

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

Overview

Number of instructional days: 7 (1 day = 45 minutes)

Content to be learned

- Use prior knowledge and investigations in order to predict whether or not an object will be attracted to a magnet.
- Demonstrate that different objects fall to the earth unless something is holding them up.
- Predict the direction and describe the motion of an object if a force is applied to it.
- Describe a change in position relative to other objects or background.
- Investigate and describe how different amounts of force can change the direction/speed of an object in motion.

Processes to be used

- Use prior knowledge to make predictions.
- Observe how the parts of a system interact.
- Observe and describe changes that occur within a system.
- Demonstrate safe practices during classroom investigations.
- Use scientific processes, including conducting investigations, making observations, conducting multiple trials to verify results, making comparisons, and drawing conclusions.

Essential questions

- What is magnetism? (Magnetism is the force of attraction or repulsion between substances made of certain materials.)
- Why are some objects attracted to a magnet while others are not?
- How does gravity affect objects?
- How can you change the direction or speed of an object in motion?

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 (3-4)–8 Students demonstrate an understanding of (magnetic) force by ...

8a using prior knowledge and investigating to predict whether or not an object will be attracted to a magnet.

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 (3-4)–7 Students demonstrate an understanding of force (e.g., push-pull, gravitational) by...

7d conducting experiments to demonstrate that different objects fall to earth unless something is holding them up. (tied to ideas/concepts of 7a.)

PS3 (3-4)–7 Students demonstrate an understanding of motion by...

7a predicting the direction and describing the motion of objects (of different weights, ~~shapes, sizes, etc.~~) if a force is applied to it.

7b describing change in position relative to other objects or background.

7c investigating and describing that different amounts of force can change direction/speed of an object in motion.

Clarifying the Standards

Prior Learning

In grade 2, students learned to predict the direction an object will move if a force, such as a push or pull, is applied. Students demonstrated that different objects fall to earth unless something is holding them up. They recognized that things move in different ways such as straight, zigzag, round and round, back and forth, and fast and slow.

Current Learning

At a reinforcement level of instruction, students predict the direction that objects will move if a force is applied. Students demonstrate that different objects fall to earth unless something is holding them up. They describe changes in position relative to other objects or background. They also predict and investigate whether or not an object will be attracted to a magnet.

At the developmental level of instruction, students describe the motion of objects of different weights if a force is applied. They investigate and describe how different amounts of force can change the direction and speed of an object in motion.

Future Learning

Students will predict the direction and describe the motion of objects of different weights, shapes, and sizes when a force is applied to the objects. They will conduct experiments to demonstrate that different objects fall to earth unless something is holding them up. Students will describe what happens when like and opposite poles of a magnet are placed near each other. They will also explore relative strength of magnets, to include the size of magnets, number of magnets, and properties of materials that are attracted to magnets.

Additional Research Findings

Students in grades 3–5 should continue to describe motion, however they can be more experimental and more quantitative as their measurement skills sharpen. Determining the speed of fast things and slow things can present a challenge that students will readily respond to. They can also work out for themselves some of the general relationships between force and change of motion and internalize the notion of force as a push or a pull of one thing on another—whether rubber bands, magnets, or explosions. By the end of grade 5, students should know that forces cause changes in speed or direction of motion. The greater the force, the greater the change in motion will be. The more massive the object is, the less effect a given force will have (*Benchmarks for Science Literacy*, p. 89).

Students should also understand that forces can act at a distance. Students should carry out investigations to become familiar with the pushes and pulls of magnets and gravity. By the end of grade 5, students should know earth’s gravity pulls any object toward it without touching it, and that a magnet pulls on all things made of iron and either pushes or pulls on other magnets (*Benchmarks*, p. 94).

According to the *National Science Education Standards*, some fundamental concepts and principles that underlie force and motion include understanding both the position and motion of objects. The position and motion of objects can be changed by pushing or pulling, and the size of the change is related to the strength of the push or pull (p. 127).

According to *Benchmarks for Science Literacy*, some common misconceptions include that all metals are attracted to magnets; that all silver-colored items are attracted to magnets; that magnetic force increases as magnets increase in size; and that magnetic force increases as the number of magnets increases. Some misconceptions related to force include that if an object is at rest, there are no forces acting upon the object, there cannot be a force without motion, and larger objects exert a greater force than smaller objects. (*Benchmarks*, online version)

Other misconceptions include students believing that magnetic force and gravity are similar because both forces pull objects. Students may even think that magnetism a type of gravity (*Making Sense of Secondary Science*, p. 126). Experimenting with magnets by lifting objects upward may help students conceptually understand the differences between magnetism and gravity.

Notes About Resources and Materials

Websites:

- BBC online—Schools: Forces
<<http://www.bbc.co.uk/schools/teachers/ks3bitesize/science/forces.shtml>>
- BBC online—Schools: Magnets
<http://www.bbc.co.uk/schools/ks3bitesize/science/energy_electricity_forces/magnets_electric_effects/revise1.shtml>
- Scholastic.com—Study Jams—Forces and Motion
<<http://studyjams.scholastic.com/studyjams/jams/science/forces-and-motion/force-and-motion.htm>>
- Engineering Interact—Resource Bank—Forces and Motion: Magnetic Forces Module
<<http://www.engineeringinteract.org/resources/parkworldplot/flash/concepts/magneticforces.htm>>

Textbook

Houghton Mifflin Discovery Works

- Text pp. C60–C61
Roll On! Science Notebook p. 137
- Text pp. C62–C63
Gravity Roll Science Notebook p. 139
- Text p. C67
Science Notebook Investigation #1 p. 141

Essential Vocabulary

- attract
- magnet
- magnetism
- repel

Grade 3 Science, Quarter 3, Unit 3.2

Human Characteristics

Overview

Number of instructional days: 7 (1 day = 45 minutes)

Content to be learned

- Understand that humans are similar to other animals in many ways, but are also unique among life forms.
- Demonstrate an understanding of human body systems by identifying how internal and external features help humans survive.
- Compare external features and characteristics of humans and other animals.
- Identify similarities inherited from a biological parent.
- Identify that some behaviors are learned.

Essential questions

- How do internal and external features help humans survive (e.g., eyes see, heart pumps blood, bones give structure, skin protects, stomach digests food, etc.)?
- In what ways are children like their parents?

Processes to be used

- Compare physical characteristics of living organisms.
- Identify similarities and differences.
- How are the external features of humans similar to and different from those of other animals?
- What are some behaviors that a child might learn from his/her parent?

Written Curriculum

Grade Span Expectations

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 (3-4)-8 Students demonstrate an understanding of human body systems by ...

8a ~~showing connections between~~ external and internal body structures (i.e., organs and systems) and how they help humans survive.

8b ~~comparing and analyzing~~ external features and characteristics of humans and other animals.

LS4 (K-4) POC -9

Distinguish between characteristics of humans that are inherited from parents (i.e., hair color, height, skin color, eye color) and others that are learned (e.g., riding a bike, singing a song, playing a game, reading)

LS4 (3-4) –9 Students demonstrate an understanding of human heredity by ...

9a identifying similarities that are inherited from a biological parent.

9b identifying that some behaviors are learned ~~and some behaviors are instinctive.~~

Clarifying the Standards

Prior Learning

During the primary grades, students observed, identified, and recorded external features of humans and other animals. They identified the senses needed for survival in a given situation. Students also observed and compared their physical features with those of parents, classmates, and other organisms. They identified that some behaviors are learned.

Current Learning

At a reinforcement level of instruction, third-grade students continue to identify learned behaviors.

At a developmental level of instruction, students at this grade level identify external and internal body structures and describe how these body structures help humans survive. This includes organs such as the stomach, lungs, and heart. Students compare external features and characteristics of humans to those of other animals. In addition, students learn to identify similarities that are inherited from a biological parent.

Future Learning

Students will analyze observations and data about external features, and will compare external features and characteristics of humans and other animals. They will explain how the physical structures and characteristics of an organism allow it to survive and defend itself. Students will identify body systems. Students also identify that some behaviors are instinctual.

Additional Research Findings

As similar as human beings are to other species, we are unique among the earth's life forms. Humans have the ability to use language and thought; our facility to think, imagine, create, and learn from experience far exceeds that of any other species. Children are often very aware of the differences between themselves and their family members, between family members and neighbors, and between neighbors and others. Similarities among people increase in interest for students when human beings are compared/contrasted to other species. In addition, despite variances in appearance and behavior, the differences among humans are minor when compared with the internal similarity of all human beings (*Benchmarks for Science Literacy*, pp. 127–128).

Students may not immediately understand that offspring resemble their parents and that inherited characteristics are a “mixture” of characteristics from both parents. Many students have the misconception that girls inherit characteristics from their mothers, while boys inherit most characteristics from their fathers (*Benchmarks for Science Literacy*, online version). Some students also believe that male animals are always bigger and stronger than their female counterparts (*Making Sense of Secondary Science*, p. 51).

Research has found that, when learning about body systems, young children give egocentric explanations for parts of the body, such as: “My hair is for washing.” By age 10, students appear to understand that the body contains numerous organs, which function together (in systems) in order to maintain life (*Making Sense*, p. 26).

Notes About Resources and Materials

Suggested websites

- Kids Health—How the Body Works
<<http://kidshealth.org>>
- Scholastic—Study Jams—Heredity
<<http://studyjams.scholastic.com/studyjams/jams/science/human-body/heredity.htm>>

Grade 3 Science, Quarter 3, Unit 3.3

Characteristics of Animals

Overview

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

Content to be learned

- Cite evidence to distinguish between living and nonliving things.
- Identify, sort, and compare based on similar and/or different external features.
- Cite evidence to draw conclusions explaining why organisms are grouped/not grouped together.
- Identify and explain how the physical structures/characteristics of an organism allow it to survive and defend itself in its environment.
- Observe that animals need water, air, food, and shelter/space to survive, grow, and reproduce.
- Sequence the life cycle of an animal using data or pictures.
- Compare the life cycle of two animals when given data or pictures.

Processes to be used

- Identify and compare physical characteristics of organisms.
- Sort and classify based on physical characteristics.
- Identify and describe the structures found in a system.
- 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 making predictions, making and recording observations, citing evidence, collecting and analyzing data, and drawing conclusions.

Essential questions

- How do we distinguish between living organisms and nonliving?
- How do we determine which organisms belong in one group and not another?
- How do physical (external) features help animals meet their needs in order to survive in their environments?
- In what ways do animals defend themselves in their environments?
- What are some similarities and differences between the life cycles of different animals?
- What do animals need in order to survive, grow, and reproduce?

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 (3-4) –1 Students demonstrate an understanding of classification of organisms by ...

1a citing evidence to distinguish between living and nonliving things.

1b identifying, sorting and comparing based on similar and/or different external features.

1d citing evidence (e.g., prior knowledge, data) to draw conclusions explaining why organisms are grouped/not grouped together (e.g. mammal, bird, and fish).

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 (3-4)–4 Students demonstrate understanding of structure and function-survival requirements by...

4a identifying and explaining how the physical structure/characteristic of an organism allows it to survive and defend itself (e.g. of a characteristic – the coloring of a fiddler crab allows it to camouflage itself in the sand and grasses of its environment so that it will be protected from predators).

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 (3-4)-2 Students demonstrate understanding of structure and function-survival requirements by...

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

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 (3-4)–3 Students demonstrate an understanding of reproduction by ...

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

3c comparing the life cycles of 2 plants or 2 animals when given a set of data/pictures.

Clarifying the Standards

Prior Learning

During the primary grades, students recorded observations of the external features that make up living things. They identified and sorted animals based on external features, and identified the specific functions of the physical structures of animals. Students also observed, drew, and labeled the stages of the life cycle of a familiar animal.

Current Learning

At the drill-and-practice level of instruction, third-grade students identify physical structures/characteristics of an organism that allow it to survive. Students learn that animals need air, water, food, and shelter/space to grow. They also sequence the life cycle of animals using pictures.

At the reinforcement level of instruction, students cite evidence to distinguish between living organisms and nonliving objects. Students compare animals based on external features and cite evidence to explain why organisms are or are not grouped together. Students sequence the life cycle of an animal given data and compare the life cycle of two animals when given a set of data/pictures.

At the reinforcement to drill-and-practice level of instruction, students identify and explain how the physical structures and characteristics of an organism allow it survive and defend itself, and they observe that animals need air, water, food, and shelter/space to grow and reproduce.

Future Learning

In fourth grade, students will analyze the structures needed for the survival of animal populations in a particular habitat/environment. Students will show connections between internal and external body structures and how they help humans survive. They will also record data and scientifically draw the stages in the life cycle of a familiar animal. Students will compare the life cycles of two animals when given a set of data/pictures.

Additional Research Findings

According to *Benchmarks for Science Literacy*, students should have the opportunity to learn about an increasing variety of living organisms, and should become more precise in identifying similarities and differences among them. Although the emphasis can still be on external features, these identifications should be at a finer level of detail. Therefore, students should routinely use hand-lenses when observing animals. As students become increasingly familiar with the characteristics of more and more organisms, they should be asked to invent schemes for classifying them. Hopefully, their classification schemes will vary according to their uses as well as gross anatomy, behavior patterns, habitats, and other features. The aim is to move students toward the realization that there are many ways to classify things, but the quality of any classification depends on its usefulness. A scheme is useful if it contributes either to making decisions on some matter or to a deeper understanding of the relatedness of organisms. Classification schemes will, of course, vary with purpose, such as pets/non-pets; edible/nonedible (*Benchmarks for Science Literacy*, online version, Grades 3–5, Diversity of Life).

According to the *National Science Education Standards*, students must learn that organisms have basic needs and they can survive only in environments in which their needs are met. The world has many different environments that support different types of organisms. Each animal has different structures that serve different functions in growth, survival, and reproduction. The behavior of individual organisms is

influenced by internal cues (such as hunger) and by external cues (such as a change in the environment). All organisms, including humans, have senses that help them detect internal and external cues (p. 129).

Animals have life cycles that include birth, maturation, reproduction, and eventually, death. The details of this life cycle are different for different organisms. Many animals closely resemble their parents. Many characteristics of an organism are inherited from the parents of the organism, but other characteristics result from an individual's interactions with the environment. An organism's patterns of behavior are related to the nature of that organism's environment, including the kinds and numbers of other organisms present, the availability of food and resources, and the physical characteristics of the environment. When the environment changes, some organisms survive and reproduce, and others die or move to new locations (*National Science Education Standards*, p. 129).

According to *Making Sense of Secondary Science*, young children can have difficulty distinguishing between living and nonliving. They tend to use movement, breathing, and death to decide whether things are alive. Students need to understand the multiple attributes that define life—generally, that living things grow, reproduce, and require food, air, water, and space (*Making Sense of Secondary Science*, p. 17).

Notes About Resources and Materials

Websites

- Sheppard Software—Kids' Corner
http://www.sheppardsoftware.com/content/animals/kidscorner/kidscorner_games.htm
- BBC—Schools—Science Clips—Habitats
http://www.bbc.co.uk/schools/scienceclips/ages/8_9/habitats.shtml
- Scholastic—Study Jams—Animal Adaptations
<http://studyjams.scholastic.com/studyjams/jams/science/animals/animal-adaptations.htm>
- Scribd.com—3rd Grade Animal Classification Worksheet
<http://www.scribd.com/doc/10042306/3rd-Grade-Animal-Classification-Worksheet>
- Kid Zone—Animal Classes
http://www.kidzone.ws/animals/animal_classes.htm
- First School Years
<http://www.firstschoolyears.com/science/resources/games/ourselves/living/living.htm>
- Science Net Links
<http://www.sciencenetlinks.com/interactives/class.html>

Textbook

Houghton Mifflin, Discovery Works

- Blending In, pp. E46–E47
- Science Notebook, p. 219
- Life Cycles of Animals, pp. A3–A5
- Science Notebook Activity, p. 3
- The Animals Sitter's Guide, pp. A26–A27
- Science Notebook. pp. 15–16

