Kindergarten Science, Quarter 3, Unit 3.1

Force and Motion

Overview

Number of instructional days: 5 (1 day = 30 minutes)

Content to be learned

- Observe objects that are or are not attracted to magnets.
- Sort objects that are or are not attracted to magnets.
- Show how pushing or pulling moves or does not move an object.

Processes to be used

- Observe how forces cause changes in objects' behavior.
- Sort objects based on physical properties.
- Observe and describe the parts of a simple system and how the parts interact.
- Use inquiry skills to conduct investigations, make observations, and sort and classify objects.

Essential questions

- How can we use a magnet to sort objects?
- Why do some objects move, and other objects do not move when they are pushed or pulled?

Written Curriculum

Grade Span Expectations

PS 3 - The motion of an object is affected by forces.

PS3 (K-4) INQ+ SAE –8

Use observations of magnets in relation to other objects to describe the properties of magnetism (i.e., attract or repel certain objects or has no effect)

PS3 (K-2)–8 Students demonstrate an understanding of (magnetic) force by …

8a observing and sorting objects that are and are not attracted to magnets.

PS3 (K-4)-INQ+SAE –7

Use data to predict how a change in force (greater/less) might affect the position, direction of motion, or speed of an object (e.g., ramps and balls).

PS3 (K-2) –7 Students demonstrate an understanding of motion by…

7a showing how pushing/pulling moves or does not move an object.

Clarifying the Standards

Prior Learning

According to the Rhode Island Early Learning Standards, preschool children asked questions in order to discover, question, and understand the physical world. They used scientific tools as props in their play. They learned about the physical world by collecting, describing, and learning to record information through discussion, drawings, and charts. They used tools and their senses to make observations and investigated cause-and-effect relationships based on everyday experiences. They asked and pursued their questions through simple investigations.

Current Learning

Kindergarten students begin to develop an understanding of force (magnetism, pushes, and pulls) by observing and sorting objects that are or are not attracted to magnets. They begin to develop an understanding of motion by showing how pushes and pulls move or do not move an object. These concepts are taught at the developmental level of instruction.

Future Learning

First-grade students will continue to develop an understanding of magnetic force by observing and sorting objects that are or are not attracted to magnets. They will continue to develop an understanding of motion by showing how pushes and pulls move or do not move an object. In addition, they will predict the direction an object will or will not move if a force is applied to it.

Additional Research Findings

According to *National Science Education Standards*, when students manipulate objects by pushing and pulling, they begin to focus on the position and the motion of the objects. They describe location as *up*, *down*, *in front*, or *behind*, discovering the various kinds of motion and the forces required to control objects. Students also begin to understand that pushing or pulling can change the position and/or motion of objects. The size of the change is related to the strength of the push or pull. With regard to magnetic force, students learn that magnets attract and repel each other and that they attract objects with certain physical properties (pp. 126–127).

Benchmarks for Science Literacy indicates that students should observe, describe, and discuss all kinds of moving things (i.e., themselves, birds, trees, doors, swings, etc.), keeping notes, drawing pictures to illustrate their motion, and raising questions (i.e., *Do they move in a straight line? Do they move fast or slow? How can you tell?).* At this stage, the question is more important than the answer. Students need varied experiences in getting things to move (p. 89). With regard to magnetic force, children in the primary years should use magnets to get things to move without touching them, and thereby learn that forces can attract at a distance with no perceivable substance in between (p. 94).

According to *Making Sense of Secondary Science*, when first working with magnets, students generally lack the understanding that repulsion (pushing) is distinct from attraction (pulling). In a study by Selman, et al., children between the ages of three and nine had two different levels of conception of magnetism. At the first level, students only linked observable events, such as magnets being attracted or not attracted to certain objects. At the second, more sophisticated level, the notion of an unseen force began to emerge and students described magnets as "pulling on things." Lack of knowledge about magnets causes students to believe that magnets "stick" to objects. They also believe that big magnets are stronger than little magnets (p. 127).

Some suggestions to counter these misconceptions would include using vocabulary such as *attract* and *pull*, and *repel* and *push*, interchangeably. Also, be mindful to address misconceptions regarding magnets "sticking" to objects. Students need varied experiences to begin to understand that magnets actually attract (or pull) objects.

Notes About Resources and Materials

Suggested Materials

- Magnets
- Rope
- Sorting containers
- Toy cars, balls
- Unit blocks and ramps
- Various objects that are/are not attracted to magnets

Books on magnetism

- Brubaker Bradley, K. (2005). *Forces Make Things Move*. New York. Harper Collins.
- Edom, H. (1992). *Usborne Science Activities: Science with Magnets*. Tulsa, OK. Educational Development Corporation Publishing.
- Mason, A. (2005). *Move It! Motion, Forces and You*. Toronto, ON. Kids Can Press.
- Shannon, S. (2009). *Pulls (How Things Move)*. Portsmouth, NH. Heinemann Publishing.
- Smith, S. (2009). *Making Things Move*. Portsmouth, NH. Heinemann Publishing.

Helpful Websites and Lesson Links

- National Geographic Teacher's Guide Force and Motion (includes information for ELL, at-risk and special needs students)

  <http://www.ngsp.com/Portals/0/Downloads/57237_WOL_LLV_Early_FAM_lr.pdf>
- Build Your Own Roller Coaster" balance and motion game

  <www.internet4classrooms.com/skills_k_science_new.htm#physical>
- Force and Motion Games for Young Children (K-1)

  <http://classroom.jc-schools.net/sci-units/force.htm#Kindergarten>
- Making Objects Move Lesson

  <http://www.sciencenetlinks.com/lessons.php?BenchmarkID=12&DocID=35>
- Let It Roll Lesson

  <http://www.sciencenetlinks.com/lessons.php?BenchmarkID=12&DocID=21>

Kindergarten Science, Quarter 3, Unit 3.2

Objects in the Sky

Overview

Number of instructional days: 3 (1 day = 30 minutes)

Content to be learned

- Observe that the sun can only be seen in the daytime.
- Observe that the moon can be seen sometimes at night and sometimes during the day.

Processes to be used

- Use inquiry skills to make observations, record observations, and make comparisons based on observations.

Essential questions

- How is the daytime sky similar to the nighttime sky?
- How is the daytime sky different from the nighttime sky?

Written Curriculum

Grade Span Expectations

ESS2 - The earth is part of a solar system, made up of distinct parts that have temporal and spatial interrelationships.

No further targets for EK ESS2 at the K-4 Grade Span

ESS2 (K-2) –7 Students demonstrate an understanding of temporal or positional relationships between or among the Earth, sun, and moon by …

7a observing that the sun can only be seen in the daytime, but the moon can be seen sometimes at night and sometimes during the day.

Clarifying the Standards

Prior Learning

According to the Rhode Island Early Learning Standards, preschoolers asked questions based on discoveries made while playing. They used their senses to observe, discover, question, and understand the physical world. They collected, described, and learned to record information through drawings, discussions, and charts.

Current Learning

Kindergartners observe that the sun can only be seen in the daytime, but the moon can be seen sometimes at night and sometimes during the day. Since these concepts are new to kindergarten students, they are taught at the developmental level of instruction.

Future Learning

First-graders will continue to observe that the sun can only be seen in the daytime, but the moon can be seen sometimes during the night and sometimes during the day. In addition, they will observe that the sun and moon appear to move slowly across the sky.

Additional Research Findings

According to *Benchmarks for Science Literacy*, during grades K–2, learning about objects in the sky should be entirely observational and qualitative, because young children are far from ready to understand the magnitudes (time, space) involved or to make sense out of explanations. The priority is to get children noticing and describing how the sky looks to them at different times. The sun can be seen only in the daytime, but the moon can be seen sometimes at night and sometimes during the day (p. 62).

According to the *National Science Education Standards,* students learn that the sun, moon, stars, and clouds all have properties, locations, and movements that can be observed and described. Objects in the sky, including the sun, moon, stars, and clouds, have patterns of movement. The sun, for example, appears to move across the sky in the same way every day, but its path changes slowly over the seasons. The moon appears to move across the sky on a daily basis, much like the sun appears to move (p. 134).

Children form misconceptions early on. These misconceptions are often logical, rational, and firmly based in evidence and experience. Although their experience may not be deep or broad enough, and their thinking capacity may not be enough to formulate what we call a scientific theory, the process at which children formulate these ideas is very scientific. For example, some children believe the moon can only be seen at night. To make sense of the relationships between the sun, moon, and earth, and the concept of day and night, we have to accept that the earth spins around every 24 hours, the earth is always half-lit up by the sun, and half is in darkness, and that the moon has an orbit around the earth so it is sometimes visible in the daytime sky. (http://www.scribd.com/doc/14207212/children-misconception-in-science)

In *Making Sense of Secondary Science*, research studies show that children have misconceptions about why it gets dark at night, suggesting that children's thinking develops with age, from more directly observable reasons to those involving the movements of the earth. Many younger children believe that the sun is an animate object (i.e., the sun hides, goes to sleep, turns off, goes out, is on the ground, hides behind the trees, or goes behind the hills). Some children believe that, at night, the sun is covered by clouds, by the moon, or by darkness. Even after children develop an understanding of the movements of the bodies in the solar system, including the rotation of the earth, misconceptions continue (pp. 169–170).

Notes About Resources and Materials

NOTE—Check the weather and phases of the moon to ensure that the sun/moon will be present before planning to teach this unit.

Materials

- Homework sheet (draw what you see in the morning and night sky)
- Venn diagram (daytime sky, nighttime sky, both)
- McClure, B. (2006). *The Sun and the Moon*. Lisle, IL. Universal Flag Publishing.
- Viola, K. (2004). *Goodnight Sun, Hello Moon*. Pleasantville, NY. Readers' Digest.
- Google images of "daytime moon" to print and share

Resources

Houghton Mifflin Science Discovery Works—Teaching guide: kindergarten *"*Looking at the Earth and Sky"

- p. C29 (The Moon in the Daytime Sky)
- p. C62 (When to See the Moon in the Daytime Sky)
- Poster Book C8 (Showing the Moon in the Day and Night Sky)

Helpful Websites and Lesson Links

- "Objects in the Sky"… addresses what the sky looks like during the day/night, identifying objects in the sky, and looking for objects that are common to the daytime and nighttime sky.

  <http://www.sciencenetlinks.com/lessons.php?BenchmarkID=4&DocID=155>

- The Differences Between the Daytime and the Nighttime Sky"…

  <http://planetarium.spps.org/Como/curric/CurricPDFS/KndrPDFs/K04Dfrnc.pdf>

- "What Do You See When You Look Up?"… (ELL teachers may want to start here before using the link above.)

  <http://planetarium.spps.org/Como/curric/CurricPDFS/KndrPDFs/K01WhSee.pdf>

Kindergarten Science, Quarter 3, Unit 3.3

Energy

Overview

Number of instructional days: 8 (1 day = 30 minutes)

Content to be learned

- Identify that the sun is a source of heat.
- Use observations to describe how sunlight interacts with objects to create shadows.
- Demonstrate when a shadow will be created using sunny versus cloudy days.

Processes to be used

- Observe and describe how heat causes changes in physical properties of various objects.
- Use scientific processes, including making and recording observations.

Essential questions

- What will happen if an object (i.e., ice cube) is left in the window on a sunny day? Why does this happen?
- When will you best be able to see your shadow?

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 -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 (K-2)-4 Students demonstrate an understanding of energy by…

4c identifying the sun as a source of heat energy.

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 (K-2)-5 Students demonstrate an understanding of energy by…

5a demonstrating when a shadow will be created using sunny versus cloudy days.

Clarifying the Standards

Prior Learning

According to the Rhode Island Early Learning Standards, preschoolers asked questions based on discoveries made while playing. They used their senses to observe, discover, question, and understand the physical world. They collected, described, and learned to record information through drawings, discussions, and charts. Preschoolers also used scientific tools as they learned to observe and describe the world around them.

Current Learning

Kindergarten students demonstrate an understanding of energy by identifying the sun as a source of heat. Students observe how sunlight interacts with objects to create shadows, and demonstrate when a shadow will be created using sunny versus cloudy days. These concepts are taught at the developmental level of instruction.

Future Learning

First-graders will continue to demonstrate an understanding of energy by identifying the sun as a source of heat energy and by demonstrating when a shadow will be created using sunny versus cloudy days. They will also demonstrate an understanding of energy by describing that the sun warms land and water, and by describing that objects change in temperature by adding heat. In addition, they will observe that the sun appears to move slowly across the sky, which causes shadows to change following a predictable pattern.

Additional Research Findings

According to the *National Science Education Standards*, by observing the day and night sky regularly, children in grades K–4 will learn to identify sequences of change and to look for patterns in these changes. As they observe changes, such as the movement of an object's shadow during the course of a day, and the positions of the sun and the moon, they will find patterns in these movements. These understandings should be confined to observations, descriptions, and finding patterns (pp. 130–131). A fundamental concept for K–4 students is that the sun provides the light and heat necessary to maintain the temperature of the earth (p. 134).

Benchmarks for Science Literacy states that young children tend to associate the term energy with moving around a lot. They are likely to know sources of energy by what they are used for—electricity gives people light or cooks their food, the sun melts snow or makes some calculators work, and moving air makes a pinwheel turn and helps some boats move. But young children probably don't see heat and light as forms of energy. It is not necessary that young children understand that energy comes in many forms. Rather, the emphasis for young children should be on familiarizing them with a wide variety of phenomena that result from moving water, wind, burning fuel, or connecting to batteries and wall sockets (p. 193). Since young children understand "energy" in terms of motion, heat, light, sound, etc., it is appropriate to refer to the sun's energy as "heat" or "light."

In research studies on children's ideas about energy, several recurring conceptualizations of energy have emerged. For example, energy is seen as associated only with animate objects; energy is linked with force and movement; energy is seen as fluid, an ingredient, or product. When children talk about energy in particular situations, they suggest that energy is needed in order to live and be active (*Making Sense of Secondary Science*, pp. 143–144).

Notes About Resources and Materials

Resources

Houghton Mifflin Science Discovery Works—Teaching guide: kindergarten "Looking at the Earth and Sky"

- Activity Card C4 (Observing Light and Heat from the Sun)

Materials

- Asch, F. (1996). *Bear Shadow*. Englewood Cliffs, NJ: Silver Burdett Press.
- Batteries
- Objects that react to the sun's heat (i.e., ice cubes, candy bar, wood block, crayon, metal car, etc.)
- Flashlights
- Recording sheets

Helpful Websites and Lesson Links

- Shadows Lesson

  <http://www.sciencenetlinks.com/lessons.php?Grade=k-2&BenchmarkID=11&DocID=10>

- Modeling Shadows Lesson

  <http://www.sciencenetlinks.com/lessons.php?BenchmarkID=11&DocID=9>

- BBC Science Online

  < http://www.bbc.co.uk/sn/>

  Do a Google search for: *Sun as a source of energy for kindergarten* and click on the link that begins: Identify the sun as the source of - Look4ithere.com

  Look4ithere.com (author Connie Campbell, Jefferson County Schools, Dandridge, TN)

  < http://look4ithere.com/rd/results/rdq_energy/classroom.jc-schools.net/sci-units/energy.htm/searchemall_Kindergarten_Energy_Energy_Kids_Page_The_student_will_investigate_energy_and_its_uses_I:_Identify_the_sun_as_the_source_of_earthâ€™s_heat_and_light_energy_%3Cdiv_class=>