Grade 1 Science, Quarter 3, Unit 3.1

Properties of Solids and Liquids

Overview

Number of instructional days: 11 (1 day = 45 minutes)

Content to be learned

- Identify and describe solids and liquids using physical properties.
- Use balances to explore the property of weight.
- Collect and record observations and data about physical properties of solids and liquids.
- Compare and sort solids and liquids using physical properties.
- Use physical properties to state why objects are grouped.

Processes to be used

- Identify and describe objects using physical properties.
- Compare, sort, and classify objects using physical properties.
- Use simple tools to explore the property of weight.
- Collect and record observations and data.
- Demonstrate safe practices during classroom and field investigations.
- Use scientific processes to conduct investigations, make and record observations, measure, describe, compare, sort, and classy, organize data, and build explanations.

Essential questions

- What physical properties can be used to describe and sort solids? Liquids?
- How are solids different from liquids?
- How are solids and liquids similar?

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).

1b recording observations/data about physical properties.

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

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 (K-2) POC –2 Students demonstrate an understanding of states of matter by …

2a describing properties of solids and liquids.

2b identifying and comparing solids and liquids**.**

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

In kindergarten, students used their five senses to identify, compare, and sort objects using physical properties. They also used simple tools to explore the property of weight.

In unit 2.1, first-grade students used simple tools and their senses to identify, compare, and sort earth materials using physical properties.

Current Learning

Reinforcement Level of Instruction (taught in prior grade)
In this unit, first-grade students use simple tools and their senses to identify, describe, compare, and sort objects using physical properties.

Developmental Level of Instruction (Content new to first grade)
In first grade, students begin recording their observations and data about physical properties of objects, and they begin to explore the properties of solids and liquids. They identify, compare, and sort solids and liquids, and use physical properties to state why objects are grouped together. Since solids and liquids are introduced at this grade level, students need multiple opportunities to explore a variety of solids and liquids. This will give them time to develop an understanding of the similarities and differences among solids and liquids.

Future Learning

Identifying, comparing, and sorting of objects by physical properties (e.g., size, shape, color, texture, smell, weight) will continue in grade 2. Additionally, students will be introduced to the concepts of temperature and flexibility. Students will continue to explore the property of weight using simple tools and record observations of physical properties. They will continue to state why objects are grouped together by properties and will gain further understanding of the properties of solids and liquids. In grade 2, students will make logical predictions about the changes in the state of matter when heat is added or taken away.

Additional Research Findings

According to *Benchmarks for Science Literacy*, by the end of grade 2, students should know that objects can be described in terms of the materials from which they're made (clay, cloth, paper, etc.) and physical properties (color, size, shape, weight, texture, flexibility, etc.). Additionally, students should have extensive opportunities to explore using simple tools, such as magnifiers and measuring devices. Through these opportunities, students reflect on the similarities and differences of objects (p. 76).

Primary students easily develop a conceptual understanding of solids and liquids because they can be readily observed. Because gases cannot be directly observed, young students struggle to understand the processes of evaporation and condensation. Therefore, teaching the water cycle to kindergarten and first-grade students is not developmentally appropriate (*Benchmarks,* p. 67; *Making Sense*, pp. 101–102).

According to *Making Sense of Secondary Science*, as students attempt to understand the differences between states of matter, a common misconception many students have is that powders are liquids because they can be poured. Also, many students think that materials such as sponges, cloth, and plasticine are neither solid nor liquid because they are soft, crumble, and can be torn (p. 79). For young students, viscous liquids, such as paste, honey, and tomato sauce were more difficult to classify as liquids because they are not runny (p. 80).

It is important to note that elementary and middle school students may think that everything that exists—including heat, light, and electricity—is matter. Alternatively, students may believe that matter does not include liquids and gases or that these are weightless materials (*Benchmarks*, p. 336).

In addition, primary students often fail to conserve weight and volume of objects that change shape. When an object's appearance changes in several dimensions, students focus on only one. They cannot imagine a reversed or restored condition and focus mostly on the object's present appearance. The ability to conserve develops gradually, and many students cannot discern weight conservation in some tasks until

they are 15 years old. This includes the ability to conserve weight in a task involving the transformation from one state to another. (*Atlas of Science Literacy*, p. 56)

According to the *National Science Education Standards*, full inquiry involves asking a simple question, completing an investigation, answering the question, and presenting the results to others. Therefore, students need repeated, structured practice in using inquiry, in whole class and small group situations (*National Science Education Standards*, p. 123).

Notes About Resources and Materials

General Resource Material

There are limited hands-on resource materials referring to only liquids and solids. Most material includes information about gases. Teacher discretion should be used. Websites may be the best resource for background knowledge.

Books

- Mason, A. (2006) *Change It! : Solids, Liquids, Gases and You*. Toronto, Canada: Kids Can Press.
- Mason, A. (2005). *Touch It! : Materials, Matter and You*. Toronto, Canada: Kids Can Press.
- Zoehfeld, K. (1998). *What is the World Made of?: All About Solids, Liquids and Gases*. New York: Harper Collins.
- Ross, M. (2007). *What's the Matter in Mr. Whisker's Room?* Somerville, MA: Candlewick Press.
- Garrett, G. (2005). *Solids, Liquids and Gases*. Danbury, CT: Children's Press.
- Stille, D. (2004). *Matter: See It, Touch It, Taste It, Smell It*. Mankato, MN: Picture Window Books.

Helpful Websites

- www.sciencekids.co.nz
- www.pppst.com
- www.fossweb.com
- www.brainpopjr.com

Grade 1 Science, Quarter 3, Unit 3.2

Characteristics of Animals

Overview

Number of instructional days: 14 (1 day = 45 minutes)

Content to be learned

- Observe that animals need water, air, food, and shelter to grow.
- Identify the basic needs that animals need in order to survive.
- Distinguish between living and nonliving things.
- Observe, identify, and record external features of animals.
- Identify specific functions of physical structures of animals (e.g., webbed feet for swimming), and explain how structures help them to survive in their environments.
- Observe, draw, and label the stages of an animal's life cycle.
- Given pictures, sequence the life cycle of an animal.
- Care for animals by identifying and providing for their needs.

Processes to be used

- Identify similarities and differences.
- Observe, identify, and record external features of organisms.
- Identify structures and describe the functions of structures within a system.
- Observe and identify patterns of change.
- Demonstrate safe and ethical practices during classroom investigations.
- Use scientific processes to make observations, organize and compare data, communicate findings, and build explanations.

Essential questions

- How do you know if something is a living organism?
- How do you care for an animal?
- How do the external features of animals help them survive in their environments?
- How do animals change over time?

Written Curriculum

Grade Span Expectations

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

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.

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 …

1a distinguishing between living and nonliving things.

LS 4 - Humans are similar to other species in many ways, and yet are unique among Earth's life forms.

LS4 (K-4) FAF -8

Identify what the physical structures of humans do (e.g., sense organs – eyes, ears, skin, etc.) or compare physical structures of humans to similar structures of animals.

LS4 (K-2)-8 Students demonstrate an understanding of human body systems by …

8b observing, identifying, and recording external features of humans and other animals.

LS1 – [See above]

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).

LS1 – [See above]

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 …

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

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.

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.~~

Clarifying the Standards

Prior Learning

In kindergarten, students learned to distinguish between living and nonliving things. Students observed, identified, and recorded external features of humans and other animals. They cared for animals by identifying and providing for their needs. The students observed that animals need water, air, food, and shelter to grow. They began to identify the functions of the physical structures of an animal. In addition, they practiced sequencing the life cycle of an animal when given a set of pictures.

Current Learning

Reinforcement Level of Instruction (content taught in prior grade)
In first grade, students continue to distinguish between living organisms and nonliving objects. They observe, identify, and record external features of humans and other animals. They continue to care for animals by identifying and providing for their needs. Students use pictures to sequence the life cycle of an animal.

Developmental Level of Instruction (content new to grade level)
Students in first grade observe and label the stages in the life cycle of an animal.

Future Learning

In the fourth quarter, first-grade students will continue to distinguish between living and nonliving things as they learn about plants. They will observe and identify the external features of plants, and will record their observations. They will observe that plants need water, air, food, and light to grow. Students will also begin to care for plants by identifying and providing for their needs. First-graders will observe, draw, and label the stages in the life cycle of a familiar plant, and will sequence the life cycle using pictures.

In grade 2, students will continue to observe, identify, and record external features of living organisms. Students will identify and learn to sort based on external features. They will continue to identify the specific functions of the physical structures of organisms. Second-graders will also care for organisms by identifying and caring for their needs. They will continue to observe and label the stages in a life cycle of an organism, and will learn how to scientifically draw living organisms.

Additional Research Findings

By the end of second grade, students should know that animals have similarities and differences both in appearance and behavior. Animals' features help them live in different environments. Students need multiple opportunities to observe and record animals in their environment. In many stories for young children, animals are given human characteristics, because the goal is to promote student interest in reading. Therefore, in science, students should be guided toward making distinctions between stories that portray animals with attributes they do not have and those stories that portray them realistically (*Benchmarks for Science Literacy*, p. 102).

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. As students have a variety of experiences with organisms and subsequently develop a knowledge base in life sciences, their inclination to give human characteristics to animals should decline (*National Science Education Standards*, p. 128).

Although children can correctly classify objects as living or nonliving, this ability is not indicative of a biological grasp of the implications of the life concept. Many students understand that the need for food indicates life, but few apply the concept of breathing or of reproduction in defining living things, even when asked questions such as, "Does a frog breathe or need air?" (*Making Sense of Secondary Science*, p. 18).

The idea that organisms depend on their environment is generally not well developed in young children. In grades K–4, the focus should be on establishing the primary association of organisms with their environments. Making sense of the way organisms live in their environments will help students develop some understanding of the diversity of life and how all living organisms depend on the living and nonliving parts of their environment for survival (*NSES*, p. 128).

During the elementary grades, children build understanding of biological concepts through direct experience with living things, their life cycles, and their habitats. Therefore, it is important to provide opportunities for young children to observe living organisms in their environments and as they progress through the stages of the life cycle (*NSES*, p. 127). Elementary students often have difficulty imagining their parents as children or themselves as old, so observing animals with short life cycles is recommended (*Benchmarks,* p. 132).

By the end of second grade, students should recognize that a lot can be learned about animals, but care must be taken to know the needs of living things and how to provide for them in the classroom. The use of animals in scientific research is a complex issue, but students should have opportunities to interact with living things in a way that promotes respect (*Benchmarks*, p. 15).

Notes About Resources and Materials

General Resources

- Ansberry, Karen, *More Perfect Science Lessons: Using Children's Books To Guide Inquiry K–4* (published by NSTA)
- National Science Teachers Association Handbook (guidelines for responsible and ethical use of animals in the classroom)
- Newbridge *Discovery Links* Science books

Houghton Mifflin Science Discovery Works

- Teaching Guide Unit A Lesson 4 A 40–47
- Teaching Guide Unit A Lesson 5 A 50–57
- Teaching Guide Unit A Lesson 6 A 58–65
- Teaching Guide Unit A Lesson 7 A 66–73
- Teaching Guide Unit A Lesson 9 A 82–89
- Teacher Resource Book
- Alternate activities 4–7 and 9 pp. A 33–36

Books

- Bullard, L. (2010). *Busy Animals: Learning About Animals in Autumn*. Mankato, MN: Picture Window Books.
- De la Bedoyere, C. (2009). *Egg to Chicken*. London, UK: QED Publishing.
- De la Bedoyere, C. (2009). *Tadpole to Frog*. London, UK: QED Publishing.
- Economos, C. (1999). *Fur, Feathers, Scales, Skin*. Marlborough, MA: Newbridge Discovery Links.
- Jenkins, S. (2001). *What Do You Do When Something Wants to Eat You?* Sandpiper.
- Kalman, B. (2005). *Camouflage: Changing to Hide*. New York: Crabtree Publishing Company.
- Kalman, B. (2000). *How Do Animals Adopt?* New York: Crabtree Publishing Company.
- Nayer, J. (1998). *How Do Frogs Grow?* Marlborough, MA: Newbridge Discovery Links.
- Page, R. (2008). *What Do You Do with a Tail Like This?* London, UK: Sandpiper.
- Phillips, D. (2008). *My First Book of Bugs and Spiders*. United Kingdom: TickTock Books.
- Phillips, D. (2008). *My First Book of Mammals*. United Kingdom: TickTock Books.
- Phillips, D. (2008). *My First Book of Ocean Life*. United Kingdom: TickTock Books.

- Phillips, D. (2008). *My First Book of Reptiles and Amphibians*. United Kingdom: TickTock Books.
- Stockland, P. (2005). *Red Eyes or Blue Feathers*. Mankato, MN: Picture Window Books.
- Stockland, P. (2005). *Stripes, Spots or Diamonds: A Book About Animal Patterns* (Animal Wise). Mankato, MN: Picture Window Books.
- Stockland, P. (2005). *Swing, Slither or Swim: A Book About Animal Movement* (Animal Wise). Mankato, MN: Picture Window Books.

Websites

- www.adoptme.com (virtual classroom pet)
- www.bbc.co.uk/schools/scienceclips