Washington State Science Learning Standards

Focus on Grades 3-5
### Asking Questions and Defining Problems for Grades 3–5

Asking questions and defining problems in 3–5 builds on K–2 experiences and progresses to specifying qualitative relationships.

- Ask questions about what would happen if a variable is changed.
- Identify scientific (testable) and non-scientific (non-testable) questions.
- Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause-and-effect relationships.
- Use prior knowledge to describe problems that can be solved.
- Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost.

### Developing and Using Models for Grades 3–5

Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.

- Identify limitations of models.
- Collaboratively develop and/or revise a model based on evidence that shows the relationships among variables for frequent and regular occurring events.
- Develop a model using an analogy, example, or abstract representation to describe a scientific principle or design solution.
- Develop and/or use models to describe and/or predict phenomena.
- Develop a diagram or simple physical prototype to convey a proposed object, tool, or process.
- Use a model to test cause-and-effect relationships or interactions concerning the functioning of a natural or designed system.

### Planning and Carrying Out Investigations for Grades 3–5

Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.

- Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered.
- Evaluate appropriate methods and/or tools for collecting data.
- Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution.
- Make predictions about what would happen if a variable changes.
- Test two different models of the same proposed object, tool, or process to determine which better meets criteria for success.

### Analyzing and Interpreting Data for Grades 3–5

Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.

- Represent data in tables and/or various graphical displays (bar graphs, pictographs, and/or pie charts) to reveal patterns that indicate relationships.
- Analyze and interpret data to make sense of phenomena, using logical reasoning, mathematics, and/or computation.
- Compare and contrast data collected by different groups in order to discuss similarities and differences in their findings.
- Analyze data to refine a problem statement or the design of a proposed object, tool, or process.
- Use data to evaluate and refine design solutions.
### Using Mathematics and Computational Thinking for Grades 3–5

Mathematical and computational thinking in 3–5 builds on K–2 experiences and progresses to extending quantitative measurements to a variety of physical properties and using computation and mathematics to analyze data and compare alternative design solutions.

- Organize simple data sets to reveal patterns that suggest relationships.
- Describe, measure, estimate, and/or graph quantities such as area, volume, weight, and time to address scientific and engineering questions and problems.
- Create and/or use graphs and/or charts generated from simple algorithms to compare alternative solutions to an engineering problem.

### Constructing Explanations and Designing Solutions for Grades 3–5

Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.

- Construct an explanation of observed relationships (e.g., the distribution of plants in the backyard).
- Use evidence (e.g., measurements, observations, patterns) to construct or support an explanation or design a solution to a problem.
- Identify the evidence that supports particular points in an explanation.
- Apply scientific ideas to solve design problems.
- Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution.

### Engaging in Argument From Evidence for Grades 3–5

Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).

- Compare and refine arguments based on an evaluation of the evidence presented.
- Distinguish among facts, reasoned judgment based on research findings, and speculation in an explanation.
- Respectfully provide and receive critiques from peers about a proposed procedure, explanation, or model by citing relevant evidence and posing specific questions.
- Construct and/or support an argument with evidence, data, and/or a model.
- Use data to evaluate claims about cause and effect.
- Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem.

### Obtaining, Evaluating, and Communicating Information for Grades 3–5

Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluating the merit and accuracy of ideas and methods.

- Read and comprehend grade-appropriate complex texts and/or other reliable media to summarize and obtain scientific and technical ideas and describe how they are supported by evidence.
- Compare and/or combine across complex texts and/or other reliable media to support the engagement in other scientific and/or engineering practices.
- Combine information in written text with that contained in corresponding tables, diagrams, and/or charts to support the engagement in other scientific and/or engineering practices.
- Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem.
- Communicate scientific and/or technical information orally and/or in written formats, including various forms of media as well as tables, diagrams, and charts.
## Crosscutting Concepts and Connections to Engineering, Technology, and Applications of Science for Grades 3–5

### Crosscutting Concepts for Grades 3–5

<table>
<thead>
<tr>
<th>Concept</th>
<th>Description</th>
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| **Patterns**                                 | • Similarities and differences in patterns can be used to sort, classify, communicate, and analyze simple rates of change for natural phenomena and designed products.  
• Patterns of change can be used to make predictions.  
• Patterns can be used as evidence to support an explanation. |
| **Cause and Effect: Mechanism and Prediction**| • Cause-and-effect relationships are routinely identified, tested, and used to explain change.  
• Events that occur together with regularity might or might not be a cause-and-effect relationship |
| **Scale, Proportion, and Quantity**          | • Observable phenomena exist from very short to very long time periods.  
• Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume. |
| **Systems and System Models**                | • A system is a group of related parts that make up a whole and can carry out functions its individual parts cannot.  
• A system can be described in terms of its components and their interactions. |
| **Energy and Matter: Flows, Cycles, and Conservation** | • Energy can be transferred in various ways and between objects.  
• Matter is made of particles.  
• Matter flows and cycles can be tracked in terms of the weight of the substances before and after a process occurs. The total weight of the substances does not change. This is what is meant by conservation of matter. Matter is transported into, out of, and within systems. |
| **Structure and Function**                   | • Different materials have different substructures, which can sometimes be observed.  
• Substructures have shapes and parts that serve functions |
| **Stability and Change**                     | • Change is measured in terms of differences over time and may occur at different rates.  
• Some systems appear stable, but over long periods of time will eventually change. |

### Connections to Engineering, Technology, and Applications of Science for Grades 3–5

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| **Interdependence of Science, Engineering, and Technology**           | • Science and technology support each other.  
• Tools and instruments are used to answer scientific questions, while scientific discoveries lead to the development of new technologies. |
| **Influence of Science, Engineering, and Technology on Society and the Natural World** | • People’s needs and wants change over time, as do their demands for new and improved technologies.  
• Engineers improve existing technologies or develop new ones to increase their benefits, to decrease known risks, and to meet societal demands.  
• When new technologies become available, they can bring about changes in the way people live and interact with one another. |
Connections to the Nature of Science

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<thead>
<tr>
<th>Understandings Most Closely Associated With Practices for Grades 3–5</th>
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<tr>
<td><strong>Scientific Investigations Use a Variety of Methods</strong></td>
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<td>•Science investigations use a variety of methods, tools, and techniques.</td>
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<td><strong>Scientific Knowledge Is Based on Empirical Evidence</strong></td>
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<td>•Science uses tools and technologies to make accurate measurements and observations.</td>
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<td><strong>Scientific Knowledge Is Open to Revision in Light of New Evidence</strong></td>
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<td><strong>Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena</strong></td>
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<td>•Science explanations describe the mechanisms for natural events.</td>
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<tr>
<th>Understandings Most Closely Associated With Crosscutting Concepts for Grades 3–5</th>
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<tr>
<td><strong>Science Is a Way of Knowing</strong></td>
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<tr>
<td>•Science is a way of knowing that is used by many people.</td>
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<tr>
<td><strong>Scientific Knowledge Assumes an Order and Consistency in Natural Systems</strong></td>
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<td>•Basic laws of nature are the same everywhere in the universe.</td>
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<td><strong>Science Is a Human Endeavor</strong></td>
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<td>•Most scientists and engineers work in teams.</td>
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<td>•Science affects everyday life.</td>
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<td>•Creativity and imagination are important to science.</td>
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<td><strong>Science Addresses Questions About the Natural and Material World</strong></td>
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### Performance Expectations and Disciplinary Core Ideas for Grade 3

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| **3-LS1-1.** Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death. | LS1.B. Growth and Development of Organisms  
Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles. |
| **Clarification Statement:** Changes organisms go through during their life form a pattern.  
**Assessment Boundary:** Assessment of plant life cycles is limited to those of flowering plants. Assessment does not include details of human reproduction. | |
| **3-LS2-1. Construct an argument that some animals form groups that help members survive.** | LS2.D. Social Interactions and Group Behavior  
Being part of a group helps animals obtain food, defend themselves, and cope with changes. Groups may serve different functions and vary dramatically in size. |
| **3-LS3-1. Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.** | LS3.A. Inheritance of Traits  
Many characteristics of organisms are inherited from their parents.  
LS3.B. Variation of Traits  
Different organisms vary in how they look and function because they have different inherited information. |
| **Clarification Statement:** Patterns are the similarities and differences in traits shared between offspring and their parents, or among siblings. Emphasis is on organisms other than humans.  
**Assessment Boundary:** Assessment does not include genetic mechanisms of inheritance and prediction of traits. Assessment is limited to non-human examples. | |
| **3-LS3-2. Use evidence to support the explanation that traits can be influenced by the environment.** | LS3.A. Inheritance of Traits  
Other characteristics result from individuals’ interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment.  
LS3.B. Variation of Traits  
The environment also affects the traits that an organism develops. |
| **Clarification Statement:** Examples of the environment affecting a trait could include that normally tall plants grown with insufficient water are stunted and that a pet dog that is given too much food and little exercise may become overweight. | |
| **3-LS4-1. Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago.** | LS4.A. Evidence of Common Ancestry and Diversity  
Some kinds of plants and animals that once lived on Earth are no longer found anywhere.  
Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments. |
| **Clarification Statement:** Examples of data could include type, size, and distributions of fossil organisms. Examples of fossils and environments could include marine fossils found on dry land, tropical plant fossils found in Arctic areas, and fossils of extinct organisms.  
**Assessment Boundary:** Assessment does not include identification of specific fossils or present plants and animals. Assessment is limited to major fossil types and relative ages. | |
| **3-LS4-2. Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.** | LS4.B. Natural Selection  
Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing. |
| **Clarification Statement:** Examples of cause-and-effect relationships could be that plants that have larger thorns than other plants may be less likely to be eaten by predators and that animals that have better camouflage coloration than other animals may be more likely to survive and therefore more likely to leave offspring. | |
### Performance Expectations (PEs) | Disciplinary Core Ideas (DCIs)
---|---
3-LS4-3. Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all. **Clarification Statement:** Examples of evidence could include needs and characteristics of the organisms and habitats involved. The organisms and their habitat make up a system in which the parts depend on each other. | LS4.C. Adaptation
For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.

3-LS4-4. Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change. **Clarification Statement:** Examples of environmental changes could include changes in land characteristics, water distribution, temperature, food, and other organisms. **Assessment Boundary:** Assessment is limited to a single environmental change. Assessment does not include the greenhouse effect or climate change. | LS2.C. Ecosystem Dynamics, Functioning, and Resilience
When the environment changes in ways that affect a place’s physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die.

LS4.D. Biodiversity and Humans
Populations live in a variety of habitats, and change in those habitats affects the organisms living there.

3-ESS2-1. Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season. **Clarification Statement:** Examples of data could include average temperature, precipitation, and wind direction. **Assessment Boundary:** Assessment of graphical displays is limited to pictographs and bar graphs. Assessment does not include climate change. | ESS2.D. Weather and Climate
Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next.

3-ESS2-2. Obtain and combine information to describe climates in different regions of the world. | ESS2.D. Weather and Climate
Climate describes a range of an area’s typical weather conditions and the extent to which those conditions vary over years.

3-ESS3-1. Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard. **Clarification Statement:** Examples of design solutions to weather-related hazards could include barriers to prevent flooding, wind-resistant roofs, and lightning rods. | ESS3.B. Natural Hazards
A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts. (4-ESS3-2)

3-PS2-1. Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object. **Clarification Statement:** Examples could include that an unbalanced force on one side of a ball can make it start moving and that balanced forces pushing on a box from both sides will not produce any motion at all. **Assessment Boundary:** Assessment is limited to one variable at a time: number, size, or direction of forces. Assessment does not include quantitative force size, only qualitative and relative. Assessment is limited to gravity being addressed as a force that pulls objects down. | PS2.A. Forces and Motion
Each force acts on one particular object and has both strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object’s speed or direction of motion. (Boundary: Qualitative and conceptual, but not quantitative addition of forces are used at this level.)

PS2.B. Types of Interactions
Objects in contact exert forces on each other.
### Performance Expectations (PEs) | Disciplinary Core Ideas (DCIs)
---|---
**3-PS2-2.** Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.  
**Clarification Statement:** Examples of motion with a predictable pattern could include a child swinging in a swing, a ball rolling back and forth in a bowl, and two children on a see-saw.  
**Assessment Boundary:** Assessment does not include technical terms such as period and frequency.  
**PS2.A. Forces and Motion**  
The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it. (Boundary: Technical terms, such as magnitude, velocity, momentum, and vector quantity, are not introduced at this level, but the concept that some quantities need both size and direction to be described is developed.)

**3-PS2-3.** Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.  
**Clarification Statement:** Examples of an electric force could include the force on hair from an electrically charged balloon and the electrical forces between a charged rod and pieces of paper; examples of a magnetic force could include the force between two permanent magnets, the force between an electromagnet and steel paperclips, and the force exerted by one magnet versus the force exerted by two magnets. Examples of cause and effect relationships could include how the distance between objects affects strength of the force and how the orientation of magnets affects the direction of the magnetic force.  
**Assessment Boundary:** Assessment is limited to forces produced by objects that can be manipulated by students, and electrical interactions are limited to static electricity.  
**PS2.B. Types of Interactions**  
Electric, and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other. (3-PS2-4)

**3-PS2-4.** Define a simple design problem that can be solved by applying scientific ideas about magnets.  
**Clarification Statement:** Examples of problems could include constructing a latch to keep a door shut and creating a device to keep two moving objects from touching each other.  
**PS2.B. Types of Interactions**  
Electric, and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other. (3-PS2-3)
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<td><strong>4-LS1-1.</strong> Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. <strong>Clarification Statement:</strong> Examples of structures could include thorns, stems, roots, colored petals, heart, stomach, lung, brain, and skin. <strong>Assessment Boundary:</strong> Assessment is limited to macroscopic structures within plant and animal systems.</td>
<td><strong>LS1.A. Structure and Function</strong> Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.</td>
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<td><strong>4-LS1-2.</strong> Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways. <strong>Clarification Statement:</strong> Emphasis is on systems of information transfer. <strong>Assessment Boundary:</strong> Assessment does not include the mechanisms by which the brain stores and recalls information or the mechanisms of how sensory receptors function.</td>
<td><strong>LS1.D. Information Processing</strong> Different sense receptors are specialized for particular kinds of information, which may then be processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions.</td>
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<td><strong>4-ESS1-1.</strong> Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time. <strong>Clarification Statement:</strong> Examples of evidence from patterns could include rock layers with marine shell fossils above rock layers with plant fossils and no shells, indicating a change from land to water over time; and a canyon with different rock layers in the walls and a river in the bottom, indicating that over time a river cut through the rock. <strong>Assessment Boundary:</strong> Assessment does not include specific knowledge of the mechanism of rock formation or memorization of specific rock formations and layers. Assessment is limited to relative time.</td>
<td><strong>ESS1.C. The History of Planet Earth</strong> Local, regional, and global patterns of rock formations reveal changes over time due to Earth forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed.</td>
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<td><strong>4-ESS1-2.</strong> Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation. <strong>Clarification Statement:</strong> Examples of variables to test could include angle of slope in the downhill movement of water, amount of vegetation, speed of wind, relative rate of deposition, cycles of freezing and thawing of water, cycles of heating and cooling, and volume of water flow. <strong>Assessment Boundary:</strong> Assessment is limited to a single form of weathering or erosion.</td>
<td><strong>ESS2.A. Earth Materials and Systems</strong> Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. <strong>ESS2.E. Biogeography</strong> Living things affect the physical characteristics of their regions.</td>
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<td><strong>4-ESS2-1.</strong> Analyze and interpret data from maps to describe patterns of Earth's features. <strong>Clarification Statement:</strong> Maps can include topographic maps of Earth's land and ocean floor, as well as maps of the locations of mountains, continental boundaries, volcanoes, and earthquakes.</td>
<td><strong>ESS2.B. Plate Tectonics and Large-Scale System Interactions</strong> The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges. Maps can help locate the different land and water features of Earth.</td>
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| **4-ESS3-1.** Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.  
Clarification Statement: Examples of renewable energy resources could include wind energy, water behind dams, and sunlight; non-renewable energy resources are fossil fuels and fissile materials. Examples of environmental effects could include loss of habitat due to dams, loss of habitat due to surface mining, and air pollution from burning of fossil fuels. | **ESS3.A. Natural Resources**  
Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not. |
| **4-ESS3-2.** Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.  
Clarification Statement: Examples of solutions could include designing an earthquake-resistant building and improving monitoring of volcanic activity.  
Assessment Boundary: Assessment is limited to earthquakes, floods, tsunamis, and volcanic eruptions. | **ESS3.B. Natural Hazards**  
A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts. (3-ESS3-1)  
**ETS1.B. Developing Possible Solutions**  
Testing a solution involves investigating how well it performs under a range of likely conditions. |
| **4-PS3-1.** Use evidence to construct an explanation relating the speed of an object to the energy of that object.  
Assessment Boundary: Assessment does not include quantitative measures of changes in the speed of an object or on any precise or quantitative definition of energy. | **PS3.A. Definitions of Energy**  
The faster a given object is moving, the more energy it possesses. |
| **4-PS3-2.** Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.  
Assessment Boundary: Assessment does not include quantitative measurements of energy. | **PS3.A. Definitions of Energy**  
Energy can be moved from place to place by moving objects or through sound, light, or electric currents. (4-PS3-3)  
**PS3.B. Conservation of Energy and Energy Transfer**  
Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. (4-PS3-3)  
Light also transfers energy from place to place.  
Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy. (4-PS3-4) |
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<td><strong>4-PS3-3.</strong> Ask questions and predict outcomes about the changes in energy that occur when objects collide. <strong>Clarification Statement:</strong> Emphasis is on the change in the energy due to the change in speed, not on the forces, as objects interact. <strong>Assessment Boundary:</strong> Assessment does not include quantitative measurements of energy.</td>
<td><strong>PS3.A. Definitions of Energy</strong> Energy can be moved from place to place by moving objects or through sound, light, or electric currents. (4-PS3-2) <strong>PS3.B. Conservation of Energy and Energy Transfer</strong> Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. (4-PS3-2) <strong>PS3.C. Relationship Between Energy and Forces</strong> When objects collide, the contact forces transfer energy so as to change the objects' motions.</td>
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<td><strong>4-PS4-2.</strong> Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen. <strong>Assessment Boundary:</strong> Assessment does not include knowledge of specific colors reflected and seen, the cellular mechanisms of vision, or how the retina works.</td>
<td>PS4.B. Electromagnetic Radiation An object can be seen when light reflected from its surface enters the eyes.</td>
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<td><strong>4-PS4-3.</strong> Generate and compare multiple solutions that use patterns to transfer information. <strong>Clarification Statement:</strong> Examples of solutions could include drums sending coded information through sound waves, using a grid of 1's and 0's representing black and white to send information about a picture, and using Morse code to send text.</td>
<td>PS4.C. Information Technologies and Instrumentation Digitized information can be transmitted over long distances without significant degradation. High-tech devices, such as computers or cell phones, can receive and decode information—convert it from digitized form to voice—and vice versa. <strong>ETS1.C. Optimizing the Design Solution</strong> Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. (3–5-ETS1-3)</td>
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<td><strong>5-LS1-1. Support an argument that plants get the materials they need for growth chiefly from air and water.</strong>&lt;br&gt;Clarification Statement: Emphasis is on the idea that plant matter comes mostly from air and water, not from the soil.</td>
<td><strong>LS1.C. Organization for Matter and Energy Flow in Organisms</strong>&lt;br&gt;Plants acquire their material for growth chiefly from air and water.</td>
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<td><strong>5-LS2-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.</strong>&lt;br&gt;Clarification Statement: Emphasis is on the idea that matter that is not food (air, water, decomposed materials in soil) is changed by plants into matter that is food. Examples of systems could include organisms, ecosystems, and the Earth.&lt;br&gt;Assessment Boundary: Assessment does not include molecular explanations.</td>
<td><strong>LS2.A. Interdependent Relationships in Ecosystems</strong>&lt;br&gt;The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plant parts and animals) and therefore operate as &quot;decomposers.&quot; Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem.**&lt;br&gt;<strong>LS2.B. Cycles of Matter and Energy Transfer in Ecosystems</strong>&lt;br&gt;Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases and water from the environment and release waste matter (gas, liquid, or solid) back into the environment.</td>
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<td><strong>5-ESS1-1. Support an argument that differences in the apparent brightness of the Sun compared to other stars is due to their relative distances from the Earth.</strong>&lt;br&gt;Assessment Boundary: Assessment is limited to relative distances, not sizes, of stars. Assessment does not include other factors that affect apparent brightness (such as stellar masses, age, stage).</td>
<td><strong>ESS1.A. The Universe and Its Stars</strong>&lt;br&gt;The Sun is a star that appears larger and brighter than other stars because it is closer. Stars range greatly in their distance from Earth.</td>
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<td><strong>5-ESS1-2. Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.</strong>&lt;br&gt;Clarification Statement: Examples of patterns could include the position and motion of Earth with respect to the Sun and selected stars that are visible only in particular months.&lt;br&gt;Assessment Boundary: Assessment does not include causes of seasons.</td>
<td><strong>ESS1.B. Earth and the Solar System</strong>&lt;br&gt;The orbits of Earth around the Sun and of the Moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the Sun, Moon, and stars at different times of the day, month, and year.</td>
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### Performance Expectations and Disciplinary Core Ideas for Grade 5 (continued)

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<tr>
<th>Performance Expectations (PEs)</th>
<th>Disciplinary Core Ideas (DCIs)</th>
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| **5-ESS2-1.** Develop a model using an example to describe ways the geosphere, biosphere,    | **ESS2.A. Earth Materials and Systems**  
Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather. |
| hydrosphere, and/or atmosphere interact.                                                      |                                                                                                                                                                                                                            |
| **Clarification Statement:** Examples could include the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere on landforms and ecosystems through weather and climate; and the influence of mountain ranges on winds and clouds in the atmosphere. The geosphere, hydrosphere, atmosphere, and biosphere are each a system. |
| **Assessment Boundary:** Assessment is limited to the interactions of two systems at a time.  |                                                                                                                                                                                                                            |
| **5-ESS2-2.** Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth. | **ESS2.C. The Roles of Water in Earth's Surface Processes**  
Nearly all of Earth's available water is in the ocean. Most fresh water is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere. |
| **Assessment Boundary:** Assessment is limited to oceans, lakes, rivers, glaciers, groundwater, and polar ice caps, and does not include the atmosphere. |                                                                                                                                                                                                                            |
| **5-ESS3-1.** Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment. | **ESS3.C. Human Impacts on Earth Systems**  
Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments. |
| **5-PS1-1.** Develop a model to describe that matter is made of particles too small to be seen. | **PS1.A. Structure and Properties of Matter**  
Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon and the effects of air on larger particles or objects. |
| **Clarification Statement:** Examples of evidence could include adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water. |                                                                                                                                                                                                                            |
| **Assessment Boundary:** Assessment does not include the atomic-scale mechanism of evaporation and condensation or defining the unseen particles. |                                                                                                                                                                                                                            |
| **5-PS1-2.** Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved. | **PS1.A. Structure and Properties of Matter**  
The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish.                                                                                                           |
| **Clarification Statement:** Examples of reactions or changes could include phase changes, dissolving, and mixing that form new substances. | **PS1.B. Chemical Reactions**  
No matter what reaction or change in properties occurs, the total weight of the substances does not change. (Boundary: Mass and weight are not distinguished at this grade level.)                                               |
| **Assessment Boundary:** Assessment does not include distinguishing mass and weight.          |                                                                                                                                                                                                                            |
### Performance Expectations (PEs) | Disciplinary Core Ideas (DCIs)
---|---
5-PS1-3. Make observations and measurements to identify materials based on their properties.  
**Clarification Statement:** Examples of materials to be identified could include baking soda and other powders, metals, minerals, and liquids. Examples of properties could include color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, and solubility; density is not intended as an identifiable property.  
**Assessment Boundary:** Assessment does not include density or distinguishing mass and weight.  
| PS1.A. Structure and Properties of Matter  
Measurements of a variety of properties can be used to identify materials. (Boundary: At this grade level, mass and weight are not distinguished, and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation.)
---|---
5-PS1-4. Conduct an investigation to determine whether the mixing of two or more substances results in new substances.  
| PS1.B. Chemical Reactions  
When two or more different substances are mixed, a new substance with different properties may be formed.
---|---
5-PS2-1. Support an argument that the gravitational force exerted by Earth on objects is directed down.  
**Clarification Statement:** “Down” is a local description of the direction that points toward the center of the spherical Earth.  
**Assessment Boundary:** Assessment does not include mathematical representation of gravitational force.  
| PS2.B. Types of Interactions  
The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center.
---|---
5-PS3-1. Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the Sun.  
**Clarification Statement:** Examples of models could include diagrams and flow charts.  
| LS1.C. Organization for Matter and Energy Flow in Organisms  
Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion.  
The energy released from food was once energy from the Sun that was captured by plants in the chemical process that forms plant matter (from air and water).
### Performance Expectations and Disciplinary Core Ideas for Engineering Design in Grades 3–5

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<tr>
<th>Performance Expectations (PEs)</th>
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<tr>
<td>3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.</td>
<td>ETS1.A. Defining and Delimiting Engineering Problems Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. (4-PS3-4)</td>
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<td>3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.</td>
<td>ETS1.B. Developing Possible Solutions Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. ETS1.B. Developing Possible Solutions At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs.</td>
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<td>3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.</td>
<td>ETS1.B. Developing Possible Solutions Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved. ETS1.C. Optimizing the Design Solution Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. (4-PS4-3)</td>
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