Washington State Science Learning Standards

Focus on Grades K–2
# Science and Engineering Practices

## Asking Questions and Defining Problems for Grades K–2

Asking questions and defining problems in K–2 builds on prior experiences and progresses to simple descriptive questions that can be tested.

- Ask questions based on observations to find more information about the natural and/or designed world(s).
- Ask and/or identify questions that can be answered by an investigation.
- Define a simple problem that can be solved through the development of a new or improved object or tool.

## Developing and Using Models for Grades K–2

Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions.

- Distinguish between a model and the actual object, process, and/or events the model represents.
- Compare models to identify common features and differences.
- Develop and/or use a model to represent amounts, relationships, relative scales (bigger, smaller), and/or patterns in the natural and designed world(s).
- Develop a simple model based on evidence to represent a proposed object or tool.

## Planning and Carrying Out Investigations for Grades K–2

Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.

- With guidance, plan and conduct an investigation in collaboration with peers (for K).
- Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question.
- Evaluate different ways of observing and/or measuring a phenomenon to determine which way can answer a question.
- Make observations (firsthand or from media) and/or measurements to collect data that can be used to make comparisons.
- Make observations (firsthand or from media) and/or measurements of a proposed object or tool or solution to determine if it solves a problem or meets a goal.
- Make predictions based on prior experiences.

## Analyzing and Interpreting Data for Grades K–2

Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.

- Record information (observations, thoughts, and ideas).
- Use and share pictures, drawings, and/or writings of observations.
- Use observations (firsthand or from media) to describe patterns and/or relationships in the natural and designed world(s) in order to answer scientific questions and solve problems.
- Compare predictions (based on prior experiences) to what occurred (observable events).
- Analyze data from tests of an object or tool to determine if it works as intended.

## Using Mathematics and Computational Thinking for Grades K–2

Mathematical and computational thinking in K–2 builds on prior experience and progresses to recognizing that mathematics can be used to describe the natural and designed world(s).

- Use counting and numbers to identify and describe patterns in the natural and designed world(s).
- Describe, measure, and/or compare quantitative attributes of different objects and display the data using simple graphs.
- Use quantitative data to compare two alternative solutions to a problem.
### Constructing Explanations and Designing Solutions for Grades K–2

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.

- Use information from observations (firsthand and from media) to construct an evidence-based account for natural phenomena.
- Use tools and/or materials to design and/or build a device that solves a specific problem or a solution to a specific problem.
- Generate and/or compare multiple solutions to a problem.

### Engaging in Argument From Evidence for Grades K–2

Engaging in argument from evidence in K–2 builds on prior experiences and progresses to comparing ideas and representations about the natural and designed world(s).

- Identify arguments that are supported by evidence.
- Distinguish between explanations that account for all gathered evidence and those that do not.
- Analyze why some evidence is relevant to a scientific question and some is not.
- Distinguish between opinions and evidence in one's own explanations.
- Listen actively to arguments to indicate agreement or disagreement based on evidence, and/or to retell the main points of the argument.
- Construct an argument with evidence to support a claim.
- Make a claim about the effectiveness of an object, tool, or solution that is supported by relevant evidence.

### Obtaining, Evaluating, and Communicating Information for Grades K–2

Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information.

- Read grade-appropriate texts and/or use media to obtain scientific and/or technical information to determine patterns in and/or evidence about the natural and designed world(s).
- Describe how specific images (e.g., a diagram showing how a machine works) support a scientific or engineering idea.
- Obtain information using various texts, text features (e.g., headings, tables of contents, glossaries, electronic menus, icons), and other media that will be useful in answering a scientific question and/or supporting a scientific claim.
- Communicate information or design ideas and/or solutions with others in oral and/or written forms using models, drawings, writing, or numbers that provide detail about scientific ideas, practices, and/or design ideas.
## Crosscutting Concepts and Connections to Engineering, Technology, and Applications of Science

### Crosscutting Concepts for Grades K–2

<table>
<thead>
<tr>
<th>Concept</th>
<th>Description</th>
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<tbody>
<tr>
<td><strong>Patterns</strong></td>
<td>Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.</td>
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<tr>
<td><strong>Cause and Effect: Mechanism and Prediction</strong></td>
<td>Events have causes that generate observable patterns. Simple tests can be designed to gather evidence to support or refute student ideas about causes.</td>
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<tr>
<td><strong>Scale, Proportion, and Quantity</strong></td>
<td>Relative scales allow objects and events to be compared and described (e.g., bigger and smaller, hotter and colder, faster and slower). Standard units are used to measure length.</td>
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<tr>
<td><strong>Systems and System Models</strong></td>
<td>Objects and organisms can be described in terms of their parts. Systems in the natural and designed world have parts that work together.</td>
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<tr>
<td><strong>Energy and Matter: Flows, Cycles, and Conservation</strong></td>
<td>Objects may break into smaller pieces, be put together into larger pieces, or change shapes.</td>
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<tr>
<td><strong>Structure and Function</strong></td>
<td>The shape and stability of structures of natural and designed objects are related to their function(s).</td>
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<tr>
<td><strong>Stability and Change</strong></td>
<td>Some things stay the same while other things change. Things may change slowly or rapidly.</td>
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### Connections to Engineering, Technology, and Applications of Science for Grades K–2

<table>
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<tr>
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<tr>
<td><strong>Interdependence of Science, Engineering, and Technology</strong></td>
<td>Science and engineering involve the use of tools to observe and measure things.</td>
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<tr>
<td><strong>Influence of Science, Engineering, and Technology on Society and the Natural World</strong></td>
<td>Every human-made product is designed by applying some knowledge of the natural world and is built by using natural materials. Taking natural materials to make things impacts the environment.</td>
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</table>
## Connections to the Nature of Science

### Understandings Most Closely Associated With Practices for Grades K–2

<table>
<thead>
<tr>
<th>Topic</th>
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| **Scientific Investigations Use a Variety of Methods** | • Science investigations begin with a question.  
• Science uses different ways to study the world. |
| **Scientific Knowledge Is Based on Empirical Evidence** | • Scientists look for patterns and order when making observations about the world. |
| **Scientific Knowledge Is Open to Revision in Light of New Evidence** | • Science knowledge can change when new information is found. |
| **Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena** | • Science uses drawings, sketches, and models as a way to communicate ideas.  
• Science searches for cause-and-effect relationships to explain natural events. |

### Understandings Most Closely Associated With Crosscutting Concepts for Grades K–2

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<tr>
<td><strong>Science Is a Way of Knowing</strong></td>
<td>• Science knowledge helps us know about the world.</td>
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</table>
| **Scientific Knowledge Assumes an Order and Consistency in Natural Systems** | • Science assumes natural events happen today as they happened in the past.  
• Many events are repeated. |
| **Science Is a Human Endeavor** | • People have practiced science for a long time.  
• Men and women of diverse backgrounds are scientists and engineers. |
| **Science Addresses Questions About the Natural and Material World** | • Scientists study the natural and material world. |
## Performance Expectations and Disciplinary Core Ideas for Kindergarten

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<thead>
<tr>
<th>Performance Expectations (PEs)</th>
<th>Disciplinary Core Ideas (DCIs)</th>
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</table>
| **K-LS1-1. Use observations to describe patterns of what plants and animals (including humans) need to survive.**  
*Clarification Statement:* Examples of patterns could include that animals need to take in food but plants do not, the different kinds of food needed by different types of animals, the requirement of plants to have light, and that all living things need water. | **LS1.C. Organization for Matter and Energy Flow in Organisms**  
All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow. |
| **K-ESS2-1. Use and share observations of local weather conditions to describe patterns over time.**  
*Clarification Statement:* Examples of qualitative observations could include descriptions of the weather (such as sunny, cloudy, rainy, and warm); examples of quantitative observations could include numbers of sunny, windy, and rainy days in a month. Examples of patterns could include that it is usually cooler in the morning than in the afternoon and the number of sunny days versus cloudy days in different months.  
*Assessment Boundary:* Assessment of quantitative observations limited to whole numbers and relative measures such as warmer/cooler. | **ESS2.D. Weather and Climate**  
Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region at a particular time. People measure these conditions to describe and record the weather and to notice patterns over time. |
| **K-ESS2-2. Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.**  
*Clarification Statement:* Examples of plants and animals changing their environment could include a squirrel digging in the ground to hide its food and tree roots breaking concrete. | **ESS2.E. Biogeography**  
Plants and animals can change their environment. |
| **K-ESS3-1. Use a model to represent the relationship between the needs of different plants and animals (including humans) and the places they live.**  
*Clarification Statement:* Examples of relationships could include that deer eat buds and leaves so they usually live in forested areas and that grasses need sunlight so they often grow in meadows. Plants, animals, and their surroundings make up a system. | **ESS3.A. Natural Resources**  
Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do. |
| **K-ESS3-2. Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.**  
*Clarification Statement:* Emphasis is on local forms of severe weather. | **ESS3.B. Natural Hazards**  
Some kinds of severe weather are more likely than others in a given region. Weather scientists forecast severe weather so that the community can prepare for and respond to these events.  
**ETS1.A. Defining and Delimiting Engineering Problems**  
Asking questions, making observations, and gathering information are helpful in thinking about problems. (K–2-ETS1-1) |
### Performance Expectations (PEs) | Disciplinary Core Ideas (DCIs)  
---|---  
**K-ESS3-3. Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.**  
*Clarification Statement:* Examples of human impact on the land could include cutting trees to produce paper and using resources to produce bottles. Examples of solutions could include reusing paper and recycling cans and bottles.  
**ESS3.C. Human Impacts on Earth Systems**  
Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things.  
**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), (secondary to K-ESS3-3), (K–2-ETS1-2)  

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**K-PS2-1. Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.**  
*Clarification Statement:* Examples of pushes or pulls could include a string attached to an object being pulled, a person pushing an object, a person stopping a rolling ball, and two objects colliding and pushing on each other.  
*Assessment Boundary:* Assessment is limited to different relative strengths or different directions, but not both at the same time. Assessment does not include non-contact pushes or pulls such as those produced by magnets.  
**PS2.A. Forces and Motion**  
Pushes and pulls can have different strengths and directions. (K-PS2-2)  
Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it. (K-PS2-2)  
**PS2.B. Types of Interactions**  
When objects touch or collide, they push on one another and can change motion.  
**PS3.C. Relationship Between Energy and Forces**  
A bigger push or pull makes things speed up or slow down more quickly.  

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**K-PS2-2. Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.**  
*Clarification Statement:* Examples of problems requiring a solution could include having a marble or other object move a certain distance, follow a particular path, and knock down other objects. Examples of solutions could include tools such as a ramp to increase the speed of the object and a structure that would cause an object such as a marble or ball to turn.  
*Assessment Boundary:* Assessment does not include friction as a mechanism for change in speed.  
**PS2.A. Forces and Motion**  
Pushes and pulls can have different strengths and directions. (K-PS2-1)  
**PS2.A. Forces and Motion**  
Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it. (K-PS2-2)  
**ETS1.A. 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. Such problems may have many acceptable solutions. (K–2-ETS1-1)  

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**K-PS3-1. Make observations to determine the effect of sunlight on Earth's surface.**  
*Clarification Statement:* Examples of Earth’s surface could include sand, soil, rocks, and water.  
*Assessment Boundary:* Assessment of temperature is limited to relative measures such as warmer/cooler.  
**PS3.B. Conservation of Energy and Energy Transfer**  
Sunlight warms Earth's surface. (K-PS3-1)  

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**K-PS3-2. Use tools and materials provided to design and build a structure that will reduce the warming effect of sunlight on an area.**  
*Clarification Statement:* Examples of structures could include umbrellas, canopies, and tents that minimize the warming effect of the sun.  
**PS3.B. Conservation of Energy and Energy Transfer**  
Sunlight warms Earth's surface. (K-PS3-2)
Performance Expectations and Disciplinary Core Ideas for Grade 1

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| **1-LS1-1. Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.**  
**Clarification Statement:** Examples of human problems that can be solved by mimicking plant or animal solutions could include designing clothing or equipment to protect bicyclists by mimicking turtle shells, acorn shells, and animal scales; stabilizing structures by mimicking animal tails and roots on plants; keeping out intruders by mimicking thorns on branches and animal quills; and detecting intruders by mimicking eyes and ears. | **LS1.A. Structure and Function**  
All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water, and air. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow.  
**LS1.D. Information Processing**  
Animals have body parts that capture and convey different kinds of information needed for growth and survival. Animals respond to these inputs with behaviors that help them survive. Plants also respond to some external inputs. |
| **1-LS1-2. Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.**  
**Clarification Statement:** Examples of patterns of behaviors could include the signals that offspring make (such as crying, cheeping, and other vocalizations) and the responses of the parents (such as feeding, comforting, and protecting the offspring). | **LS1.B. Growth and Development of Organisms**  
Adult plants and animals can have young. In many kinds of animals, parents and the offspring themselves engage in behaviors that help the offspring to survive. |
| **1-LS3-1. Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.**  
**Clarification Statement:** Examples of patterns could include features plants or animals share. Examples of observations could include that leaves from the same kind of plant are the same shape but can differ in size and that a particular breed of dog looks like its parents but is not exactly the same.  
**Assessment Boundary:** Assessment does not include inheritence or animals that undergo metamorphosis or hybrids. | **LS3.A. Inheritance of Traits**  
Young animals are very much, but not exactly like, their parents. Plants also are very much, but not exactly, like their parents.  
**LS3.B. Variation of Traits**  
Individuals of the same kind of plant or animal are recognizable as similar but can also vary in many ways. |
| **1-ESS1-1. Use observations of the sun, moon, and stars to describe patterns that can be predicted.**  
**Clarification Statement:** Examples of patterns could include that the Sun and Moon appear to rise in one part of the sky, move across the sky, and set; and stars other than our Sun are visible at night but not during the day.  
**Assessment Boundary:** Assessment of star patterns is limited to stars being seen at night and not during the day. | **ESS1.A. The Universe and Its Stars**  
Patterns of the motion of the Sun, Moon, and stars in the sky can be observed, described, and predicted. |
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| 1-ESS1-2. Make observations at different times of year to relate the amount of daylight to the time of year.  
**Clarification Statement:** Emphasis is on relative comparisons of the amount of daylight in the winter to the amount in the spring or fall.  
**Assessment Boundary:** Assessment is limited to relative amounts of daylight, not quantifying the hours or time of daylight. | ESS1.B. Earth and the Solar System  
Seasonal patterns of sunrise and sunset can be observed, described, and predicted. |
| 1-PS4-1. Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.  
**Clarification Statement:** Examples of vibrating materials that make sound could include tuning forks and plucking a stretched string. Examples of how sound can make matter vibrate could include holding a piece of paper near a speaker making sound and holding an object near a vibrating tuning fork. | PS4.A. Wave Properties  
Sound can make matter vibrate, and vibrating matter can make sound. |
| 1-PS4-2. Make observations to construct an evidence-based account that objects in darkness can be seen only when illuminated.  
**Clarification Statement:** Examples of observations could include those made in a completely dark room, a pinhole box, and a video of a cave explorer with a flashlight. Illumination could be from an external light source or by an object giving off its own light. | PS4.B. Electromagnetic Radiation  
Objects can be seen if light is available to illuminate them or if they give off their own light. |
| 1-PS4-3. Plan and conduct investigations to determine the effect of placing objects made with different materials in the path of a beam of light.  
**Clarification Statement:** Examples of materials could include those that are transparent (such as clear plastic), translucent (such as wax paper), opaque (such as cardboard), and reflective (such as a mirror).  
**Assessment Boundary:** Assessment does not include the speed of light. | PS4.B. Electromagnetic Radiation  
Some materials allow light to pass through them, others allow only some light through, and others block all the light and create a dark shadow on any surface beyond them, where the light cannot reach. Mirrors can be used to redirect a light beam. (Boundary: The idea that light travels from place to place is developed through experiences with light sources, mirrors, and shadows, but no attempt is made to discuss the speed of light.) |
| 1-PS4-4. Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.  
**Clarification Statement:** Examples of devices could include a light source to send signals, paper cup and string “telephones,” and a pattern of drum beats.  
**Assessment Boundary:** Assessment does not include technological details for how communication devices work. | PS4.C. Information Technologies and Instrumentation  
People use a variety of devices to communicate (send and receive information) over long distances. |
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<tr>
<td>2-LS2.1. 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.</td>
<td>LS2.A. Interdependent Relationships in Ecosystems Plants depend on water and light to grow.</td>
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<tr>
<td>2-LS2.2. Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.</td>
<td>LS2.A. Interdependent Relationships in Ecosystems Plants depend on animals for pollination or to move their seeds around. ETS1.B. Developing Possible Solutions Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (2-LS2-2), (K-ESS3-3), (K–2-ETS1-2)</td>
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<tr>
<td>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.</td>
<td>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.</td>
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<tr>
<td>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 time scales 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 time scales.</td>
<td>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.</td>
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<tr>
<td>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.</td>
<td>ESS2.A. Earth Materials and Systems Wind and water can change the shape of the land. ETS1.C. Optimizing the Design Solution Because there is always more than one possible solution to a problem, it is useful to compare and test designs. (K–2-ETS1-3)</td>
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<td>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.</td>
<td>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.</td>
</tr>
<tr>
<td>2-ESS2.3. Obtain information to identify where water is found on Earth and that it can be solid or liquid.</td>
<td>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.</td>
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<tr>
<td>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.</td>
<td>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.</td>
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| **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.  
Clariification Statement: Examples of properties could include strength, flexibility, hardness, texture, and absorbency.  
Assessment Boundary: Assessment of quantitative measurements is limited to length. | PS1.A. Structure and Properties of Matter  
Different properties are suited to different purposes.  
(2-PS1-3) |

**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.  
Clariification Statement: Examples of pieces could include blocks, building bricks, or other assorted small objects. | PS1.A. Structure and Properties of Matter  
Different properties are suited to different purposes.  
(2-PS1-2)  
A great variety of objects can be built up from a small set of pieces. |

**2-PS1-4.** Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.  
Clariification 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. | 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. |
Performance Expectations and Disciplinary Core Ideas for Engineering Design in Grades K–2

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| **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. | **ETS1.A. 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. Such problems may have many acceptable solutions. (K-PS2-2)  
**ETS1.A. Defining and Delimiting Engineering Problems**  
Asking questions, making observations, and gathering information are helpful in thinking about problems. (K-ESS3-2)  
**ETS1.A. Defining and Delimiting Engineering Problems**  
Before beginning to design a solution, it is important to clearly understand the problem. |
| **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. | **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), (K-ESS3-3), (K–2-ETS1-2) |
| **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. | **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) |