

Grade 2 Science, Quarter 3, Unit 3.1
Earth Materials

Overview

Number of instructional days: 10 (1 day = 40 minutes)

Content to be learned

- Describe, compare, and sort rocks and soils by similar or different physical properties (e.g., size, shape, color, texture, smell, weight).
- Record observations and data about physical properties of earth materials (rocks and soil).
- Use attributes of properties to state why objects are grouped together (e.g., rocks can be shiny or dull).
- Conduct tests on how different soils retain water.
- Identify which materials (rocks and soils) are best for different uses (e.g., soils for growing plants, sand for the sandbox).

Science processes to be integrated

- Conduct investigations to make observations, record data, make predictions, and draw conclusions in order to identify and describe physical properties.
- Collect, record, and summarize data.
- Identify, compare, and sort objects using physical properties.
- Demonstrate safe practices during classroom and field investigations.

Essential questions

- In what ways can earth materials (rocks and soil) be sorted and classified?
- How can you determine which earth material is best for certain uses?
- What are some similarities and differences among earth materials?

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-1

Given certain earth materials (soils, rocks or minerals) use physical properties to sort, classify, and describe them.

ESS1 (K-2)–1 Students demonstrate an understanding of earth materials by ...

1a describing, comparing, and sorting rocks and soils by similar or different physical properties (e.g., size, shape, color, texture, smell, weight).

1b recording observations/data about physical properties.

1c using attributes of properties to state why objects are grouped together (e.g., rocks that are shiny or not shiny).

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

2a conducting tests on how different soils retain water (e.g., how fast does the water drain through?).

ESS1 (K-4) FAF -6

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

ESS1 (K-2) –6 Students demonstrate an understanding of properties of earth materials by...

6a identifying which materials are best for different uses (e.g., soils for growing plants, sand for the sand box).

Clarifying the Standards

Prior Learning

In kindergarten, students described, compared, and sorted rocks by different or similar physical properties (e.g., size, shape, color, texture, smell, weight), and they used attributes of properties to state why earth materials are grouped together (e.g., rocks that are shiny or not shiny).

In grade 1, students described and compared soils by different or similar physical properties (e.g., size, shape, color, texture, smell, weight). Students recorded observations and data about physical properties of

soils, and they identified which soils were best for different uses (e.g., soils for growing plants, sand for the sandbox).

Current Learning

At the reinforcement level of instruction, second graders describe, sort, and compare rocks and soils by similar or different physical properties, including size, shape, color, texture, smell, and weight. Students record observations and data about physical properties identified, and they use attributes of properties to state why objects are grouped together. In addition, students identify which materials are best for different uses (e.g., soils for growing plants, sand for the sandbox).

At the developmental level of instruction, second graders conduct tests on how different soils retain water. They investigate the question, “How fast does water drain through different soils?” Since this is a new concept for students, they need time and instruction on how to set up and conduct investigations, make observations, and record and summarize data in order to describe how water interacts with different soils. Students should be challenged to think about and discuss the physical properties of different types of rocks and soils in order to identify earth materials that are better suited than others for various uses. For example, gravel is used in areas that need to drain water, but soil is better to grow plants because it retains the water.

During this unit of study, students can

- observe and compare three to five different kinds of rocks and create a table in their science notebooks to record the physical properties observed.
- sort and classify a wide variety of rocks and explain why the rocks were grouped in a certain way.
- to determine the effect on rocks, rub a variety of rocks on both black and white paper. Students observe and record what they notice (e.g., color of the rubbing, the ease with which a rubbing can be made, the effect on the rock when rubbed on paper).
- using different types of rocks, rub two rocks together or shake two rocks in a plastic container. Students record what they observe happening when rocks are rubbed or shaken together. If possible, they should have the opportunity to investigate the effect on a wide variety of rocks.
- compare different types of soil and record the properties of each in their science notebooks. For example, students should note color, texture, and smell of each sample; they should have the opportunity to add water to each sample to see what happens to the color and texture; and they should use tools such as sieves to separate each sample into its component parts in order to see what kinds of things are found in the soil samples.
- conduct investigations that separate the components of various soils, including silt, clay, sand, gravel, pebbles, and organic materials. Students can place a sample of soil into a plastic water bottle, add water, and then shake the sample. After the sample has had plenty of time to settle, students notice that the materials have settled into layers, with the large-grained materials (pebbles and gravel) settling at the bottom, while the small-grained materials settle in the upper layers. In addition, organic materials such as leaves and twigs float on top of the water.

Future Learning

In grades 3 and 4, students will identify water, soil, rocks, and air as the four basic materials of Earth. Students will continue to describe, compare, and sort rocks and soils by physical properties; however, they will also describe, compare, and sort minerals. Students will use size, shape, color, texture, smell,

weight, temperature, hardness, and composition to describe earth materials. They will record and analyze observations and data about physical properties (e.g., within a grouping) and will cite evidence (e.g., prior knowledge, data) to support why rocks, soils, or minerals are classified/not classified together. Students will also demonstrate an understanding of properties of earth materials by 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 best prevents erosion).

Additional Findings

Children come to school aware that Earth's surface is composed of rocks, soils, water, and living organisms, but a closer look helps them identify many additional properties of earth materials. By carefully observing and describing the physical properties of many rocks, children begin to see that some rocks are made of one substance, but most are made of several substances. In later grades, the substances can be identified as minerals. Understanding rocks and minerals should not be extended to the study of the source of the rocks (e.g., sedimentary, igneous, metamorphic) because the origin of rocks and minerals has little meaning to young children. (*National Science Education Standards*, p. 130)

Playgrounds and nearby lots are convenient study sites to observe a variety of earth materials. As students collect rocks, they see that soil varies from place to place in its color, texture, and reaction to water. If students continue to revisit these sites, they develop an understanding that Earth's surface is constantly changing. Some environmental changes occur slowly, and others occur more rapidly. In addition, students should understand that earth materials are solid rocks and soils, water, and the gases of the atmosphere. The varied materials have different physical properties, which make them useful in different ways. Soils have properties of color and texture, capacity to retain water, and the ability to support the growth of many kinds of plants, including those in the food supply. Earth materials provide many of the resources that humans use. (*National Science Education Standards*, pp. 130 and 134)

Students should become familiar with all aspects of their immediate surroundings, including how things change and what seems to cause these changes. Children may hold the view that the world was always as it is now; however, they should learn that change is something that happens to many things. These changes can be so slow or so fast that they are hard to see. (*Benchmarks for Science Literacy*, p. 336)

Teaching geological facts about how the surface of Earth changes serves little purpose in the primary grades. Students should instead become familiar with all aspects of their immediate surroundings, including what things change and what seems to cause change. By the end of second grade, students understand that rocks come in many sizes and shapes, from boulders to grains of sand. (*Benchmarks for Science Literacy*, p. 72)

Children often get confused when deciding whether a rock sample is natural. They consider it to be natural if it is untouched by man. Students also believe that soil is just dirt or any stuff in the ground. They think soil is just used for plant growth or that it is different from dirt by stating that soil has more "goodness" in it. Students are aware that there are living organisms in the soil, but they think the organisms are eating the soil and not living in it. (*Making Sense of Secondary Science*, pp. 112 and 114) In addition, the tasks of classifying objects by what they are made of and comparing properties of materials can be challenging for early elementary school children. They may have limited knowledge or hold misconceptions about the origins and transformations of materials. Understanding should begin with differentiating between objects and the materials that make them up and between properties of objects and properties of materials. (*Atlas of Science Literacy, Vol. 2*, p. 54)

Notes About Resources and Materials

Materials

- Various types of rocks
- Various types of soil (soil, sand, clay, peat moss, etc.)

Trade Books

- Flanagan, A. (2001). *Soil*. Mankato, MN: Compass Point Books.
- Gans, R. (1997). *Let's Go Rock Collecting*. New York, NY: HarperCollins.
- Hiscock, B. (1999). *The Big Rock*. Fullerton, CA: Aladdin.
- Knapp, B. (2002). *Rocks and Soils*. United Kingdom: Atlantic Europe Publishing Co.
- Richardson, A. (2003). *Soil*. Mankato, MN: Capstone.
- Rosinsky, N. (2002). *Dirt: The Scoop on Soil*. Mankato, MN: Picture Window Books.

Websites

- Foss Web—K-2—Pebbles, Sand, and Silt
www.fossweb.com/ca/modulesK-2/PebblesSandandSilt/index.html
- Discovery Education
<http://streaming.discoveryeducation.com/index.cfm>
- www.eduplace.com/kids/hmsc/activities/simulations/grk/unitc.html
- <http://classroom.jc-schools.net/sci-units/resources.htm>

Videos

- The Magic School Bus Shows and Tells
- The Magic School Bus Rocks and Rolls
- The Magic School Bus Meets the Rot Squad

Grade 2 Science, Quarters 3 and 4, Unit 3.2

Animals

Overview

Number of instructional days: 20 (10 in Quarter 3, 10 in Quarter 4) (1 day = 40 minutes)

Content to be learned

- Identify and sort animals based on similar or different external features.
- Observe and record external features of animals.
- Identify the specific functions of the physical structures of an animal.
- Observe that animals need water, air, food and shelter to grow.
- Care for animals by identifying and providing for their needs.
- Observe the stages in the life cycle of familiar animals.
- Scientifically draw (e.g., record shapes, prominent features, relative proportions; organize and differentiate significant parts observed) and label the stages of the life cycle of familiar animals.
- Given a set of pictures, sequence the life cycle of a familiar animal.

Science processes to be integrated

- Observe, identify, record, and sort organisms using external characteristics.
- Observe and describe specific functions of physical structures of organisms.
- Observe, identify, and record patterns of change.
- Scientifically draw and label change that occurs in organisms.
- Demonstrate safe practices during classroom and field investigations.
- Use scientific processes, including observing, comparing, sorting, drawing and labeling, conducting investigations, and drawing conclusions.

Essential questions

- What are some similarities and differences among animals?
- How do animals meet their needs in their environment?
- How do animals grow and change over time?
- How do the external features of an animal help it survive?

Written Curriculum

Grade-Span Expectations

LS1 - All living organisms have identifiable structures and characteristics that allow for survival (organisms, populations, and species).

LS1 (K-4) - INQ+POC –1

Sort/classify different living things using similar and different characteristics. Describe why organisms belong to each group or cite evidence about how they are alike or not alike.

LS1 (K-2) –1 Students demonstrate an understanding of classification of organisms by ...

1b identifying and sorting based on a similar or different external features.

1c observing and recording the external features that make up living things (~~e.g. roots, stems, leaves, flowers~~, legs, antennae, tail, shell).

LS1 (K-4) SAE -2

Identify the basic needs of plants and animals in order to stay alive. (i.e., water, air, food, space).

LS1 (K-2)-2 Students demonstrate understanding of structure and function-survival requirements by...

2a ~~observing that plants need water, air, food, and light to grow;~~ observing that animals need water, air, food and shelter to grow.

LS2 - Matter cycles and energy flows through an ecosystem.

LS2 (K-4) SAE –5

Recognize that energy is needed for all organisms to stay alive and grow or identify where a plant or animal gets its energy.

LS2 (K-2)–5 Students demonstrate an understanding of energy flow in an ecosystem by ...

5a ~~caring for plants and/or animals by identifying and providing for their needs; experimenting with a plant's growth under different conditions, including light and no light.~~

LS1 - All living organisms have identifiable structures and characteristics that allow for survival (organisms, populations, and species).

LS1 (K-4) POC –3

Predict, sequence or compare the life stages of organisms – plants and animals (e.g., put images of life stages of an organism in order, predict the next stage in sequence, compare two organisms).

LS1 (K-2)–3 Students demonstrate an understanding of reproduction by ...

3a observing and scientifically drawing (e.g. recording shapes, prominent features, relative proportions, organizes and differentiates significant parts observed) and labeling the stages in the life cycle of a familiar ~~plant and~~ animal.

3b sequencing the life cycle of a ~~plant or~~ animal when given a set of pictures.

LS1 (K-4) FAF –4

Identify and explain how the physical structures of an organism (plants or animals) allow it to survive in its habitat/environment (e.g., roots for water; nose to smell fire).

LS1 (K-2)–4 Students demonstrate understanding of structure and function-survival requirements by...

4a identifying the specific functions of the physical structures of a ~~plant or~~ an animal (e.g. ~~roots for water;~~ webbed feet for swimming).

Clarifying the Standards

Prior Learning

In kindergarten, students learned to distinguish between living and nonliving things. Students observed that animals need water, air, food, and shelter to grow, and they cared for animals by identifying and providing for their needs. Students also observed and labeled the stages in the life cycle of a familiar animal, and they sequenced the life cycle of an animal when given a set of pictures.

In grade 1 life science, students distinguished between living and nonliving things, and then their learning focused on plants. Students identified and sorted plants based on similar or different external features, and they observed and recorded the external features that make up plants. They also identified the specific functions of the physical structures of a plant. Students observed that plants need water, air, food, and light to grow, and they cared for plants by identifying and providing for their needs. They experimented with a plant's growth under different conditions, including light and no light. Students observed and scientifically drew and labeled the stages in the life cycle of a familiar plant, and they sequenced the life cycle of a plant when given a set of pictures.

Current Learning

In grade 2 life science, student learning focuses on animals. At the reinforcement level of instruction, second graders observe that animals need water, air, food and shelter to grow, and they care for animals by identifying and providing for their needs. They observe and scientifically draw and label the stages in the life cycle of a familiar animal. It is important that these drawings are scientifically accurate and that they take into account such things as prominent features and relative proportions. In addition, students sequence the life cycle of a familiar animal when given a set of pictures.

At the developmental level of instruction, second graders identify and sort animals based on similar or different external features, and they observe and record the external features that make up living things (e.g., legs, antennae, tail, shell,). Second graders also demonstrate an understanding of structure and function-survival requirements by identifying the specific functions of the physical structures of animals (e.g., webbed feet are a structure that is helpful for swimming).

During this unit of study, students can

- observe and record data, using both pictures and words, about the stages in the life cycle of mealworms, butterflies, and/or various other insects.
- observe and record data, using both pictures and words, about the stages in the life cycle of frogs.

- use pictures of insects and other animals to compare their physical structures. Students can sort pictures based on similarities among physical structures.
- read grade-level-appropriate literature to enhance students' knowledge of living organisms and their use of external structures to meet their needs.

Future Learning

In grade 3 life science, student learning will focus on the external structures and the survival of animals. Students will observe that animals need water, air, food, and shelter/space to grow and reproduce. Students will identify, sort, and compare animals based on similar and/or different external features, and they will record and analyze observations/data about external features (e.g., within a grouping, which characteristics are the same and which are different). Students will cite evidence to draw conclusions as to why animals are grouped/not grouped together (e.g., mammal, bird, fish). They will observe changes and record data to scientifically draw and label the stages in the life cycle of a familiar animal. In addition, when given a set of data/pictures, students will sequence the stages in the life cycle of a familiar animal, and they will also compare the life cycles of two animals when given a set of data/pictures. For the first time, reproduction and defense mechanisms are introduced as function-survival requirements. Third graders will identify and explain how the physical structure/characteristic of an organism allows it to survive and defend itself, and they will analyze the structures needed for survival of populations of plants and animals in a particular habitat or environment.

In grade 4 life science, student learning will focus on the flow of energy in ecosystems. Students will identify sources of energy for survival of organisms, and they will demonstrate in a food web that all animals' food begins with the sun. Students will use information about organisms to design a habitat and explain how the habitat provides for the needs of the organisms that live there, and they will explain the way that plants and animals in that habitat depend on each other. Students will explain what plants or animals might do if their environment changes (e.g., changing food supply or habitat due to fire, human impact, sudden weather-related changes) and how the balance of the ecosystem can be disturbed (e.g., How does overpopulation of a species affect the rest of the ecosystem?). In addition, students will compare and analyze external features and characteristics of humans and other animals.

Additional Findings

In grades K–2, student investigations often involve collecting live animals to bring into the classroom for observation. Although most children want pet-like animals (e.g., goldfish, rabbits) to be treated carefully, not all children treat living organisms with care. The use of animals in science is a complex issue, but long before students are ready to discuss it in any depth, they should have opportunities, in the context of science, to interact with living things in a way that promotes respect. By the end of grade 2, students should know that much can be learned about plants and animals by observing them closely, but care must be taken to know the needs of living things and how to provide for them in the classroom. (*Benchmarks for Science Literacy*, p. 15)

General similarities and differences among organisms are easily observed. Most children enter kindergarten interested in living things and are able to distinguish among the common ones. When first observing and comparing organisms, children can focus on any attribute—size, color, limbs, fins, or wings—but then should gradually be guided to realize that for purposes of understanding relatedness among organisms, some characteristics are more significant than others. The teacher's task is to move students toward a more-sophisticated understanding of the features of organisms that connect or differentiate them, including external features and behavior patterns. Understanding and appreciating the

diversity of life does not come from students' knowing bits of information or classification categories about many different species; rather, it comes from their ability to see in organisms the patterns of similarity and difference that permeate the living world. (*Benchmarks for Science Literacy*, p. 101)

All students, especially those who live in circumstances that limit their interaction with nature, must have multiple opportunities to make purposeful observations of a variety of animals in the classroom, neighborhood, parks, streams, and gardens; on the school grounds; and at home and the zoo. However, observing is not enough. Students should have reasons for their observations—reasons that prompt them to do something with the information they collect. The reason can be to answer students' own questions about how organisms live or care for their young. Some students may enjoy displaying, with drawings or photographs, all the living things they can find and where these things live. The point is to find answers by looking carefully, using hand lenses when needed, at plants and animals, and then checking their observations and answers with one another. By the end of second grade, students should know that some animals are alike in the way they look and what they do, while others are very different from one another. Students should also know that animals have features that help them live in different environments. (*Benchmarks for Science Literacy*, p. 102)

A young child's idea of "animal" may be very restricted. Piaget noted that in lower grades many children associate "life" with any objects that are active in any way. This view of life develops into one in which movement becomes the defining characteristic. Eventually, children incorporate other concepts such as eating, breathing, and reproducing to define life. Many students tend to think of animals as things that have four legs, are large in size, live on land, have fur, and make noise. They may, however, have the misconception that animals such as fish, frogs, boys and girls, snails, snakes, and whales are nonanimals. (*Making Sense of Secondary Science*, p. 22) In addition, in many stories for young children, animals are given human characteristics; however, by the end of second grade, students should know that stories give animals anthropomorphic attributes that they really do not possess. (*Benchmarks for Science Literacy*, p. 103).

During the elementary years, children build understanding of biological concepts through direct experience with living things, their life cycles, and their habitats. These experiences emerge from a sense of wonder and natural interests of children who ask questions such as, "How do plants get food? How many different animals are there? Why do some animals eat other animals?" An understanding of the characteristics of organisms, life cycles of organisms, and the complex interactions among all components of the natural environment begins with questions such as these and an understanding of how individual organisms maintain and continue life. Making sense of the way organisms live in their environments develops some understanding of the diversity of life and how all living organisms depend on the living and nonliving environment for survival. Because the children's world in grades K–4 is closely associated with home, school, and the immediate environment, the study of organisms should include observations and interactions within the natural world of the children. (*National Science Education Standards*, p. 127)

Young children think very concretely about individual organisms. The idea that organisms depend on their environment is not well developed in young children. In grades K–4, the focus should be on establishing the primary association of organisms with their environments and the secondary ideas of dependence on various aspects of the environment and of behaviors that help various animals survive. Students should also understand that organisms have basic needs and can survive only in environments in which their needs can be met. The world has many different environments, and distinct environments support the life of different types of organisms. All animals have structures that serve similar functions in growth, survival, and reproduction. It is important for students to understand that many animals closely resemble the parent; that many animals have life cycles that include being born, growth, reproduction, and death; and that the details of the life cycle vary among different animals. In addition, young children need

to be given opportunities to observe living organisms in their environments and as they progress through the stages of the life cycle. (*National Science Education Standards*, p. 127–129)