

Grade 3 Science, Quarter 2, Unit 2.1
Changes to Earth's Surface

Overview

Number of instructional days: 9 (1 day = 45 minutes)

Content to be learned

- Conduct investigations and use observational data to describe how water moves rocks and soils.
- Use models to simulate the effects of wind and water in shaping and reshaping the land (e.g., erosion, sedimentation, deposition, and glaciation).
- Identify sudden and gradual changes that affect the earth.
- Determine and support explanations of the uses of soils.

Essential questions

- How do wind and water affect land?
- How are gradual changes to the earth's surface different from sudden changes?

Processes to be used

- Use models to understand the natural world.
 - Use tools to collect data and make observations.
 - Identify and describe changes that occur in systems over time.
 - Demonstrate safe practices during classroom and field investigations.
 - Use scientific processes to conduct investigations, make observations, organize and compare data, communicate findings, cite evidence, and build explanations.
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- How would you determine what type of earth material to use for a particular situation or purpose?

Written Curriculum

Grade Span Expectations

ESS1 - The earth and earth materials as we know them today have developed over long periods of time, through continual change processes.

ESS1 (K-4) INQ –2

Use results from an experiment to draw conclusions about how water interacts with earth materials (e.g., percolation, erosion, frost heaves).

ESS1 (3-4)–2 Students demonstrate an understanding of processes and change over time within earth systems by ...

2a conducting investigations and using observational data to describe how water moves rocks and soils.

ESS1 (K-4) INQ+SAE –4

Explain how wind, water, or ice shape and reshape the earth.

ESS1 (3-4) –4 Students demonstrate an understanding of processes and change over time within earth systems by ...

4b using ~~or building~~ models to simulate the effects of how wind and water shape and reshape the land (e.g., erosion, sedimentation, deposition, glaciation).

4c identifying sudden and gradual changes that affect the Earth (e.g. sudden change = flood; gradual change = erosion caused by oceans).

ESS1 (K-4) FAF -6

Given information about earth materials explain how their characteristics lend themselves to specific uses

ESS1 (3-4)-6 Students demonstrate an understanding of properties of earth materials by...

6a determining and supporting explanations of their uses (e.g., best soils to grow plants, ~~best building material for a specific purpose, determining which rock size will best prevent erosion).~~

Clarifying the Standards

Prior Learning

Students in K–2 observed, described, and sorted rocks and soil, using physical properties. They recorded their observations and data about physical properties of rocks and soils, and were required to state why objects were grouped together. Students also conducted tests to see how soils retain water (e.g., how fast water drains through).

Current Learning

At a developmental level of instruction, students in grade 3 conduct investigations and use observational data to describe how water moves rocks and soil. Because the processes that cause these changes are

difficult to observe in the natural world, students should use models to simulate how wind and water shape and reshape the land. These experiences will help students begin to identify sudden and gradual changes that affect the earth. Students describe characteristics of earth materials and how these characteristics determine the purposes for which earth materials can be used. Additionally, they cite evidence to support their explanations for the best uses of earth materials (e.g., best soils to grow plants).

Future Learning

Fourth-graders will look at local landforms and determine how wind, water, and ice shape and reshape the land. They will build models to simulate how wind and water shape and reshape the land, and describe the best materials for specific purposes (e.g., which rock size will best prevent erosion).

Additional Research Findings

According to *Benchmarks for Science Literacy*, students in grades 3–5 should accumulate information about the physical environment, becoming familiar with the details of geological features such as hills, valleys, rivers, etc., without elaborate classification. Students should have experiences using magnifiers to inspect a variety of rocks and soils, not to classify rigorously, but to notice the variety of components that make up rocks. Students should also observe elementary processes of change—weathering, erosion, and deposition. Models offer students first-hand experiences with these processes and their effects. Students should build devices for demonstrating how wind and water shape the land and how forces on materials can make wrinkles, folds, and faults. These types of experiences will help students understand that wind, water, and ice shape and reshape the land by eroding rock and soils in some areas while depositing them in other areas, that soil is made partly from weathered rock and partly from plant remains, and that soil contains living organisms (p. 72).

Some common misconceptions for students include their understanding of soil. Students consider soil to be just dirt or any stuff on the ground. Students are aware that organisms are found in soil, but seem to be largely unaware of the role of living organisms in soil. Students often distinguish dirt from soil by saying that “soil has more goodness in it.” Children may also think that soil comes from a volcano or that soil is only composed of rocks. Additionally, it is difficult for children to understand the idea that water expands upon freezing, which would make it difficult for students to account for the breaking of rocks when water freezes within them (*Making Sense of Secondary Science*, p. 114).

Notes About Resources and Materials

Houghton Mifflin Science: Discovery Works, Unit D, grade 3

Land as a Natural Resource, p. 179

Wearing Down and Building Up, pp. D50–D53

Soak It Up Activity, pp. D54–D55

Science Notebook, pp. 184–185

A Force of Nature Activity, p. D49

Science Notebook, p. 182

- Stwertka, E., Stwertka, A. (1991). *Drip Drop: Water's Journey*. Publisher: Julian Messner.

Grade 3 Science, Quarter 2, Unit 2.2

Matter

Overview

Number of instructional days: 7 (1 day = 45 minutes)

Content to be learned

- Identify, compare, and sort objects using physical properties such as size, shape, color, texture, smell, weight, temperature, and flexibility.
- Cite evidence to support conclusions about why objects are or are not grouped together.
- Describe properties of solids, liquids, and gases.
- Identify and compare solids, liquids, and gases.
- Observe and describe physical changes in matter, such as freezing, thawing, tearing, cutting, etc.
- Use balances to demonstrate that the weight of an object stays the same despite a change in its shape.

Essential questions

- What similarities and differences can be observed between liquids and solids?
- How are gases different from solids and liquids?

Processes to be used

- Use physical properties to identify, describe, compare, and sort objects.
- Use scientific tools to observe physical properties.
- Observe and describe physical changes.
- Demonstrate safe practices during classroom investigations.
- Use scientific processes to conduct investigations, make and record observations, organize and analyze data, communicate findings, cite evidence, and draw conclusions.

- What happens to the physical properties of an object when the object undergoes a physical change?

Written Curriculum

Grade Span Expectations

PS1 - All living and nonliving things are composed of matter having characteristic properties that distinguish one substance from another (independent of size or amount of substance).

PS1 (K-4) INQ –1

Collect and organize data about physical properties in order to classify objects or draw conclusions about objects and their characteristic properties (e.g., temperature, color, size, shape, weight, texture, flexibility).

PS1 (3-4)–1 Students demonstrate an understanding of characteristic properties of matter by ...

1a identifying, comparing, and sorting objects by similar or different physical properties (e.g., size, shape, color, texture, smell, weight, temperature, flexibility).

1b citing evidence (e.g., prior knowledge, data) to support conclusions about why objects are grouped/not grouped together.

PS1 (K-4) POC –2

Make a prediction about what might happen to the state of common materials when heated or cooled or categorize materials as solid, liquid, or gas.

PS1 (3-4) –2 Students demonstrate an understanding of states of matter by ...

2a describing properties of solids, liquids, and gases.

2b identifying and comparing solids, liquids, and gases.

PS1 (K-4) INQ –1

Collect and organize data about physical properties in order to classify objects or draw conclusions about objects and their characteristic properties (e.g., temperature, color, size, shape, weight, texture, flexibility).

PS1 (3-4)–1 Students demonstrate an understanding of characteristic properties of matter by ...

1c observing and describing physical changes (e.g. freezing, thawing, torn piece of paper).

PS1 (K-4) SAE –3

Use measures of weight (data) to demonstrate that the whole equals the sum of its parts.

PS1 (3-4)–3 Students demonstrate an understanding of conservation of matter by ...

3c showing that the weight of an object remains the same despite a change in its shape.

Clarifying the Standards

Prior Learning

Students in grades K–2 identified, compared, and sorted objects by similar or different physical properties (e.g., size, shape, color, texture, smell, weight), and they recorded observations and data about physical properties. Students used physical properties to state why objects are grouped together (e.g., things that roll, things that are rough), and they described, identified, and compared physical properties of solids and liquids. Students also used simple tools (e.g., balance scale, seesaw) to explore the property of weight.

Current Learning

Students in grade 3 observe, identify, describe, sort, and compare solids and liquids. They identify, describe, and compare solids and liquids using physical properties. These concepts were addressed in previous grade levels, and are taught at a reinforcement level of instruction.

At a developmental level of instruction, students are taught to compare and sort based on the physical properties of temperature and flexibility. They learn to cite evidence to support conclusions about why objects are or are not grouped together. Students also describe, identify, and compare gases (as well as solids and liquids). They observe and describe a variety of physical changes to matter (e.g., freezing, tearing, folding, bending, cutting), and demonstrate their understanding of the conservation of mass (i.e., the weight of an object stays the same despite a change in its shape).

Future Learning

Students will continue to describe properties of solids, liquids, and gases. They will observe and describe physical changes and make logical predictions about the changes in the state of matter when adding or taking away heat. Students will measure the weight of objects to prove that all matter has weight and will use measures of weight to prove that the whole equals the sum of the parts (conservation of mass).

Additional Research Findings

According to *Making Sense of Secondary Science*, children tend to decide a material's state based on appearance and behavior. Younger children tend to regard any rigid material as a solid, any powder as a liquid, and any non-rigid material as an intermediate between a solid and a liquid. Liquids are usually defined as anything that can be poured; therefore, powders, sand, and salt tend to confuse students. Non-rigid materials confuse students because they are soft, can crumble, or can be torn. Gases also pose a problem for children—often students at this age believe gases are similar to thoughts. In addition, if young children cannot feel the weight of something, they might believe it has no weight at all (pp. 79–80).

When learning about sand, salt, sugar, and other powders as solids, students need multiple experiences using magnifiers so they can see that these materials are actually collections of tiny solids. They should observe and describe the behavior of large collections of solids and consider that the collections may have new properties that the pieces do not. For example, students should observe that tiny solids *pile* when you pour them, while poured liquids result in a flat surface. In addition to observing, students also need many experiences weighing objects. Students should weigh piles of small objects (marbles, sugar cubes, wooden blocks) and divide to find the weight of each object. The concept that the whole weighs the same as the sum of its parts isn't obvious to children. This is a foundational concept for developing conservation of matter (*Benchmarks for Science Literacy*, p. 76).

Children should learn to write clear descriptions of what they observe. They should be encouraged to describe what they did and how materials responded to physical changes (cutting, bending, tearing, folding, wetting) (*Benchmarks*, p. 76). In addition, students need to determine whether physical properties change or remain the same when an object undergoes a physical change (i.e., when the shape of a ball of clay is changed, the color and mass of the clay remains the same).

Notes About Resources and Materials

Website

- Science A–Z
www.sciencea-z.com

Grade 3 Science, Quarter 2, Unit 2.3

Forms of Energy

Overview

Number of instructional days: 9 (1 day = 45 minutes)

Content to be learned

- Show that heat moves from one object to another, causing temperature change.
- Describe how heat moves from warm objects to cold objects until both are the same temperature.
- Use experimental data to classify materials as conductors or insulators.
- Investigate the observable effects of light using a variety of light sources (i.e., light travels in a straight line until it interacts with an object; blocked light rays produce shadows).
- Predict, describe, and investigate how light rays are reflected, refracted, or absorbed.
- Conduct experiments in order to identify and classify different pitches and volumes of sounds produced by different objects.
- Use data to explain what causes sound to have different pitches or volumes.

Essential questions

- What is the difference between a conductor and an insulator?
- How do you explain what happens to the temperature of a bowl of soup that is left out on a counter for several hours?

Processes to be used

- Use scientific tools to observe and measure.
- Make predictions based on investigations.
- Use data to classify materials.
- Observe, describe, and explain how objects and energy interact within systems.
- Demonstrate safe practices during classroom investigations.
- Use scientific processes to conduct investigations, make and record observations, organize and analyze data, communicate findings, cite evidence, and draw conclusions.

Written Curriculum

Grade Span Expectations

PS 2 - Energy is necessary for change to occur in matter. Energy can be stored, transferred, and transformed, but cannot be destroyed.

PS2 (K-4) SAE+INQ – 6

Experiment, observe, or predict how heat might move from one object to another.

PS2 (3-4)–6 Students demonstrate an understanding of energy by...

6a describing how heat moves from warm objects to cold objects until both objects are the same temperature.

6b showing that heat moves from one object to another causing temperature change (e.g., when land heats up it warms the air).

PS2 (K-4) SAE -4

Given a specific example or illustration (e.g., simple closed circuit, rubbing hands together), predict the observable effects of energy (i.e., light bulb lights, a bell rings, hands warm up (e.g., a test item might ask, “what will happen when...?”)).

PS2 (3-4)-4 Students demonstrate an understanding of energy by...

4e using experimental data to classify a variety of materials as conductors or insulators

PS2 (K-4) SAE – 5

Use observations of light in relation to other objects/substances to describe the properties of light (can be reflected, refracted, or absorbed).

PS2 (3-4)-5 Students demonstrate an understanding of energy by...

5a investigating observable effects of light using a variety of light sources (e.g., light travels in a straight line until it interacts with an object, blocked light rays produce shadows).

5b predicting, describing, and investigating how light rays are reflected, refracted, or absorbed.

PS2 (K-4) SAE -4

Given a specific example or illustration (e.g., simple closed circuit, rubbing hands together), predict the observable effects of energy (i.e., light bulb lights, a bell rings, hands warm up (e.g., a test item might ask, “what will happen when...?”)).

PS2 (3-4)-4 Students demonstrate an understanding of energy by...

4a experimenting to identify and classify different pitches and volumes of sounds produced by different objects.

4b using data to explain what causes sound to have different pitch or volume

Clarifying the Standards

Prior Learning

Students in grades K–2 described the observable effects of light using a variety of light sources. They experimented and described how vibrating objects make sound. They identified the sun as a source of heat energy, and described how the sun warms land and water. Students demonstrated how the sun interacts with objects to create shadows on sunny days, and they described how objects change in temperature by adding or subtracting heat.

Current Learning

Students in grade 3 conduct experiments in order to identify and classify sounds of different pitch and volume produced by a variety of objects. In addition, they collect and use data to explain what causes sound to have different pitch or volume. Students describe how heat moves from one object to another until the temperature of both objects is the same. *Conductor* and *insulator* are new terms for students in grade 3 as they learn to classify a variety of materials into these two categories. Students describe the properties of light (that it can be reflected, refracted, and absorbed) after observing how light interacts with various objects and substances. Students are asked to predict, describe, and investigate how light rays will be reflected, refracted, and absorbed. All concepts are taught at the developmental level of instruction.

Future Learning

Students will continue to classify materials as conductors or insulators and describe how heat moves from warm objects to cold objects until they are the same temperature. Students will continue to predict, describe, and investigate how light rays are reflected, refracted, and absorbed, and observe the effects of light using a variety of light sources. Students will also learn that heat can be produced in many ways (electricity, friction, and burning). The students will draw, diagram, and build a complete electrical circuit. Real-world applications of heat (conduction and convection) will be diagrammed and described, and students will learn how sound moves through solids, liquids, and gases.

Additional Research Findings

Energy is a mysterious concept, even though its various forms can be precisely defined and measured. At its simplest level, children can think of energy as something needed to make things go, run, or happen. Energy is a major exception to the principle that students should understand ideas before being given labels for them. Children benefit from talking about energy before they are able to define it. Although learning about energy does not make it much less mysterious, it is worth trying to understand because a wide variety of scientific explanations are difficult to follow without some knowledge of the concept of energy (*Benchmarks for Science Literacy*, p. 81). Therefore, investing a lot of time and effort in developing formal energy concepts can wait. The importance of energy lies in the fact that it helps us make sense of a large number of things that occur in the natural world (*Benchmarks*, p. 83).

Children often believe that light is white and that our eyes see the color of an object rather than the color of the reflected light (*Making Sense of Secondary Science*, pp. 131–132). The fact that the path light takes is not itself directly visible presents special difficulties for children. Many students conceive light as a source (an electric bulb, the sun), an effect (patch of light), or a state (such as brightness). Children do not recognize light as a physical entity that exists in the space between a light source and its produced effect (*Making Sense*, p. 128).

Heat is one of the most confusing scientific concepts for many students. They tend to think of heat as a substance that flows from place to place, similar to air. Students do not necessarily think of *hot* and *cold* as part of the same continuum. Rather, they perceive these as two different phenomena, with *cold* often thought to be the opposite of heat. Distinguishing between heat and temperature is also one of the most difficult tasks for children. They tend to view temperature as the mixture of heat and cold inside an object or simply as a measure of the amount of heat possessed by that object, with no distinction between the intensity of heat and the amount of heat possessed. Misconceptions regarding heat include that cold—rather than heat—is transferred, and that objects that keep us warm (mittens and sweaters) are sources of heat (*Making Sense*, p. 138).

In regards to sound energy, children often believe that sound is produced because the object or instrument is made of plastic or rubber or because it is thick, thin, taut, or hard. Young children very often link the production of sounds with their own actions. They may also think sound is a part of an object or instrument and that it is released by human action. Students are also confused by the speed and size of sound vibration—this confusion makes it difficult to discuss pitch and volume. Additionally, some children think that sound spreads out, while others believe that sound only goes to the intended listener. Some students also believe that sound needs an unobstructed pathway to be heard (*Making Sense*, pp.133–137).

Notes About Resources and Materials

Heat Energy

Houghton Mifflin Science: Discovery Works

- What is Heat and How Can It Move?
Activity: Bottle Thermometer, pp. C40–C41
- Conductors and Insulators
Activity: Heat Takes a Trip, p. C43
Why did the metal spoon feel warmer than the plastic spoon?
Why would metal be a good material to use if you wanted heat to move fast?
- Keeping Warm, pp. C50–52
Find examples in the classroom or house of good conductors and insulators. For example, two doors, double paned windows, insulation (pink fiber glass).

Light Energy:

- Energy You Can See, pp. C34–C35

Trade Books

- Anderson, K. *All About Sound*. Glenview, IL: Pearson Education.
- *Light and Color*. Glenview, IL: Pearson Education.