboration

Essential Questions

What are observable properties of a material?
What are the properties of a solid?
What are the properties of a liquid?
What does it mean when something melts?
What does it mean when something freezes?
What does it mean when materials are classified?
How do different properties of materials make them better suited for certain purposes?
How are some objects made up of a set of different smaller objects?
How do heating and cooling different objects change the properties?
How can some changes from heating and cooling be reversed and some cannot?

Content

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

-1: Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

2-PS1-2: Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.

2-PS1-3: 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.

2-PS1-4: Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.

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.

2-PS1-4: Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.

2-PS1-1: Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

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.

2-PS1-2: Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.

2-PS1-3: 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.

2-PS1-2: Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.

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2-PS1-4: Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.

2-PS1-1: Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

-1-3: 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.

2-PS1-2: Analyze data obtained for testing different materials to determine which materials have the properties that are best suited for an intended purpose.

Skills

The learner will be able to make observations of a variety of materials to classify based on their properties.
The learner will be able to collect data based on observations of properties.
The learner will be able to analyze data from investigations to classify materials.
The learner will be able to collaboratively plan an investigation to determine the characteristic properties of water as a solid and a liquid.
The learner will be able to construct and argument with evidence that some changes from heating and cooling are reversible and some are not.
The learner will be able to analyze data to determine which materials have properties best suited for a specific purpose.
The learner will be able to use evidence to construct an explanation that some objects are made up of a set of small pieces and can be disassembled and made into a different object.
The learner will be able to plan and conduct an investigation to determine the properties of water as a solid and liquid.
The learner will be able to plan and conduct an investigation into the reversible changes in water.
The learner will be able to use evidence from their investigation into the melting and freezing of water and develop a new investigation into a different material.
The learner will be able to analyze and interpret data to compare characteristics of materials before and after heating and cooling.
The learner will be able to construct an argument from evidence supporting the claim that some changes in materials when heated and cooled can be reversed and some cannot.

Instructional Strategies & Activities

- Teacher modeling
- Teacher think aloud
- Teacher read aloud
- Science Talk Moves
- Student-led conversations
- Use of graphic organizers
- Use of anchor charts
- Use of partnerships
- Planning and Carrying out Investigations
- Constructing explanations
- Developing and using models
- Asking questions
- Defining problems
- Providing content vocabulary
- Obtaining, evaluating and communicating information

Credentialing Focus/ Mismatch

Assessments

*Student Response Journal
*Battle Creek Pre and Post Assessment

Resources

Required Resources:

Great City Science Curriculum Binder

Recommended Resources:

- See Professional Resources as listed in the Curriculum Binder
- *The Three Little Pigs*

Technology Benchmarks

Changing Earth: Today and Over Time

Collaboration

Essential Questions

What materials is Earth made up of?
What forms can water on Earth be seen as?
What are the major bodies of water?
What are the major landforms?
How do maps show where major landforms and bodies of water are located?
How do wind and water change the shape of the land?
How does the motion of water create bodies of water and change the shape of Earth?
What can cause rapid change to the surface of the Earth?
Why do some changes to the land occur quickly and some occur slowly, over a very long period of time?

Content

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

2-E 1. Use information from several sources to provide evidence that Earth events can occur quickly or slowly.

E Earth Materials and Systems • Wind and water can change the shape of the land.

2-ESS2-1. Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.

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.

2-ESS2-2. Develop a model to represent the shapes and kinds of land and bodies of water in an area.

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.

2-ESS2-3. Obtain information to identify where water is found on Earth and that it can be solid or liquid.

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.

2-ESS2-1. Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.

2-ESS2-2. Develop a model to represent the shapes and kinds of land and bodies of water in an area

2-ESS1-1. Use information from several sources to provide evidence that Earth events can occur quickly or slowly.

2-ESS2-1. Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.

2-ESS2-3. Obtain information to identify where water is found on Earth and that it can be solid or liquid.

2-ESS2-2. Develop a model to represent the shapes and kinds of land and bodies of water in an area.

2-ESS2-3. Obtain information to identify where water is found on Earth and that it can be solid or liquid.

2-ES . Use information from several sources to provide evidence that Earth events can occur quickly or slowly.

Skills

The learner will be able to develop and use models to explain different landforms and bodies of water.
The learner will be able to develop and use models to gather evidence that wind and water change the shape if the surface of the Earth.
The learner will be able to use information from maps to locate landforms and bodies of water.

The learner will be able to plan and conduct simple investigations to provide patterns in data related to changes in the surface of Earth.
The learner will be able to plan, design, and develop a model to solve a problem of erosion caused by heavy rain.

I: uctional Strategies & Activities

- Teacher modeling
- Teacher think aloud
- Teacher read aloud
- Science Talk Moves
- Student-led conversations
- Use of graphic organizers
- Use of anchor charts
- Use of partnerships
- Planning and Carrying out Investigations
- Constructing explanations
- Developing and using models
- Asking questions
- Defining problems
- Providing content vocabulary
- Obtaining, evaluating and communicating information

Credentialing Focus/ Mismatch

Assessments

*Student Response Journal
*Battle Creek Pre and Post Assessment

Resources

Required Resources:

- **Cereal City Science Curriculum Binder**

Recommended Resources:

- See Professional Resources as listed in the Curriculum Binder

Technology Benchmarks

South Lyon Community Schools
Science 2 NGSS

Plant and Animal Relationships

Collaboration

Essential Questions

What doplants and animals need to survive?
What different types of plants and animals live in different areas or habitats?
What are different types of habitats?
How do plants and animals help seed dispersal?
What features of the plant and animal are necessary for pollination?
Where does pollen come from?
How can seeds be different from plant to plant?

Content

LS2.A: Interdependent Relationships in Ecosystems• Plants depend on water and light to grow.• Plants depend on animals for pollination or to move their seeds around
2-LS2-1. Plan and conduct an investigation to determine if plants need sunlight andwater to grow.
2-LS2-2. Develop a simple model that mimics the function of an animal in dispersingseeds and pollinating plants.

: Biodiversity and Humans• There are many different kinds of living things in any area, and they exist indifferent places on land and in water
2-LS4-1. Make observations of plants and animals to compare the diversity of life indifferent habitats.

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.
2-LS2-2. Develop a simple model that mimics the function of an animal in dispersing seeds and pollinating plants.

Developing and Using ModelsModeling in K–2 builds on prior experiences and progresses to include using anddeveloping models (i.e., diagram, drawing, physical replica, diorama, dramatization,
or storyboard) that represent concrete events or design solutions.• Develop a simple model based on evidence to represent a proposed object or tool.

2-LS2-2. Develop a simple model that mimics the function of an animal in dispersingseeds and pollinating plants.

Planning and Carrying Out Investigations
Planning and carrying out investigations to answer questions or test solutions toproblems 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.• Plan and conduct an investigation collaboratively to produce data to serve as thebasis for evidence to answer a question.• Make observations (firsthand and from media) to collect data which can be usedto make comparisons

2-LS2-1. Plan and conduct an investigation to determine if plants need sunlight andwater to grow
2-LS4-1. Make observation of plants and animals to compare the diversity of life indifferent habitats.

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

2-LS2-1. Plan and conduct an investigation to determine if plants need sunlight andwater to grow.

e and Function
• The shape and stability of structures of natural and designed objects are relatedto their function(s).

2-LS2-2. Develop a simple model that mimics the function of an animal in dispersingseeds and pollinating plants.

Skills

The learner will be able to make observations of nature firsthand and through media.
The learner will be able todesign an investigation to find out about the plants and animals that live in a given area.
T' learner will be able to construct explanations based on evidence.
earner will be able todesign an investigation into a plant's need for water and/or sunlight.
The learner will be able toobtain, evaluate, and communicate information from text.
The learner will be able toanalyze data from investigations.
The learner will be todefine a problem and design a solution.
The learner will be able to develop and use models to represent a concept or solution.

Instructional Strategies & Activities

- Teacher modeling
- Teacher think aloud
- Teacher read aloud
- Science Talk Moves
- Student-led conversations
- Use of graphic organizers
- Use of anchor charts
- Use of partnerships
- Planning and Carrying out Investigations
- Constructing explanations
- Developing and using models
- Asking questions
- Defining problems
- Providing content vocabulary
- Obtaining, evaluating and communicating information

Credentialing Focus/ Mismatch

Assessments

*Student Response Journal
*Battle Creek Pre and Post Assessment

Resources

Required Resources:

- **Cereal City Science Curriculum Binder**

Recommended Resources:

- See Professional Resources as listed in the Curriculum Binder

Technology Benchmarks

Grade 2: NGSS Alignment with Cereal City Science by BCAMSC
Course Matrix

Benchmarks to put on report card →	Changing Earth: Today and Over Time	Structure and Properties of Matter	Plant and Animal Relationships
2-ESS1-1: Use information from several sources to provide evidence that Earth events can occur quickly or slowly.	X		
2-ESS2-1: Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.	X		
2-ESS2-2: Develop a model to represent the shapes and kinds of land and bodies of water in the state of Michigan and the Great Lakes or a more local land area and water body.	X		
2-ESS2-3: Obtain information to identify where freshwater is found on Earth including the Great Lakes and Great Lakes Basin, and that it can be solid or liquid.	X		
2-PS1-1: Plan and conduct an investigation to describe and classify different kinds of materials by their observable.		X	
2-PS1-2: Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.		X	
2-PS1-3: 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.		X	
2-PS1-4: Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.		X	
2-LS2-1: Plan and conduct an investigation to determine if plants need sunlight and water to grow.			X
2-LS2-2: Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.			X
2-LS4-1: Make observation of plants and animals to compare the diversity of life in different habitats.			X

CEREAL CITY SCIENCE by BCAMSC

STRUCTURE AND PROPERTIES OF MATTER (2.PS.NGSS)

UNIT AT A GLANCE

ACTIVITY 1 - What Are Objects Made Of?

QUESTIONS: How can we find out what properties are useful?

Time to Complete

Preparation: 20 minutes
Activity: 4 classes
- Lesson 1A: 45-50 min.
- 2 class periods
- Lesson 1B: 45-50 min.
- 2 class periods

Phenomena

What would happen if tools and different items were made without considering the properties that will make them useful?

Summary: Students Will...

- Read about "What Would Happen If" situations when properties of materials are not considered in their construction.
- Compare initial ideas about properties of objects.
- Be introduced to a design challenge to choose material to move water from one place to another.

Students Figure Out How To:

- Construct explanations of the concept of how we identify properties of matter.
- Determine different properties that ake things useful.

Practices

Constructing Explanations

Patterns

Performance Expectations (PE) at Lesson Level and Assessment

PE at Lesson Level

Develop an initial understanding of how to identify properties and how they make things useful.

Formative Assessment

Properties of Matter chart
Activity Page
Journal Entry
Class Discussion

ACTIVITY 2 - Exploring Properties

QUESTIONS: How can we determine what properties are important for the purpose of objects?

Time to Complete

Preparation: 10 minutes
Activity: 4 classes
- Lesson 2A: 45-50 min.
- 2 class periods
- Lesson 2B: 45-50 min.
- 2 class periods

Phenomena

Children on slide with different clothing descend the slide at a different speed.
A tree has a rigid trunk and flexible branches that can sway in the wind.
Children walk to school on a rainy day. One child has on rubber boots and the other is wearing tennis shoes. One child has dry socks and the other child has wet socks.

Summary: Students Will...

- Make observations and classify objects by texture, flexibility, buoyancy, and repel and absorb.
- Complete a mini-design challenge at each property station.

ACTIVITY 2 - Exploring Properties - *Continued*

Students Figure Out How To:

- Construct explanations of the usefulness of the properties when designing objects.
- Begin to apply what they have learned to solve a problem.

Practices

Constructing Explanations and Designing solutions

Carrying Out Investigations.

Obtaining, Evaluating, and Communicating Information

Patterns

Performance Expectations (PE) at Lesson Level and Assessment

PE at Lesson Level

Use observations and explorations to develop an understanding of how texture, rigid and flexible, sink and float, and repel and absorb are properties that make things useful.

Summative Assessment

Activity Page
Journal Entry

ACTIVITY 3 - Solving Problems with Properties

QUESTIONS: How can we use materials to build a device that solves a problem?

Time to Complete

Preparation: 15 minutes
Activity 3: 2 classes
Lesson 3A: 55-60 min.
Lesson 3B: 55-60min.

Phenomena

Design challenge:
Different materials are used based on the properties that are best suited for an intended purpose.

Summary: Students Will...

- Work together as a team of engineers to build a structure that can withstand wind and water, and keep things dry.
- Test their designs and make adjustments for improvement.

Students Figure Out How To:

- Work as a team of engineers.
- Choose material to fit the purpose.
- Test and redesign based on results and feedback.

Practices

Constructing Explanations

Analyzing and Interpreting Data

Patterns

Cause and Effect

Performance Expectations (PE) at Lesson Level and Assessment

PE at Lesson Level

Develop an understanding of the properties of solids compared to the properties of liquids.

Summative Assessment

Activity Pages
Respond to Text
Journal Entries
Class Discussion

ACTIVITY 4 - Liquids

QUESTIONS: How do the properties of solids and liquids differ?
How can we determine if change in temperature changes the properties of water?

Time to Complete

Preparation: 20 minutes
Activity 4: 10 classes
Lesson 4A: 45-50 min.
2 class periods
Lesson 4B: 55-60 min.
2 class periods
Lesson 4C: 45-50 min.
2 class periods
Lesson 4D: 45-50 min.
2 class periods
Lesson 4E: 45-50 min.
2 class periods

Phenomena

Liquid water takes on the shape of its container.

Ice keeps its own shape.

Summary: Students Will...

- Compare and adapt their ideas about properties of solids to properties of liquids.
- Develop an investigation into how temperature change can change water from solid to liquid and liquid to solid and determine what properties change in the phase change.

ACTIVITY 4 - Liquids - *Continued*

Students Figure Out How To:

- Construct explanations of the concept of how we identify properties of matter.
- Recognize patterns that can be used to describe properties of solids and liquids.

Practices

Constructing Explanations

Analyzing and Interpreting Data

Patterns

Cause and Effect

Performance Expectations (PE) at Lesson Level and Assessment

PE at Lesson Level

Develop an understanding of the properties of solids compared to the properties of liquids.

Summative Assessment

Activity Pages
Respond to Text
Journal Entries
Class Discussion

ACTIVITY 5 - Heating and Cooling: Beyond Water

QUESTIONS: How can we determine if change in temperature changes the properties of different substances? Are the changes caused by heating and cooling reversible?

Time to Complete

Preparation: 20 minutes
Activity 5: 2 classes
Lesson 5A: 50-60 min.
Lesson 5B: 45-50 min.

Phenomena

Popsicles change from a solid to a liquid when there is a temperature change.

When a lettuce leaf is frozen it cannot be thawed to return to its original form.

Summary: Students Will...

- Plan and carry out an investigation into temperature change of a material of their choosing.

Students Figure Out How To:

- Construct explanations of the effect of heating and cooling on different material.
- Determine if heating and cooling of different material is reversible or not reversible.

Practices

Constructing Explanations and Designing solutions

Carrying out investigations.

Cause and Effect

Performance Expectations (PE) at Lesson Level and Assessment

PE at Lesson Level

Construct an argument using evidence that some changes caused by heating and cooling are reversible and some are not.

Formative Assessment

Activity Page
Class Discussion
Journal Entry

ACTIVITY 6 - Taking Our Property Observations Outdoors

QUESTIONS: How can we mimic nature when designing useful objects?

Time to Complete

Preparation: 5 minutes
Activity 6: 5 classes
- Lesson 6A: 50-60 min.
- Lesson 6B: 45-50 min.
- Lesson 6C: 45-50
- 2 class periods

Phenomena

Popsicles change from a solid to a liquid when there is a temperature change.

When a lettuce leaf is frozen it cannot be thawed to return to its original form.

Summary: Students Will...

- Make observations of properties in nature.
- Determine the importance of properties of living organisms for survival.

Students Figure Out How To:

- Design an object that mimics a characteristic of an animal.

Practices

Constructing Explanations and Designing solutions

Analyzing and Interpreting Data

Engaging in Argument from Evidence

Patterns

Cause and Effect

Performance Expectations (PE) at Lesson Level and Assessment

ACTIVITY 7 - Rearranging the Pieces

QUESTIONS: How can we determine if an object made of a small set of pieces can be disassembled and rearranged into a different and new object?

Time to Complete

Preparation: 10 minutes
Activity 7: 2 classes
- Lesson 7A: 50-60 min.
- Lesson 7B: 50-60 min.

Phenomena

Design Challenge Part 2:
Rearrange blocks to make new structures.
Rearrange existing structure with a purpose to make a new structure with a different purpose.

Summary: Students Will...

- Disassemble and rearrange a structure.
- Determine if the properties and function have changed.

Students Figure Out How To:

- Construct a new structure from and existing structure by rearranging a small set of pieces.
- Test the structure to determine if the properties have changed.

Practices

Constructing Explanations and Designing Solutions

Engaging in Argument from Evidence

Energy and Matter

Performance Expectations (PE) at Lesson Level and Assessment

PE at Lesson Level

Construct an argument using first hand experience that a structure made of small pieces can be disassembled and rearranged to make a new structure.

Summative Assessment

Activity Page
Journal Entry

2.Structure and Properties of Matter

2.Structure and Properties of Matter

dents who demonstrate understanding can:

2-PS1-1. Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties. [Clarification Statement: Observations could include color, texture, hardness, and flexibility. Patterns could include the similar properties that different materials share.]

2-PS1-2. Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.* [Clarification Statement: Examples of properties could include, strength, flexibility, hardness, texture, and absorbency.] [Assessment Boundary: Assessment of quantitative measurements is limited to length.]

2-PS1-3. 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. [Clarification Statement: Examples of pieces could include blocks, building bricks, or other assorted small objects.]

2-PS1-4. Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot. [Clarification Statement: Examples of reversible changes could include materials such as water and butter at different temperatures. Examples of irreversible changes could include cooking an egg, freezing a plant leaf, and heating paper.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

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.

- Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question. (2-PS1-1)

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. (2-PS1-2)

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.

- ake observations (firsthand or from media) to construct an idence-based account for natural phenomena. (2-PS1-3)

aging 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).

- Construct an argument with evidence to support a claim. (2-PS1-4)

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. (2-PS1-4)

Disciplinary Core Ideas

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. (2-PS1-1)
- Different properties are suited to different purposes. (2-PS1-2),(2-PS1-3)
- A great variety of objects can be built up from a small set of pieces. (2-PS1-3)

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. (2-PS1-4)

Crosscutting Concepts

Patterns

- Patterns in the natural and human designed world can be observed. (2-PS1-1)

Cause and Effect

- Events have causes that generate observable patterns. (2-PS1-4)
- Simple tests can be designed to gather evidence to support or refute student ideas about causes. (2-PS1-2)

Energy and Matter

- Objects may break into smaller pieces and be put together into larger pieces, or change shapes. (2-PS1-3)

Connections to Engineering, Technology, and Applications of Science

Influence of Engineering, Technology, and Science on Society and the Natural World

- Every human-made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world. (2-PS1-2)

Connections to other DCIs in second grade: N/A

Articulation of DCIs across grade-levels: **4.ESS2.A** (2-PS1-3); **5.PS1.A** (2-PS1-1),(2-PS1-2),(2-PS1-3); **5.PS1.B** (2-PS1-4); **5.LS2.A** (2-PS1-3)

Common Core State Standards Connections:

ELA/Literacy –

RI.2.1	Ask and answer such questions as *who, what, where, when, why,* and *how* to demonstrate understanding of key details in a text. *(2-PS1-4)*
RI.2.3	Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text. (2-PS1-4)
RI.2.8	Describe how reasons support specific points the author makes in a text. *(2-PS1-2),*(2-PS1-4)
W.2.1	Write opinion pieces in which they introduce the topic or book they are writing about, state an opinion, supply reasons that support the opinion, use linking words (e.g., *because, and, also*) to connect opinion and reasons, and provide a concluding statement or section. (2-PS1-4)
W.2.7	Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations). (2-PS1-1),(2-PS1-2),(2-PS1-3)
W.2.8	Recall information from experiences or gather information from provided sources to answer a question. (2-PS1-1),(2-PS1-2),(2-PS1-3)

Mathematics –

MP.2	Reason abstractly and quantitatively. *(2-PS1-2)*
MP.4	Model with mathematics. *(2-PS1-1),(2-PS1-2)*
MP.5	Use appropriate tools strategically. *(2-PS1-2)*
2.MD.D.10	Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph. *(2-PS1-1),(2-PS1-2)*

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

CEREAL CITY SCIENCE by BCAMSC

STRUCTURE AND PROPERTIES OF MATTER (2.PS.NGSS)

NEXT GENERATION SCIENCE STANDARDS

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. • Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena.	1,2,3,4,5,6,7
2-PS1-3: 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.	3,6,7
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). • Construct an argument with evidence to support a claim.	4,6,7
2-PS1-2: Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.	2,3,6,7

Crosscutting Concepts	
Cause and Effect • Events have causes that generate observable patterns. • Simple tests can be designed to gather evidence to support or refute student ideas about causes.	4,5,6
2-PS1-2: Analyze data obtained for testing different materials to determine which materials have the properties that are best suited for an intended purpose.	2,3,6,7
2-PS1-4: Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.	4,5
Patterns • Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.	1,4,6
2-PS1-1: Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.	1,2,3,4,6
Energy and Matter • Objects may break into smaller pieces and be put together into larger pieces, or change shapes.	7
2-PS1-3: 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.	3,6,7
Connections to Engineering, Technology, and Applications of Science	
Influence of Engineering, Technology, and Science, on Society and the Natural World • Every human-made product is designed by applying some knowledge of the natural world and is build by using natural materials.	6
2-PS1-2: Analyze data obtained for testing different materials to determine which materials have the properties that are best suited for an intended purpose.	3,6,7

CEREAL CITY SCIENCE by BCAMSC

STRUCTURE AND PROPERTIES OF MATTER (2.PS.NGSS)

NEXT GENERATION SCIENCE STANDARDS

Disciplinary Core Ideas/Performance Expectations	Activities
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. • Different properties are suited to different purposes. • A great variety of objects can be built up from a small set of pieces.	1,2,3,4,5,6,7
2-PS1-1: Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.	1,4,6
2-PS1-2: Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.	1,2,3,6,7
2-PS1-3: 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.	3,7
2-PS1-4: Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.	4,5
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.	5
2-PS1-4: Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.	4,5

Science and Engineering Practices	
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. • Plan and conduct investigations collaboratively to produce data to serve as the basis for evidence to answer a question.	1,4,5
2-PS1-1: Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.	1,4,6
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.	2,3,6
2-PS1-2: Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.	1,2,3,6,7

CEREAL CITY SCIENCE by BCAMSC

CHANGING EARTH: TODAY & OVER TIME (2.ES.NGSS)

UNIT AT A GLANCE

ACTIVITY 1 - Changing Land and Water

QUESTIONS: How does the surface of Earth get shaped?
How does the surface of Earth change over time?

Time to Complete

Preparation: 15–20 min.
Activity 1:
Lesson 1A: 45–50 min.
Lesson 1B: 55–60 min., 2 class periods

Phenomena

Observe landforms that have weathered over time.

Observations in the schoolyard (potholes, cracks in sidewalks, runoff from erosion) give evidence of changes in the shape of the land.

Summary: Students Will...

- Make observations and relate ideas about the cause of different shapes of landforms.
- Make observations in the schoolyard of possible changes in the shape of the area.
- Record observations of the changes in the land due to water and wind.

Students Figure Out How To:

- Generate questions about the shapes of the landforms and what caused the shapes.
- Make observations to find evidence of changes in the land.
- Record observations of changes in the land due to water or wind.

Practices

Asking Questions and Defining Problems

Planning and Carrying Out Investigations

Patterns

Cause & Effect

Stability & Change

Performance Expectations (PE) at Lesson Level and Assessment

PE at Lesson Level
Use observations and text to collect data and gain information about changes in the surface of Earth.

Formative Assessment
What We Think chart
Activity Page
Science Talk

ACTIVITY 2 - Land on Earth

QUESTIONS: What is the surface of Earth made of?
What are the different landforms in different areas?

Time to Complete

Preparation: 15–20 min.
Activity 2:
Lesson 2A: 45–50 min.
Lesson 2B: 45–50 min.
Lesson 2C: 45–50 min.

Phenomena

Globe toss to figure out if Earth is made up of more land or more water.

The types of landforms and bodies of water change from area to area.

Summary: Students Will...

- Collect data to determine that Earth is made up mostly of water.
- Make observations of a photo of Earth taken from space.
- Read about John Wesley Powell's journey across the country.
- Use a map to determine different landforms and bodies of water across the US.

ACTIVITY 2 - Land on Earth - *Continued*

Students Figure Out How To:

- 'nterpret data to determine if Earth is ıostly water or land.
- Determine why the astronauts call Earth the "big blue marble" through observations of a photo.
- Obtain information from text to learn about different landforms and bodies of water.
- Read a topographic map.
- Make a sand model of the different landforms encountered on Powell's journey.

Practices

Analyzing and Interpreting Data

Constructing Explanations and Designing Solutions

Asking Questions and Defining Problems

Developing and Using Models

Performance Expectations (PE) at Lesson Level and Assessment

PE at Lesson Level

Obtain information from text and maps to develop a model of landforms and bodies of water observed during the journey of John Wesley Powell.

Formative Assessment

Science Talk

Summative Assessment

Journal Entry

ACTIVITY 3 - Major Landforms

QUESTIONS: What are the major landforms that make up Earth's surface? How can we find out how the different shapes of the land are formed?

Time to Complete

Preparation: 20–30 min.
Activity 3:
Lesson 3A: 45–50 min.
'sson 3B: 45–50 min.
esson 3C: 45–50 min.
_esson 3D: 45–50 min.

Phenomena

Make observations of videos of erosion to figure out how land changes.

Summary: Students Will...

- Make a model of a landform.
- Obtain and share information about a landform.
- Use straws and their breath as wind and test to see if the shape of the landform changes with moving air.
- Use moving water on the model.

Students Figure Out How To:

- Make connections between the information from videos and the information from text and observations of pictures.
- Use information from media and text to develop a model that explain a particular landform.
- Test the model for evidence of a change in shape from wind and water.

Practices

Obtaining, Evaluating, and Communicating Information

Developing and Using Models

Performance Expectations (PE) at Lesson Level and Assessment

PE at Lesson Level

Develop models of landforms to test for effects of wind and water.

Formative Assessment

Science Talk
Activity Pages Journal Entry

Summative Assessment

Student Models
Journal Entries
Student Presentations

ACTIVITY 4 - Major Bodies of Water

QUESTIONS: What are the major bodies of water on Earth's surface?
Where does the water come from that fills our bodies of water?

Time to Complete

Preparation: 15–20 min.
Activity 4:
Lesson 4A: 50–55 min.
Lesson 4B: 50–55 min.
Lesson 4C: 50–55 min.
2 days
Lesson 4D: 50–55 min.
2 days

Phenomena

Make observations of a video of bodies of water to raise questions about the source of the water.

Summary: Students Will...

- Develop a model of a body of water.
- Obtain and share information about a body of water.
- Compare features and formation of different bodies of water found on Earth.
- Develop a model that demonstrates how melting snow and ice change the land and bodies of water.

Students Figure Out How To:

- Develop a model that demonstrates bodies of water and how they are formed.
- Obtain and relate information from text about a body of water.
- Use information to compare features of bodies of water and sources that form the body of water.

Practices

Obtaining, Evaluating, and Communicating Information

Developing and Using Models

Constructing Explanations and Designing Solutions

Patterns

Performance Expectations (PE) at Lesson Level and Assessment

PE at Lesson Level
Develop models of bodies of water to explain their features and how they are formed.
Formative Assessment
Science Talk
Activity Pages
Summative Assessment
Science Talk
Presentations and models

ACTIVITY 5 - Snow and Ice on the Move

QUESTIONS: How do snow and ice change the shape of the land?

Time to Complete

Preparation: 15–20 min.
Activity 5:
Lesson 5A: 45–50 min.
Lesson 5B: 55–60 min.
Observations and recording at 30-minute intervals.

Phenomena

Observe melting ice or snow on top of an inverted cup to figure out how snow melt and ice melt change the surface of land.

Summary: Students Will...

- Develop a model that demonstrates how melting snow and ice change the land and bodies of water.
- Compare the properties of liquid water and solid water.
- Obtain information from text to find out the effect of melting snow and ice on the land.
- Obtain information from text and maps to find out where water exists as a solid and a liquid.

ACTIVITY 5 - Snow and Ice on the Move - *Continued*

Students Figure Out How To:

- Develop a model to find out the effect of melting snow and ice on landforms and bodies of water.
- Communicate a description of the effect of melting ice and snow on the shape of the land.
- Use text and maps to find out where water on Earth exists as a solid and a liquid.

Practices

Connecting to the Nature of Science

Developing and Using Models

Analyzing and Interpreting Data

Obtaining, Evaluating, and Communicating Information

Patterns

Performance Expectations (PE) at Lesson Level and Assessment

PE at Lesson Level

Use observations of models and text to collect data and gain information about changes in the surface of Earth from melting ice and snow.

Formative Assessment

Activity Page
t-chart

Summative Assessment

Journal Entry
model
Science Talk

ACTIVITY 6 - Fast Changes

QUESTIONS: How can we find out how the surface of Earth changes quickly and how it changes slowly?

Time to Complete

Preparation: 15–20 min.
Activity 6:
Lesson 6A: 45–50 min.
Lesson 6B: 45–50 min.
Lesson 6C: 45–50 min.
Lesson 6D: 45–50 min.

Phenomena

Observe a model of slow drip and rapid flow of water on flat, slight angle, and steep angle.

Observe the effect of a landslide to figure out how it shapes the land.

Observe a video of an earthquake to figure out how earthquakes change the land.

Summary: Students Will...

- Investigate the effect of moving water (fast and slow) on soil at different angles.
- Make a model to solve an engineering problem.
- Obtain information from text and video about the effect of earthquakes on the shape of the land.
- Follow directions to build a model of an earthquake.

Students Figure Out How To:

- Use information from investigations and observations to determine that some areas have greater erosion and landslides and others do not.
- Solve an engineering design problem to prevent erosion on a hillside.
- Use result of a model to explain the sudden changes in Earth's surface caused by an earthquake.

Practices

Asking Questions and Defining Problems

Constructing Explanations and Designing Solutions

Developing and Using Models

Obtaining, Evaluating, and Communicating Information

Planning & Carrying Out Investigations

Stability & Change

Performance Expectations (PE) at Lesson Level and Assessment

PE at Lesson Level

Obtain information from text and models to explain the rapid effect of landslides and earthquakes on the shape of the land.

Formative Assessment

Journal Entry
What We Think chart

Summative Assessment

Journal Entry
Science Talk
Activity Pages

ACTIVITY 7 - Volcanoes Change the Surface of Earth

QUESTIONS: How do volcanic eruptions cause changes to Earth's surface?

Time to Complete

Preparation: 20–30 min.
Activity 7:
Lesson 7A: 45–50 min.
Lesson 7B: 45–50 min.
Lesson 7C: 45–50 min.

Phenomena

Observe a video of a volcanic eruption to figure out how volcanoes change the surface of Earth.

Summary: Students Will...

- Raise questions about volcanoes based on observations from media and text.
- Use media and text to gather facts about volcanoes.
- Create a graphic organizer from information.

Students Figure Out How To:

- Obtain and communicate information from media and text about changes to the land caused by volcanic eruptions.
- Explain the changes to the land caused by volcanic eruptions.
- Use a graphic organizer of gathered facts to write an informational story.
- Use research strategies and skills for information gathering.

Practices

Obtaining, Evaluating, and Communicating Information

Constructing Explanations and Designing Solutions

Cause and Effect

Stability and Change

Performance Expectations (PE) at Lesson Level and Assessment

PE at Lesson Level

Obtain information from text and media to explain how rapid changes to the shape of the land are caused by volcanic eruptions.

Summative Assessment

fact cards
Journal Entries
Science Talk
research facts

2.Earth's Systems: Processes that Shape the Earth

2.Earth's Systems: Processes that Shape the Earth

Students who demonstrate understanding can:

2-ESS1-1. Use information from several sources to provide evidence that Earth events can occur quickly or slowly. [Clarification Statement: Examples of events and timescales could include volcanic explosions and earthquakes, which happen quickly and erosion of rocks, which occurs slowly.] [Assessment Boundary: Assessment does not include quantitative measurements of timescales.]

2-ESS2-1. Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.* [Clarification Statement: 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.]

2-ESS2-2. Develop a model to represent the shapes and kinds of land and bodies of water in an area. [Assessment Boundary: Assessment does not include quantitative scaling in models.]

2-ESS2-3. Obtain information to identify where water is found on Earth and that it can be solid or liquid.

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

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.
- Develop a model to represent patterns in the natural world. (2-ESS2-2)

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.
- Make observations from several sources to construct an evidence-based account for natural phenomena. (2-ESS1-1)
- Compare multiple solutions to a problem. (2-ESS2-1)

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.
- 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. (2-ESS2-3)

Disciplinary Core Ideas

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. (2-ESS1-1)

ESS2.A: Earth Materials and Systems
- Wind and water can change the shape of the land. (2-ESS2-1)

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. (2-ESS2-2)

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. (2-ESS2-3)

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. *(secondary to 2-ESS2-1)*

Crosscutting Concepts

Patterns
- Patterns in the natural world can be observed. (2-ESS2-2),(2-ESS2-3)

Stability and Change
- Things may change slowly or rapidly. (2-ESS1-1),(2-ESS2-1)

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. (2-ESS2-1)

Connections to Nature of Science

Science Addresses Questions About the Natural and Material World
- Scientists study the natural and material world. (2-ESS2-1)

Connections to other DCIs in second grade: **2.PS1.A** (2-ESS2-3)

Articulation of DCIs across grade-levels: **K.ETS1.A** (2-ESS2-1); **3.LS2.C** (2-ESS1-1); **4.ESS1.C** (2-ESS1-1); **4.ESS2.A** (2-ESS1-1),(2-ESS2-1); **4.ESS2.B** (2-ESS2-2); **4.ETS1.A** (2-ESS2-1); **4.ETS1.B** (2-ESS2-1); **4.ETS1.C** (2-ESS2-1); **5.ESS2.A** (2-ESS2-1); **5.ESS2.C** (2-ESS2-2),(2-ESS2-3)

Common Core State Standards Connections:

ELA/Literacy –

RI.2.1	Ask and answer such questions as *who, what, where, when, why,* and *how* to demonstrate understanding of key details in a text. *(2-ESS1-1)*
RI.2.3	Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text. (2-ESS1-1),*(2-ESS2-1)*
RI.2.9	Compare and contrast the most important points presented by two texts on the same topic. (2-ESS2-1)
W.2.6	With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers. *(2-ESS1-1),(2-ESS2-3)*
W.2.7	Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations). (2-ESS1-1)
W.2.8	Recall information from experiences or gather information from provided sources to answer a question. (2-ESS1-1),(2-ESS2-3)
SL.2.2	Recount or describe key ideas or details from a text read aloud or information presented orally or through other media. (2-ESS1-1)
SL.2.5	Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings. *(2-ESS2-2)*

Mathematics –

MP.2	Reason abstractly and quantitatively. *(2-ESS2-1),(2-ESS2-1),(2-ESS2-2)*
MP.4	Model with mathematics. *(2-ESS1-1),(2-ESS2-1),(2-ESS2-2)*
MP.5	Use appropriate tools strategically. *(2-ESS2-1)*
2.NBT.A	Understand place value. (2-ESS1-1)
2.NBT.A.3	Read and write numbers to 1000 using base-ten numerals, number names, and expanded form. *(2-ESS2-2)*
2.MD.B.5	Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units, e.g., by using drawings (such as drawings of rulers) and equations with a symbol for the unknown number to represent the problem. *(2-ESS2-1)*

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

CEREAL CITY SCIENCE by BCAMSC

CHANGING EARTH: TODAY AND OVER TIME (2.ES.NGSS)

NEXT GENERATION SCIENCE STANDARDS

Science and Engineering Practices	
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. • Make observations from several sources to construct an evidence-based account for natural phenomena. • Compare multiple solutions to a problem.	2,4,6,7
2-ESS1-1. Use information from several sources to provide evidence that Earth events can occur quickly or slowly.	2,4,6,7
2-ESS2-1. Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.	2,4,6,7
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. • 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.	2,3,4,5,6,7
2-ESS2-3. Obtain information to identify where water is found on Earth and that it can be solid or liquid.	2,3,4,5,6,7
Crosscutting Concepts	
Patterns • Patterns in the natural world can be observed.	4,7
2-ESS2-2. Develop a model to represent the shapes and kinds of land and bodies of water in an area.	4,7
2-ESS2-3. Obtain information to identify where water is found on Earth and that it can be solid or liquid.	4,7
Stability and Change • Things may change slowly or rapidly.	1,6,7
2-ESS1-1. Use information from several sources to provide evidence that Earth events can occur quickly or slowly.	1,6,7

CEREAL CITY SCIENCE by BCAMSC

CHANGING EARTH: TODAY AND OVER TIME (2.ES.NGSS)

NEXT GENERATION SCIENCE STANDARDS

Disciplinary Core Ideas/Performance Assessments	Activities
ESS1.C: The History of Planet Earth • Some events happen very quickly; others occur very slowly, over a period of time much longer than one can observe.	3,6,7
2-ESS1-1. Use information from several sources to provide evidence that Earth events can occur quickly or slowly.	3,6,7
ESS2.A: Earth Materials and Systems • Wind and water can change the shape of the land.	1,2,3,5,6,7
2-ESS2-1. Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.	3,5,7
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.	2,3,4,5
2-ESS2-2. Develop a model to represent the shapes and kinds of land and bodies of water in an area.	2,3,4,5,6
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.	4,5,6
2-ESS2-3. Obtain information to identify where water is found on Earth and that it can be solid or liquid.	4,5,6
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.	5,6,7
2-ESS2-1. Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.	3,5,7
Science and Engineering Practices	
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. • Develop a model to represent patterns in the natural world.	2,3,4,5,6
2-ESS2-2. Develop a model to represent the shapes and kinds of land and bodies of water in an area	2,3,4,5,6

PLANNING

UNIT AT A GLANCE

Activity	Time to Complete	Questions	Phenomena	Summary: Students Will . . .
1 Observing Different Habitats	Preparation: 20 min. Activity 1: Lesson 1A: 45–50 min. Lesson 1B: 45–50 min. Lesson 1C: 45–50 min. Lesson 1D: 45–50 min.	• What different types of plants and animals live in different areas? • What are some different types of habitats?	Observations of the whirligig beetle.	• Make observations of a picture of the whirligig beetle. • Make observations of a photo of a pond with a variety of different plants and animals. • Read information about the variety of living things on and around a pond ecosystem. • Make observations of a variety of photos of different living things in different habitats.
2 Schoolyard Detectives	Preparation: Activity 2: Lesson 2A: 45–50 min. Lesson 2B: 45–50 min. Lesson 2C: 45–50 min., 3–4 days	• How can we learn about the different plants and animals that live in the schoolyard? • What different types of plants and animals live in different areas of the schoolyard?	Observation in a given area leads to the phenomenon that many plants and animals live there.	• Conduct outdoor fieldwork in a given area of the schoolyard. • Make observations and record data over time. • Relate their observations in the schoolyard to information in text.
3 Conducting Investigations through Field Study	Preparation: Activity 3: Lesson 3A: 45–50 min., 2 classes Lesson 3B: 45–50 min. Lesson 3C: 45–50 min., 2 classes	• How can we use our observations from our fieldwork to plan and conduct an investigation that answers a question?	Observation in a given area leads to the phenomenon that many plants and animals live there.	• Conduct an investigation based on findings through fieldwork. • Conduct an investigation with a team. • Interpret their observations, data, and findings.
4 Plants Need Water and Sunlight	Preparation: Activity 4: Lesson 4A: 45–50 min., 2 classes Lesson 4B: 55–60 min. Lesson 4C: 45–50 min., 2 classes	What is the effect of changing the amount of or position of sunlight in relationship to plant growth and survival?	Observe growth of a potted plant over time. Observe that the plant grew toward the light.	• Conduct an investigation to find out the effect of water and sunlight on plants. • Set up an investigation. • Make observations. • Collect data.

Students Figure Out How to:	Practices	PE at Lesson Level and Assessment
• Develop and revise a model of the whirligig beetle in its habitat as ideas and information are gathered. • Raise questions about different organisms based on observations. • Make comparisons of different living things that live in different regions. • Obtain information from text and compare the information to findings through observation.	**Asking Questions and Defining Problems** **Planning and Carrying Out Investigations** **Obtaining, Evaluating, and Communicating Information**	**PE at Lesson Level** Make observations and collect information to compare different living things that are able to live in a given area. **Formative Assessment** Activity Pages Science Talks Journal Entries t-chart
• Make observations that lead to questions and data. • Record and organize findings from observations. • Compare and contrast personal observations with observations in text. • Determine when measurement is important in observations. • Recognize patterns from observations and data.	**Asking Questions and Defining Problems** **Planning and Carrying Out Investigations** **Obtaining, Evaluating, and Communicating Information** Patterns	**PE at Lesson Level** Conduct a field study of a given area to make observations of the plants and animals that live there. **Formative Assessment** Activity Page Science Talk Pre-Writing Strategy Journal Entry/Respond to Text Schoolyard Observation Log
• Develop an investigable question based on observations and patterns from fieldwork. • Determine the materials needed to conduct an investigation. • Carry out an investigation. • Construct an explanation based on evidence.	**Asking Questions and Defining Problems** **Planning and Carrying Out Investigations** **Constructing Explanations** Patterns	**PE at Lesson Level** Plan and carry out an investigation based on our field study observations and questions. **Formative Assessment** Science Talk student-generated questions **Summative Assessment** Science Talk Activity Pages Journal Entry
• Raise questions and plan and carry out an investigation based on the phenomenon of a plant growing toward the light. • Design the investigation. • Collect and record data. • Construct an explanation based on evidence.	**Asking Questions and Defining Problems** **Planning and Carrying Out Investigations** **Constructing Explanations** Patterns	**PE at Lesson Level** Raise questions to plan and carry out an investigation into how plants need water and sunlight. **Formative Assessment** Science Talk Activity Page, questions 1–3 **Summative Assessment** Activity Page Science Talk investigations Journal Entry

PLANNING

UNIT AT A GLANCE

Activity	Time to Complete	Questions	Phenomena	Summary: Students Will . . .
5 Plants and Animals Interact to Help Plants Reproduce	Preparation: Activity 5: Lesson 5A: 45–50 min. Lesson 5B: 45–50 min. Lesson 5C: 45–50 min. Lesson 5D: 45–50 min. Lesson 5E: 45–50 min.	How do animals help plants in seed dispersal? How can we develop a model to demonstrate how animals help plants in seed dispersal?	Exploding seeds videos: Some plants have seed pods that burst open, spreading seeds away from the parent plant.	• View a video of exploding seed pods. • Share ideas of how seeds move from place to place. • Collect seeds from the schoolyard. • Investigate different ways seeds disperse.
6 Not Enough Bees	Preparation: 20 min. Activity 6: Lesson 6A: 45–50 min. Lesson 6B: 45–50 min. Lesson 6C: 45–50 min. Lesson 6D: 45–50 min., 2–3 days	How can we develop a model that demonstrates how the interaction between animals and plants aids in seed dispersal? What features of the animal help in pollination? What are the features of the plant that are essential for pollination?	Bee moving from blossom to blossom.	• Use a model to demonstrate pollination. • Make a model of an apple blossom. • Read about the importance of pollen in pollination and plant reproduction.

Students Figure Out How to:	Practices	PE at Lesson Level and Assessment
• Obtain information from text. • Relate information to experiences. • Develop a model that aids in seed dispersal. • Plan and carry out an investigation into seed dispersal.	**Planning and Carrying Out Investigations** **Developing and Using Models** **Obtaining, Evaluating, and Communicating Information** Cause and Effect Structure and Function	**PE at Lesson Level** Use observations and resources to determine different methods of seed dispersal. Design a model that mimics how animals interact with plants to disperse seeds. **Formative Assessment** Science Talk t-chart **Summative Assessment** Summary Discussion Activity Pages Science Talk Journal Entry seed models and presentations "Seedy Characters"
• Obtain information from text and media to help develop a hand pollinator. • Develop a hand-pollinator model to aid in pollination of fruit trees in orchards with too few bees.	**Developing and Using Models** **Obtaining, Evaluating, and Communicating Information** Cause and Effect Structure and Function	**PE at Lesson Level** Use observations and resources to gain an understanding of how animals interact with plants to gather nectar and pollen. Design a model of a hand pollinator. **Formative Assessment** What We Think chart Activity Page class discussion **Summative Assessment** Journal Entry Respond to Text models and presentations

2.Interdependent Relationships in Ecosystems

2.Interdependent Relationships in Ecosystems

dents who demonstrate understanding can:

.S2-1. Plan and conduct an investigation to determine if plants need sunlight and water to grow. [Assessment Boundary: Assessmen is limited to testing one variable at a time.]

2-LS2-2. Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.*

2-LS4-1. Make observations of plants and animals to compare the diversity of life in different habitats. [Clarification Statement: Emphasis is on the diversity of living things in each of a variety of different habitats.] [Assessment Boundary: Assessment does not include specific animal and plant names in specific habitats.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

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.

- Develop a simple model based on evidence to represent a proposed object or tool. (2-LS2-2)

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.

- Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question. (2-LS2-1)
- Make observations (firsthand or from media) to collect data which can be used to make comparisons. (2-LS4-1)

Connections to Nature of Science

Scientific Knowledge is Based on Empirical Evidence

- Scientists look for patterns and order when making observations about the world. (2-LS4-1)

Disciplinary Core Ideas

LS2.A: Interdependent Relationships in Ecosystems

- Plants depend on water and light to grow. (2-LS2-1)
- Plants depend on animals for pollination or to move their seeds around. (2-LS2-2)

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. (2-LS4-1)

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. *(secondary to 2-LS2-2)*

Crosscutting Concepts

Cause and Effect

- Events have causes that generate observable patterns. (2-LS2-1)

Structure and Function

- The shape and stability of structures of natural and designed objects are related to their function(s). (2-LS2-2)

Connections to other DCIs in second grade: N/A

lation of DCIs across grade-levels: **K.LS1.C** (2-LS2-1); **K-ESS3.A** (2-LS2-1); **K.ETS1.A** (2-LS2-2); **3.LS4.C** (2-LS4-1); **3.LS4.D** (2-LS4-1); **5.LS1.C** (2-LS2-1); **5.LS2.A** (2-LS2-LS4-1)

mon Core State Standards Connections:

ELA/Literacy –

W.2.7 Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations). (2-LS2-1),(2-LS4-1)

W.2.8 Recall information from experiences or gather information from provided sources to answer a question. (2-LS2-1),(2-LS4-1)

SL.2.5 Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings. *(2-LS2-2)*

Mathematics –

MP.2 Reason abstractly and quantitatively. *(2-LS2-1),(2-LS4-1)*

MP.4 Model with mathematics. *(2-LS2-1),(2-LS2-2),(2-LS4-1)*

MP.5 Use appropriate tools strategically. *(2-LS2-1)*

2.MD.D.10 Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems. *(2-LS2-2),(2-LS4-1)*

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.