

Grade 2 Science, Quarter 3, Unit 3.1
Force and Motion

Overview

Number of instructional days: 8 (1 day = 45 minutes)

Content to be learned

- Predict the direction an object will or will not move if a force is applied to it.
- Show that different objects fall to earth unless something is holding them up.

Processes to be used

- Identify and describe the structures found in a simple system (i.e., the structures in a ramp system could include a ball, ramp, and a surface).
- Observe and describe patterns of change within a simple system.
- Demonstrate safe practices during classroom and field investigations.
- Use scientific processes such as making predictions, recording observations, conducting investigations, and collecting and analyzing data.

Essential questions

- How do forces (pushes and pulls) affect objects?
- How can you change the direction of a moving object?
- What effect does gravity have on objects?

Written Curriculum

Grade Span Expectations

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

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...

7b predicting the direction an object will or will not move if a force is applied to it.

7c showing that different objects fall to earth unless something is holding them up.

Clarifying the Standards

Prior Learning

In kindergarten and first grade, students demonstrated an understanding of magnetic force by observing and sorting objects that are or are not attracted to magnets. They demonstrated an understanding of motion by showing how pushing and pulling does or does not move an object. Students in first grade predicted the direction an object will or will not move if a force is applied to it.

Current Learning

At the Reinforcement Level of Instruction

Second-graders predict the direction an object will or will not move if a force is applied to it. Students should see that things move in many different ways, such as straight, zigzag, round and round, back and forth, and fast and slow.

At the Developmental Level of Instruction

Students show that things near the earth fall to the ground unless something holds them up.

Future Learning

In third grade, students will predict whether or not an object will be attracted to a magnet. They will also show an understanding of force by demonstrating that different objects fall to earth unless something is holding them up. They will demonstrate an understanding of motion by predicting the direction and describing the motion of an object if a force is applied to it. They will be introduced to the concept of weight and how it applies to motion. They will also describe changes in position relative to other objects or background, and will investigate how different amounts of force can change the direction or speed of an object in motion.

Additional Research Findings

According to the *National Science Education Standards*, when students describe and manipulate objects by pushing, pulling, throwing, dropping, and rolling, they also begin to focus on the position and movement of objects, describing location as *up*, *down*, *in front of*, or *behind* and discovering the various kinds of motion and forces required to control it. 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 (pp. 126–127).

The focus in this unit should be on motion and on encouraging students to be observant about when and how things seem to move or not move. They should observe motion everywhere, making lists of different kinds of motion, and they need to be exposed to many objects that may or may not move, as well as to changes in the direction of objects already in motion. Students should also notice that things fall to the ground if not held up, observing that forces can act at a distance with no perceivable substance in between. By the end of second grade, students should view, describe, and discuss all kinds of moving things—themselves, insects, birds, trees, doors, rain, fans, swings, balls, wagons, etc. Students should keep notes, draw pictures that suggest motion, and raise questions: *Do they move in a straight line? Is the motion fast or slow? How can you tell?* They should also know that things move in different ways and that the way to change an object’s motion is to give it a *push* or *pull* (*Benchmarks for Science Literacy*, pp. 89, 94).

According to *Making Sense of Secondary Science*, students often tend to associate force in terms of anger or feeling. They also talk of forces in terms of getting things going, rather than making them stop. They associate forces with physical activity or muscular strength. Students also tend to believe that if there is motion, a force is acting on it; conversely, if there is no motion, they believe there is no force acting on it. Students tend to think that when an object is moving, there is a force in the direction of its motion and that a moving object stops when its force is “used up.” Regarding motion, students tend to see objects as either at rest or moving (pp. 148–149, 155).

Notes About Resources and Materials

Houghton Mifflin Discovery Works Science, Lessons 4, 5 (Experiments can be conducted from the lessons.)

Trade Books

Bradley, K. (2005). *Forces Make Things Move*. New York, NY: Harper Collins.

Branley, F. (2007). *Gravity is a Mystery*. New York, NY: Harper Collins.

Knapp, B. (2002). *Forces in Action*. United Kingdom: Atlantic Europe Publishing Co.

Mason, A. (2005). *Move it! Motion, Forces and You*. Toronto, Canada: Kids Can Press.

Websites

- BBC Kids—Schools—Science Ages 5–6—Pushes and Pulls
<http://www.bbc.co.uk/schools/scienceclips/ages/5_6/pushes_pulls.shtml>
- BBC Kids—Schools—Science Ages 6–7—Forces and Movement
<http://www.bbc.co.uk/schools/scienceclips/ages/6_7/forces_movement.shtml>

Grade 2 Science, Quarter 3, Unit 3.2

Characteristics of Animals

Overview

Number of instructional days: 10 (1 day = 45 minutes)

Content to be learned

- Observe and record external features of animals.
- Identify and sort animals based on external features.
- Identify the specific functions of the physical features of an animal.
- Explain how physical structures of an animal allow it to survive in its habitat or environment.
- Care for animals by identifying and providing for their needs.
- Observe, scientifically draw, and label the stages in an animal life cycle.
- Use information about a food web to determine how basic needs are met by the habitat or environment.

Processes to be used

- Identify, sort, and classify using physical characteristics.
- Identify and describe the structures found in a system (e.g., an animal can be considered a system with a variety of external structures, such as mouth parts, legs, claws, ears, a tail, etc. Each structure has one or more functions that help the animal survive).
- Describe the functions of the structures found in a system.
- Observe and describe interactions and patterns of change within a system.
- 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

- How do animals grow and change over time?
- How do animals meet their needs in their environment?
- In what ways do animals depend on other living organisms in order to survive?

Written Curriculum

Grade Span Expectations

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

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

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

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).

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 – [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 ...

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 – [See above]

LS2 (K-4) SAE –6

Describe ways plants and animals depend on each other (e.g., shelter, nesting, food).

LS2 (K-2)–6 Students demonstrate an understanding of food webs in an ecosystem by ...

6b using information about a simple food web to determine how basic needs (e.g. shelter and water) are met by the habitat/environment.

Clarifying the Standards

Prior Learning

Primary students learned to distinguish between living organisms and nonliving objects. Students in kindergarten and first grade observed, identified, and recorded external features of animals, and identified the functions of specific physical features. They learned about animals needs in terms of survival and growth. Children used pictures to sequence an animal life cycle. In first grade, students observed, drew, and labeled the life-cycle stages of a familiar animal.

Current Learning

At the drill-and-practice level of instruction, second-grade students observe, identify, and record external features of living things, and they identify and sort animals based on similar and different external features.

At the reinforcement level of instruction, students observe, draw, and label the stages in the life cycle of an animal. It is important that these drawings are scientifically accurate and that they take into account such things as prominent features and relative proportions.

At the developmental level of instruction, second-grade students use information from simple food webs to determine how animals meet basic needs in their habitat.

Future Learning

Students in third grade will learn to cite evidence to distinguish between living organisms and nonliving objects. They will identify, sort, and compare animals based on similar and different external features. Third grade students will cite evidence to explain why organisms are or are not grouped together (e.g., mammals, birds, fish). Students will identify and explain how the physical structures or characteristics of an organism allow it to survive and defend itself, and they will observe that animals' need to have basic needs met in order to reproduce. Third-graders will use data and pictures to sequence the life cycle of an animal, and will compare the life cycles of two animals.

Additional Research Findings

All students, especially those who live in circumstances that limit their interaction with nature, must have the opportunity to observe a variety of animals in the classroom, on the school grounds, in the neighborhood, at home, in parks, streams, and gardens, and at the zoo. But observing is not enough. The students should have reasons for their observations—reasons that prompt them to do something with the information they collect. The reason, for example, can be to answer the students' own questions about how organisms live or care for their young. Students should be encouraged to ask questions for which

they can find answers by looking carefully at animals, using hand lenses when needed, and then checking their observations and answers with others. By the end of second grade, students should know that some animals are alike in how they look and what they do, while others are very different from one another. They should also know that animals have features that help them live in different environments. Children need to understand that stories (e.g., fables, folk tales) give animals attributes that they really do not have (*Benchmarks for Science Literacy*, p. 102).

According to *Making Sense of Secondary Science*, 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 don't readily recognize that these attributes are not common among all animals and do not distinguish animals from other living things (p. 22).

According to the *National Science Education Standards*, young children think of animals as pets or creatures in a zoo. The idea that organisms depend on their environment and on other organisms within that environment is not well developed in young children. The focus should be on associating animals with their environments, animal dependence on the environment, behaviors that help them survive, and the food link between organisms (p. 128).

According to the *Atlas of Science Literacy*, young children can understand simple food links involving two organisms. However, they think of these organisms as independent of each other (p. 32).

Notes About Resources and Materials

Houghton Mifflin Discovery Works Science, Unit A: Interactions of Living Things

The following resources can be found at most CPS libraries.

Books

- Arnosky, J. (2000). *I See Animals Hiding*. New York: Scholastic.
- Jenkins, S. (2003). *What Do You Do with a Tail Like This?* Boston, MA: Houghton Mifflin.
- Lauber, P. (1994). *Who Eats What? Food Chains and Food Webs*. New York: Harper Collins.
- Otto, C. (1996). *What Color is Camouflage?* New York: Harper Collins.
- Relf, P. (1996). *The Magic School Bus Gets Eaten: A Book About Food Chains*. New York: Harper Collins.

Video

“Eat and Be Eaten: Food Chains” Children’s Television Workshop

Websites

- Scholastic.com—Endangered Ecosystems—Be an Explorer: Mexican Wildcats
<http://teacher.scholastic.com/activities/explorer/ecosystems/be_an_explorer/map/form_wildcats.htm>