Kindergarten Science, Quarter 2, Unit 2.1

Properties of Objects

Overview

Number of instructional days: 10 (1 day = 20–30 minutes)

Content to be learned

- Identify, compare, and sort objects by similar or different physical properties.
- Use simple tools to explore the property of weight.
- Use attributes of properties to state why objects are grouped together.

Science processes to be integrated

- Identify, compare, and sort to classify objects using physical properties.
- Use simple tools to explore physical properties.

Essential questions

- In what ways can you compare and sort objects?
- Why are certain objects grouped together?
- How can tools help you learn about the world around us?

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 (K-2)–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).

1c using attributes of properties to state why objects are grouped together (e.g., things that roll, things that are rough).

PS1 (K-4) SAE –3

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

PS1 (K-2)–3 Students demonstrate an understanding of conservation of matter by…

3a using simple tools (e.g. balance scale, see-saw) to explore the property of weight.

Clarifying the Standards

Prior Learning

According to the Rhode Island Early Learning Standards (www.ride.ri.gov/els/science.asp), students who attended preschool had opportunities to collect, describe, and record information using their senses, scientific tools, discussions, drawings, and charts. Preschoolers also investigated changes in materials and cause-effect relationships (e.g., changes in temperature) based on everyday experiences.

Current Learning

Students in kindergarten demonstrate understanding of the properties of objects that distinguish one substance from another by observing, identifying, comparing, and sorting objects. They use scientific tools such as balances and their senses to gather data about the properties of objects. All concepts in this unit are new to students and should be taught at the developmental level of instruction.

When learning about properties of objects, students need multiple opportunities to make observations and identify, compare, and sort objects. Students should also understand that objects can be grouped together by one or more attributes. For example, objects can be sorted in groups such as things that roll or things that are either smooth or rough. Throughout this unit, students should participate in a variety of whole-group activities and should be actively engaged in observing, identifying, comparing, and sorting objects by similar or different physical properties.

Future Learning

In grade 1, students will continue to identify, compare, and sort objects by similar or different physical properties (e.g., size, shape, color, texture, smell, weight). They will record their observations/data and will use attributes of properties to state why objects are grouped together. Students will explain that objects change in temperature by adding or subtracting heat and will use simple tools such as a balance to explore the property of weight.

In grade 2, students will continue to use simple tools to explore the property of weight. They will demonstrate an understanding of states of matter by describing properties of solids and liquids and will identify and compare solids and liquids. Students will make logical predictions about the changes in the state of matter when adding or taking away heat (e.g., ice melting, water freezing) and will explain that objects change in temperature by adding or subtracting heat.

In grades 3 and 4, students will continue to identify, compare, and sort objects by similar or different physical properties (e.g., size, shape, color, texture, smell, weight), and they will learn to identify, compare, and sort objects using the properties of temperature and flexibility. Students will cite evidence to support conclusions on why objects are or are not grouped together and will observe and describe physical changes (e.g., freezing, thawing, torn pieces of paper). Students will describe properties of solids, liquids, and gases, and they will identify and compare solids, liquids, and gases. They will make logical predictions about the changes in the state of matter when adding or taking away heat (e.g., ice melting, water boiling or freezing, condensation/evaporation). Students will demonstrate an understanding of conservation of matter by measuring the weight of objects to prove that all matter has weight and will use measure of weight to prove that the whole equals the sum of its parts. In addition, students will show that the weight of an object remains the same despite a change in its shape.

Additional Findings

During their early years, children's natural curiosity leads them to explore the world by observing and manipulating common objects and materials in their environment. Children compare, describe, and sort as they begin to form explanations of the world. Developing a subject-matter knowledge base to explain and predict the world requires many experiences over a long period. Young children bring experiences, understanding, and ideas to school; teachers provide opportunities to continue children's explorations in focused settings with other children using simple tools such as magnifiers and measuring devices. (*National Science Education Standards*, p. 123)

In grades K–4, students should be given opportunities to increase their understanding of the characteristics of objects and materials they encounter daily. Through the observation, manipulation, and classification of common objects, children reflect on the similarities and differences of the objects. As a result, their initial sketches and single-word descriptions lead to increasingly more-detailed drawings and richer verbal descriptions. Describing, grouping, and sorting solid objects and materials are possible early in the K–4 grade range. (*National Science Education Standards*, p. 123)

Young children begin their study of matter by examining and qualitatively describing objects and their behavior. The important but abstract ideas of science all begin with observing and keeping track of the way the world behaves. When carefully observed, described, and measured, the properties of objects, changes in properties over time, and the changes that occur when materials interact provide the necessary precursors to the later introduction of more abstract ideas in the upper grades. (*National Science Education Standards*, p. 126)

Although the word *stuff* may not be accepted as a scientific word, it has tangible connotations for pupils. Therefore, it is useful for developing the idea that there are different kinds of stuff and they are recognized by their different properties. (*Making Sense of Secondary Science*, p. 74)

Researchers have found that, from an early age, children learn to "feel the weight" of objects as they notice how objects differ in the way they appear to "press down" on their hands, shoulders, or head. Children compare objects by their "felt weight" and over time generate an idea that felt weight is a characteristic property of an object. Conceptual understanding of an object being pulled down by a force (rather than actually pressing downward) and the development of the concept of mass appeared to develop slowly. Mass is often associated with the phonetically similar word *massive* and in that way was conflated with size or volume. In that event, pupils often estimated the mass of a material from its bulk appearance. (*Making Sense of Secondary Science*, p. 77)

Making Sense of Secondary Science also indicates that children between ages 4 and 7 have difficulty understanding that if an object is cut up or broken apart, it still contains its original physical properties. This is foundational in developing an understanding of conservation of matter (p. 73). In reference to mass and weight, research indicates that children before age 5 can only focus on either size or weight and are not able to bring the two together in their general awareness of heaviness. Between ages 5 and 7, the notion of density (heavy for size) appears to be added to the child's awareness of weight such that weight and density are not differentiated but included in a general awareness of heaviness (p. 78).

Kindergarten Science, Quarter 2, Unit 2.2

Earth Materials

Overview

Number of instructional days: 10 (1 day = 20–30 minutes)

Content to be learned

- Describe, compare, and sort rocks by similar or different physical properties (e.g., size, color, texture, smell, weight)
- Use attributes of properties to state why objects are grouped together.

Science processes to be integrated

- Describe, compare, and sort to classify objects using physical properties.
- Use simple tools to explore physical properties.

Essential questions

- In what ways can rocks and soils be compared and sorted?
- Why are certain earth materials grouped together?

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).

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

Clarifying the Standards

Prior Learning

According to the Rhode Island Early Learning Standards (www.ride.ri.gov/els/science.asp), students who attended preschool had opportunities to collect, describe, and record information using their senses, scientific tools, discussions, drawings, and charts. Preschoolers also investigated changes in materials and cause-effect relationships (e.g., changes in temperature) based on everyday experiences.

Current Learning

Students in kindergarten demonstrate an understanding of earth materials by describing, comparing, and sorting rocks by similar or different physical properties (e.g., size, shape, color, texture, smell, weight) and stating why the objects are grouped together. All concepts in this unit are new to students and should be taught at the developmental level of instruction.

When learning about earth materials, students need multiple opportunities to make observations and identify, compare, and sort objects. Students should begin to develop an understanding that earth materials, as you know them today, have developed over long periods of time through continual change processes and that these materials can be grouped together by one or more attributes (e.g., size, shape, color, texture, smell, weight). Throughout this unit, students should participate in a variety of whole- and small-group activities and should be actively engaged in observing, identifying, comparing, and sorting objects using physical properties.

Future Learning

In grade 1, students will describe and compare soils by similar or different physical properties (e.g., size, shape, color, texture, smell, weight), and they will record their observations. Students will also identify which materials are best for different uses (e.g., soils for growing plants, sand for the sandbox.)

In grade 2, students will describe, compare, and sort rocks and soils by similar or different physical properties, and they will record their observations and data about physical properties. They will use attributes of properties to state why objects are grouped together. Students will conduct tests on how different soils retain water and will identify which materials are best for different uses.

In grades 3 and 4, students will describe, compare, and sort rocks, soils, and minerals by similar or different physical properties (including size, shape, color, texture, smell, weight, temperature, hardness, and composition) and will identify the four basic materials of the Earth (rocks, soil, water, air). They will record and analyze observations and data about physical properties and will cite evidence to support why rocks, soils, or minerals are classified/not classified together. Students will conduct investigations and use observational data to describe how water moves rocks and soils. They will investigate local landforms and how wind, water, or ice has shaped and reshaped them and will use or build models to simulate the effects of how wind and water shape and reshape the land. Students will identify sudden and gradual changes that affect the Earth and will determine and support explanations of the best uses of earth materials.

Additional Findings

Young children are naturally interested in everything they see around them—soil, rocks, streams, rain, snow, clouds, rainbows, sun, moon, and stars. During the first years of school, they should be encouraged to observe closely the objects and materials in their environment, note their properties, distinguish one from another, and develop their own explanations of how things became the way they are. As children become more familiar with their world, they can be guided to observe changes, including cyclical changes such as night and day and the seasons, predictable trends such as growth, and less consistent changes such as the weather. (*National Science Education Standards*, p. 130)

Teachers should keep in mind that children come to school aware that the Earth's surface is composed of rocks, soils, water, and living organisms, but a closer look will help them identify many additional properties of earth materials. By carefully observing and describing the properties of various rocks, children will begin to see that some rocks are made of a single substance, but most are made of several substances. Playgrounds and nearby parks are convenient study sites to observe a variety of earth materials. As students collect rocks and observe vegetation, they will become aware that soil varies from place to place in its color, texture, and reaction to water. By planting seeds in a variety of soil samples, they can compare the effect of different soils on plant growth. (*National Science Education Standards*, p. 130)

In grades K–4, students learn that earth materials, including rocks and soils, have different physical properties that make them useful in different ways (e.g., as building materials, as sources of fuel, or for growing the plants used as food). Soils have properties of color and texture, capacity to retain water, and the ability to support the growth of many kinds of plants. (*National Science Education Standards*, p. 134)

Although water is not listed as one of the Earth's resources in the GSE, it is considered to be a basic earth material that has physical properties, including weight. It is very appropriate for young children to explore the physical properties of water when learning about earth materials.