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Introduction to Your Science Pacing Guide

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Superintendent

Mark Coscarella, Ed.D.
Deputy Superintendent

Mara Lud
Executive Director of Instructional Learning

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Vocabulary

Boulder
Changes in the Earth’s surface
Clay
Coal
Constructed environment
Crude oil
Earth materials
Earthquake
Erosion
Forests
Freshwater
Fuels
Garbage
Glacier
Gravel
Habitat destruction
Harmful changes
Helpful chance
Ice
Land management
Landslide
Metal (s)
Mineral
Natural environment
Natural gas
Natural resources
Non-renewable resources
Oil
Recycle
Reduce
Renewal
Renewable resources
Reuse
Rock
Rock breakage
Sand
Soil
Soil color
Soil texture
Volcanic eruptions
Water
Weathered rock
Weathering
Wind

Crosscutting Concepts

4-ESS1-1 Patterns
Patterns can be used as evidence to support an explanation.

4-ESS2-1 Cause and Effect
Cause and effect relationships are routinely identified, tested, and used to explain change.

4-ESS2-2 Patterns
Patterns can be used as evidence to support an explanation.

4-ESS3-1 Cause and Effect
Cause and effect relationships are routinely identified and used to explain change.

4-ESS3-2 Cause and Effect
Cause and effect relationships are routinely identified, tested, and used to explain change.

Resources *

* List your recommended texts and resources - we will be collecting them at the end of the year.
<table>
<thead>
<tr>
<th>Earth's Place 4-ESS1-1</th>
<th>Earth's System 4-ESS2-1</th>
<th>Earth's System 4-ESS2-2</th>
<th>Earth and Humans 4-ESS3-1</th>
<th>Earth and Humans 4-ESS3-2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I CAN STATEMENT</strong></td>
<td><strong>I CAN STATEMENT</strong></td>
<td><strong>I CAN STATEMENT</strong></td>
<td><strong>I CAN STATEMENT</strong></td>
<td><strong>I CAN STATEMENT</strong></td>
</tr>
<tr>
<td>☐ I CAN explain land changes over time using evidence from rock layers and fossils.</td>
<td>☐ I CAN explain ‘weathering’ and ‘erosion’.</td>
<td>☐ I CAN analyze and interpret data from a variety of maps to describe patterns of Earth’s features.</td>
<td>☐ I CAN collect information to describe where energy and fuels come from.</td>
<td>☐ I CAN identify and compare multiple ways to reduce the impacts of natural Earth processes (earthquakes, floods, tsunamis, and volcanic eruptions) on humans.</td>
</tr>
</tbody>
</table>

**Core Idea**

**The History of Planet Earth**

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.

**Earth Materials and Systems**

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.

**Biogeology**

Living things affect the physical characteristics of their regions.

**Plate Tectonics and Large-Scale System Interactions**

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 areas of Earth.

**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.

**Standard**

Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time. **Clarification Statement:** 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.

**Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.**

**Clarification Statement:** 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.

**Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.**

**Clarification Statement:** 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.

**Analyze and interpret data from maps to describe patterns of Earth’s features.**

**Clarification Statement:** 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.

**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.

**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.

**Science and Engineering Practices**

**Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.**

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**Planning and Carrying Out Investigations**

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

- **Identify the evidence that supports particular points in an explanation.**

**Analyzing and Interpreting Data**

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.

- **Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon.**

**Obtaining, Evaluating, and Communicating Information**

Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluate the merit and usefulness of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.

- **Obtain and combine information from books and other reliable media to explain phenomena.**

**Constructing Explanations and Designing Solutions**

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.

- **Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution.**
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### Vocabulary

- appliance
- attract
- battery
- bulb
- Celsius
- closed circuit
- compass
- conductor
- decrease
- device
- electric current
- electricity
- energy
- energy transfer
- evident
- Fahrenheit
- friction
- generator
- heat
- increase
- iron filings
- lines of force
- magnet
- magnetic field
- magnetic poles
- open circuit
- power source
- repel
- simple circuit
- substance
- temperature
- thermometer
- wire
- conduct
- conduction
- resistance
- electromagnet
- three dimensional

### Crosscutting Concepts

- 4-PS3-1
- 4-PS3-2
- 4-PS3-3
- 4-PS3-4

**Energy and Matter**

Energy can be transferred in various ways and between objects.

### Resources *

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## I CAN STATEMENT

<table>
<thead>
<tr>
<th>Draft 1</th>
<th>Draft 2</th>
<th>Draft 3</th>
<th>Draft 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ I CAN use evidence to explain the relationship between the speed (movement) of an object and the energy of that object.</td>
<td>☐ I CAN make observations and provide evidence to explain how energy can be transferred from place to place.</td>
<td>☐ I CAN predict the outcomes of the changes in energy that occurs when objects collide.</td>
<td>☐ I CAN apply scientific ideas to design, test, and refine a device that converts energy (electric, motion, light, sound, heat) from one form to another.</td>
</tr>
</tbody>
</table>

### Core Idea

#### Definitions of Energy

- The faster a given object is moving, the more energy it possesses.
- Energy can be moved from place to place by moving objects or through sound, light, or electric currents. 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.
- Energy can be moved from place to place by moving objects or through sound, light, or electric currents. 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.
- 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. The expression “produce energy” typically refers to the conversion of stored energy into a desired form for practical use.

### Standard

- Use evidence to construct an explanation relating the speed of an object to the energy of that object.
- Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.
- Ask questions and predict outcomes about the changes in energy that occur when objects collide.
- Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.

### Science and Engineering Practices

<table>
<thead>
<tr>
<th>Constructing Explanations and Designing Solutions</th>
<th>Planning and Carrying Out Investigations</th>
<th>Asking Questions and Defining Problems</th>
<th>Constructing Explanations and Designing Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>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. ▶ Use evidence (e.g., measurements, observations, patterns) to construct an explanation.</td>
<td>Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to specifying qualitative relationships. ▶ Make observations to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution.</td>
<td>Asking questions and defining problems in grades 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships. ▶ Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships.</td>
<td>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. ▶ Apply scientific ideas to solve design problems.</td>
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Vocabulary

- wave
- wavelength
- amplitude
- sound
- Morse code
- patterns of motion
- surfact

Crosscutting Concepts

<table>
<thead>
<tr>
<th>4-PS4-1</th>
<th>4-PS4-2</th>
<th>4-PS4-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patterns</td>
<td>Cause and Effect</td>
<td>Patterns</td>
</tr>
<tr>
<td>Similarities and differences in patterns can be used to sort and classify natural phenomena.</td>
<td>Cause and effect relationships are routinely identified.</td>
<td>Similarities and differences in patterns can be used to sort and classify designed products.</td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>Grade 4</th>
<th>Science</th>
<th>Third Quarter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waves and Their Applications in Technologies for Information Transfer 4-PS4-1</td>
<td>Waves and Their Applications in Technologies for Information Transfer 4-PS4-3</td>
<td>Notes</td>
</tr>
<tr>
<td><strong>I CAN STATEMENT</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>☐ I CAN explain amplitude and wavelength as they relate to waves.</td>
<td>☐ I CAN generate and compare at least two different ways that use patterns to send information.</td>
<td></td>
</tr>
<tr>
<td>☐ I CAN develop a model to describe patterns in terms of amplitude and wavelength.</td>
<td>☐ I CAN determine which pattern or code is the best way to send information.</td>
<td></td>
</tr>
<tr>
<td>☐ I CAN explain what waves are and some things waves can do.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Core Idea</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Wave Properties</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waves, which are regular patterns of motion, can be made in water by disturbing the surface. When waves move across the surface of deep water, the water goes up and down in place; there is no net motion in the direction of the wave except when the water meets a beach. Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks).</td>
<td>Information Technologies and Instrumentation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td><strong>Standard</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.</td>
<td>Generate and compare multiple solutions that use patterns to transfer information.</td>
<td></td>
</tr>
<tr>
<td><strong>Clarity Statement:</strong> 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.</td>
<td><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></td>
</tr>
<tr>
<td><strong>Science and Engineering Practices</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Developing and Using Models</td>
<td>Constructing Explanations and Designing Solutions</td>
<td></td>
</tr>
<tr>
<td>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. ▶ Develop a model using an analogy, example, or abstract representation to describe a scientific principle.</td>
<td>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. ▶ Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution.</td>
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<th>Science</th>
<th>Fourth Quarter</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I CAN STATEMENT</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>☐ I CAN develop a model to show how the eye allows objects to be seen.</td>
<td>☐ I CAN identify and describe some external and internal structures of plants that help them to survive, grow and reproduce.</td>
<td>☐ I CAN use a model to explain how animals receive information through their senses, process the information in their brains and respond to the information in different ways.</td>
</tr>
<tr>
<td><strong>Core Idea</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electromagnetic Radiation</td>
<td>Structure and Function</td>
<td>Information Processing</td>
</tr>
<tr>
<td>An object can be seen when light reflected from its surface enters the eyes.</td>
<td>Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.</td>
<td>Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal’s brain. Animals are able to use their perceptions and memories to guide their actions.</td>
</tr>
<tr>
<td><strong>Standard</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.</td>
<td>Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Clarification Statement: Emphasis is on systems of information transfer.</td>
</tr>
<tr>
<td><strong>Science and Engineering Practices</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Developing and Using Models</td>
<td>Engaging in Argument from Evidence</td>
<td>Developing and Using Models</td>
</tr>
<tr>
<td>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. ▶ Develop a model to describe phenomena.</td>
<td>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). ▶ Construct an argument with evidence, data, and/or a model.</td>
<td>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. ▶ Use a model to test interactions concerning the functioning of a natural system.</td>
</tr>
</tbody>
</table>