Science Standard-Specific Supports

Grade 2

Revised October 2022

Contents

Science Standard-Specific Supports

Overview

The West Virginia College- and Career-Readiness Standards for Science[1] identify what students should know and be able to do at the end of science instruction. Each standard represents the integration of three "dimensions" of science education: practices of scientists and engineers, core science content, and science connecting concepts. As such, both student learning and assessment around the standards should be "three dimensional." The Science Standard-Specific Supports in this document are intended to show what it looks like for students to fully satisfy the intent of the standard.

The Science Standard-Specific Supports are adapted from the Evidence Statements of the Next Generation Science Standards (NGSS)[2], created when West Virginia was a lead state during the NGSS writing process, and the Framework for K-12 Science Instruction[3], created prior to the development of the NGSS. For more information on the Evidence Statements, please refer to them in their original form.

Purpose

The Science Standard-Specific Supports were designed to articulate how students can use the practices of scientists and engineers to demonstrate their understanding of the core science content through the lens of the science connecting concepts, and thus, demonstrate proficiency on each standard. The Science Standard-Specific Supports do this by clarifying:

- how the three dimensions could be assessed together, rather than in independent units;
- the underlying knowledge required for each core science content;
- the detailed approaches to the practices of scientists and engineers; and
- how science connecting concepts might be used to deepen content- and practice-driven learning.

The Science Standard-Specific Supports are not intended to be used as curriculum or limit or dictate instruction.

Structure

The practices of scientists and engineers are used as the organizing structure for the Science Standard-Specific Supports. However, this does not mean that the practices are more important than the other dimensions. The practices of scientists and engineers form the activities through which students demonstrate understanding of the science content. The proper integration of the practices makes students' thinking visible.

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[1] *West Virginia College- and Career-Readiness Standards for Science* (Policy 2520.3C) https://apps.sos.wv.gov/adlaw/csr/readfile.aspx?DocId=54673&Format=PDF

[2] NGSS Lead States. 2013. *Next Generation Science Standards: For States, By States.* Washington, DC: The National Academies Press.

[3] National Research Council. (2012). *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas.* Washington, DC: The National Academies Press.

How to Use the Science Standard-Specific Supports

- For instruction:
    - The Science Standard-Specific Supports can be used to aid instructional design, but it is crucial to recognize there are numerous pathways educators may use throughout the sequence of lessons and units to allow students to ultimately be prepared to demonstrate mastery of the standards.
- For assessment:
    - The Science Standard-Specific Supports can be used to inform the development of formative and summative assessments by the classroom educator.

Although supports are listed individually for each standard, this does not indicate that they should be measured individually, or that standards should be taught or assessed individually. Best practices in classroom instruction should be focused on helping students build towards several standards at one time because many concepts and practices are interrelated.

Limitations of the Science Standard-Specific Supports

The science standard-specific supports cannot do the following:

- Provide or prescribe the contexts through which the standards may be taught or assessed.
- Be the rubrics on which levels of student success would be measured.
- Identify the sequence of instruction or assessment.
- Put limits on student learning or student coursework.
- Replace lesson plans or assessment items.
- Serve as complete scoring rubrics.

Science – Grade 2 Introduction

Second Grade Science standards build upon the early stages of experimentation and maintenance of natural curiosity. Through a progressive rigorous, integrated approach, the inquiry-based program of study provides students opportunities to demonstrate scientific literacy in the domains of Physical Science, Life Science, and Earth and Space Science focusing on the connecting concepts of science: systems, changes, and models. Students will engage in hands-on activities at least 50% of the instructional time as they develop and demonstrate conceptual understandings along with research and laboratory skills described in the standards and indicators for science. Engineering, Technology, and the Application of Science are integrated throughout instruction as students define problems and design solutions related to the course standards and indicators for science. The content focus develops early problem-solving skills through observing, experimenting, and concluding. Second Grade Science intentionally supports developmental and academic growth. Standards followed by an asterisk (*) denote the integration of traditional science content with an engineering practice.

Within the evidence statements, the words “description” or “describe” followed by an asterisk indicate those descriptions given by students could include but are not limited to written, oral, pictorial, and kinesthetic descriptions unless otherwise specified.

College- and Career-Readiness Indicators for Science Grades K-2

<table>
<tr><th colspan="2">College- and Career-Readiness Indicators for Science</th></tr>
<tr><td colspan="2" align="center">Grades K - 2</td></tr>
<tr><th colspan="2">Nature of Science</th></tr>
<tr><td colspan="2">• Scientific knowledge is simultaneously reliable and subject to change based on empirical evidence and interpretation.
• Scientific knowledge is obtained through a combination of observations of the natural world and inferences based on those observations.
• Science is a creative human endeavor which is influenced by social and cultural biases.
• A primary goal of science is the formation of theories and laws. Theories are inferred explanations of some aspect of the natural world based on successfully tested information from evidence and evaluated phenomena. Laws describe relationships among what has been observed in the natural world.
• Scientific investigations use a variety of methods to address questions about the natural and material world.</td></tr>
<tr><th>Practices of Scientists and Engineers</th><th>Science Connecting Concepts</th></tr>
<tr><td>• Asking questions and defining problems
• Developing and using models
• Planning and carrying out investigations
• Analyzing and interpreting data
• Using mathematical and computational thinking
• Constructing explanations and designing solutions
• Engaging in argument from evidence
• Obtaining, evaluating, and communicating information</td><td>• Observing patterns
• Investigating and explaining cause and effect
• Recognizing scale, proportion, and quantity
• Defining systems and system models
• Tracking energy and matter flows into, out of, and within systems to understand system behavior
• Determining the relationships between structure and function
• Studying stability and change</td></tr>
<tr><th>Science Literacy</th><th>Science Lab Safety</th></tr>
<tr><td>• Utilizing and connecting ideas among informational (factual) scientific texts
• Integrating and applying information presented in various media formats when writing and speaking
• Citing evidence to support scientific claims
• Comparing and contrasting sets of data
• Building and appropriately using science domain vocabulary and phrases
• Interpreting and applying visually expressed information (e.g., flowchart, diagram, model, graph, or table)</td><td>• Requiring lab safety training and archiving signed student safety contracts including medical conditions
• Wearing proper protective equipment as needed (e.g., goggles, apron, and gloves)
• Requiring grade-appropriate lab equipment operation and safety training
• Storing and disposing of chemical/biological materials properly
• Following ethical classroom use of living organisms</td></tr>
</table>

Physical Science

Topic: Structure and Properties of Matter

S.2.1. 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.]

<table>
<tr><th>Practices of Scientists and Engineers</th><th>Core Science Content</th></tr>
<tr><td>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. Students will plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question.</td><td rowspan="3">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.</td></tr>
<tr><td>Science Connecting Concepts</td></tr>
<tr><td>Patterns
Patterns in the natural and human designed world can be observed.</td></tr>
</table>

Observable features of the student performance by the end of the course:

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

a) According to the developed investigation plan, students collaboratively collect and record data on the properties of the materials.

S.2.2. 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.]

Practices of Scientists and Engineers	Core Science Content
Analyzing and Interpreting Data Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations. Students will analyze data from tests of an object or tool to determine if it works as intended.	Structure and Properties of Matter Different properties are suited to different purposes.
Science Connecting Concepts	
Cause and Effect Simple tests can be designed to gather evidence to support or refute student ideas about causes. 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.	

Observable features of the student performance by the end of the course:

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

S.2.3. 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.]

<table>
<tr><td>Practices of Scientists and Engineers</td><td>Core Science Content</td></tr>
<tr><td>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. Students will make observations (firsthand or from media) to construct an evidence-based account for natural phenomena.</td><td rowspan="3">Structure and Properties of Matter
Different properties are suited to different purposes. A great variety of objects can be built up from a small set of pieces.</td></tr>
<tr><td>Science Connecting Concepts</td></tr>
<tr><td>Energy and Matter
Objects may break into smaller pieces and be put together into larger pieces or change shapes.</td></tr>
</table>

Observable features of the student performance by the end of the course:

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

S.2.4. 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.]

<table>
<tr><th>Practices of Scientists and Engineers</th><th>Core Science Content</th></tr>
<tr><td>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). Students will construct an argument with evidence to support a claim.
Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena
Science searches for cause and effect relationships to explain natural events.</td><td rowspan="3">Chemical Reactions
Heating or cooling a substance may cause changes that can be observed. Sometimes these changes are reversible, and sometimes they are not.</td></tr>
<tr><th>Science Connecting Concepts</th></tr>
<tr><td>Cause and Effect
Events have causes that generate observable patterns.</td></tr>
</table>

Observable features of the student performance by the end of the course:

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

Life Science

Topic: Interdependent Relationships in Ecosystems

S.2.5. Plan and conduct an investigation to determine if plants need sunlight and water to grow. [Assessment Boundary: Assessment is limited to testing one variable at a time.]

Practices of Scientists and Engineers	Core Science Content
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. Students will plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question.	**Interdependent Relationships in Ecosystems** Plants depend on water and light to grow.
Science Connecting Concepts	
Cause and Effect Events have causes that generate observable patterns.	

Observable features of the student performance by the end of the course:

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

S.2.6. Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.*

<table>
<tr><th>Practices of Scientists and Engineers</th><th>Core Science Content</th></tr>
<tr><td>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. Students will develop a simple model based on evidence to represent a proposed object or tool.</td><td rowspan="3">Interdependent Relationships in Ecosystems
Plants depend on animals for pollination or to move their seeds around.</td></tr>
<tr><td>Science Connecting Concepts</td></tr>
<tr><td>Structure and Function
The shape and stability of structures of natural and designed objects are related to their function(s).</td></tr>
</table>

Observable features of the student performance by the end of the course:

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

S.2.7. 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.]

<table>
<tr><th>Practices of Scientists and Engineers</th><th>Core Science Content</th></tr>
<tr><td>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. Students will make observations (firsthand or from media) to collect data which can be used to make comparisons.
Scientific Knowledge is Based on Empirical Evidence
Scientists look for patterns and order when making observations about the world.</td><td rowspan="3">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.</td></tr>
<tr><td>Science Connecting Concepts</td></tr>
<tr><td></td></tr>
</table>

Observable features of the student performance by the end of the course:

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

Earth and Space Science

Topic: Earth's Systems: Processes that Shape the Earth

S.2.8. 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.]

<table>
<tr><th>Practices of Scientists and Engineers</th><th>Core Science Content</th></tr>
<tr><td>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. Students will make observations from several sources to construct an evidencebased account for natural phenomena.</td><td rowspan="3">The History of Planet Earth
Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe.</td></tr>
<tr><td>Science Connecting Concepts</td></tr>
<tr><td>Stability and Change
Things may change slowly or rapidly.</td></tr>
</table>

Observable features of the student performance by the end of the course:

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

S.2.9. 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.]

Practices of Scientists and Engineers	Core Science Content
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. Students will compare multiple solutions to a problem.	**Earth Materials and Systems** Wind and water can change the shape of the land.
Science Connecting Concepts	
Stability and Change Things may change slowly or rapidly. **Influence of Engineering, Technology, and Science on Society and the Natural World** Developing and using technology has impacts on the natural world. **Science Addresses Questions About the Natural and Material World** Scientists study the natural and material world.	

Observable features of the student performance by the end of the course:

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

S.2.10. 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.]

Practices of Scientists and Engineers	Core Science Content
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. Students will develop a model to represent patterns in the natural world.	**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.
Science Connecting Concepts	
Patterns Patterns in the natural world can be observed.	

Observable features of the student performance by the end of the course:

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

S.2.11. Obtain information to identify where water is found on Earth and that it can be solid or liquid.

<table>
<tr><th>Practices of Scientists and Engineers</th><th>Core Science Content</th></tr>
<tr><td>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. Students will 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.</td><td rowspan="3">The Roles of Water in Earth’s Surface Processes
Water is found in oceans, rivers, lakes, and ponds. Water exists as solid ice and in liquid form.</td></tr>
<tr><td>Science Connecting Concepts</td></tr>
<tr><td>Patterns
Patterns in the natural world can be observed.</td></tr>
</table>

Observable features of the student performance by the end of the course:

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

Engineering, Technology, and Applications of Science

Topic: Engineering Design

S.2.12. 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.

Practices of Scientists and Engineers	Core Science Content
Asking Questions and Defining Problems Asking questions and defining problems in K–2 builds on prior experiences and progresses to simple descriptive questions. Students will ask questions based on observations to find more information about the natural and/or designed world(s). Students will define a simple problem that can be solved through the development of a new or improved object or tool.	Defining and Delimiting Engineering Problems A situation that people want to change or create can be approached as a problem to be solved through engineering. Asking questions, making observations, and gathering information are helpful in thinking about problems. Before beginning to design a solution, it is important to clearly understand the problem.
Science Connecting Concepts	

Observable features of the student performance by the end of the course:

1) Addressing phenomena of the natural or designed world
   a) Students ask questions and make observations to gather information about a situation that people want to change. Students' questions, observations, and information gathering are focused on:
      i) A given situation that people wish to change.
      ii) Why people want the situation to change.
      iii) The desired outcome of changing the situation.
2) Identifying the scientific nature of the question
   a) Students' questions are based on observations and information gathered about scientific phenomena that are important to the situation.
3) Identifying the problem to be solved
   a) Students use the information they have gathered, including the answers to their questions, observations they have made, and scientific information, to describe* the situation people want to change in terms of a simple problem that can be solved with the development of a new or improved object or tool.
4) Defining the features of the solution
   a) With guidance, students describe* the desired features of the tool or object that would solve the problem, based on scientific information, materials available, and potential related benefits to people and other living things.

S.2.13. 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.

<table>
<tr><th>Practices of Scientists and Engineers</th><th>Core Science Content</th></tr>
<tr><td>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. Students will develop a simple model based on evidence to represent a proposed object or tool.</td><td rowspan="3">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.</td></tr>
<tr><td>Science Connecting Concepts</td></tr>
<tr><td>Structure and Function
The shape and stability of structures of natural and designed objects are related to their function(s).</td></tr>
</table>

Observable features of the student performance by the end of the course:

1) Components of the model
    a) Students develop a representation of an object and the problem it is intended to solve. In their representation, students include the following components:
        i) The object.
        ii) The relevant shape(s) of the object.
        iii) The function of the object.
    b) Students use sketches, drawings, or physical models to convey their representations.
2) Relationships
    a) Students identify relationships between the components in their representation, including:
        i) The shape(s) of the object and the object’s function.
        ii) The object and the problem it is designed to solve.
3) Connections
    a) Students use their representation (simple sketch, drawing, or physical model) to communicate the connections between the shape(s) of an object, and how the object could solve the problem.

S.2.14. Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

<table>
<tr><th>Practices of Scientists and Engineers</th><th>Core Science Content</th></tr>
<tr><td>Analyzing and Interpreting Data
Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations. Students will analyze data from tests of an object or tool to determine if it works as intended.</td><td rowspan="3">Optimizing the Design Solution
Because there is always more than one possible solution to a problem, it is useful to compare and test designs.</td></tr>
<tr><td>Science Connecting Concepts</td></tr>
<tr><td></td></tr>
</table>

Observable features of the student performance by the end of the course:

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

David L. Roach
West Virginia Superintendent of Schools