

Grade 5 Science, Quarter 3, Unit 3.1
Processes That Shape the Earth—Geology

Overview

Number of instructional days: 15 (1 day = 45 minutes)

Content to be learned

- Identify and describe the layers of the earth.
- Demonstrate an understanding of change by representing the processes of the rock cycle in words, diagrams, or models.

Science processes to be integrated

- Use or build models to demonstrate understanding of interactions and change that occur within systems.
- Represent a system using words, diagrams, or models.

Essential questions

- What characteristics distinguish one layer of the earth from another?
- How do heat, pressure, and time cause change to rocks?

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 (5-8) INQ+ POC –1

Use geological evidence provided to support the idea that the Earth’s crust/lithosphere is composed of plates that move.

ESS1 (5-6)–1 Students demonstrate an understanding of processes and change over time within earth systems by ...

1a identifying and describing the layers of the earth.

ESS1 (5-8) INQ+ POC –5

Using data about a rock’s physical characteristics make and support an inference about the rock’s history and connection to rock cycle.

ESS1 (5-6)-5 Students demonstrate an understanding of processes and change over time by ...

5a representing the processes of the rock cycle in words, diagrams, or models.

Clarifying the Standards

Prior Learning

In grades K–2, students described, compared, and sorted rocks and soils by physical properties, such as size, shape, color, texture, smell, and weight. They recorded observations and data about physical properties and explained how and why certain objects were grouped together. Students also conducted tests on how different soils retain water.

In grades 3–4, students identified the four basic earth materials as water, soil, rocks, and air. They described, compared, and sorted rocks and soils by physical properties, including size, shape, color, texture, smell, weight, temperature, hardness, and composition. Students also recorded and analyzed observations and data about physical properties, including similarities and differences between samples, and they cited evidence to support why rocks and soils were or were not classified together. They conducted investigations and used observational data to describe how water moves rocks and soils, and identified sudden and gradual changes that affect the earth. Students investigated how wind, water, or ice have shaped or reshaped local landforms, and used or built models to simulate the effects of how wind and water shape and reshape the land

Current Learning

In grade 5, students demonstrate an understanding of processes and change over time within earth systems by identifying and describing the layers of the earth, and by representing the processes of the rock cycle. Teachers should introduce the terms *igneous*, *sedimentary*, and *metamorphic*. A review of weathering, erosion, deposition, and sedimentation may be necessary to help explain the processes involved in the formation of rocks. Students are taught at the developmental level of instruction when identifying and describing the layers of the earth, and when learning about the formation of igneous, sedimentary, and metamorphic rocks through the processes that occur within the rock cycle. The processes of the rock cycle will be addressed again in grade 6; however, identifying and describing the layers of the earth is only addressed in grade 5 and should be taught through the drill and practice level of instruction.

These concepts are abstract, and not directly observable. Therefore, it is important for students to create and use models during this unit of study in order to understand the structure of the earth and to describe the interactions that occur during the rock cycle. Students will view a variety of visual representations of the layers of the earth, and should create various representation of the rock cycle using words, with pictures, and with models.

Students in prior grades learned to differentiate rocks and minerals by their properties. In 5th grade, students investigate how heat, pressure, and time cause leads to the formation of different types of rock, and how this process of the rock cycle leads to shaping earth's layers. In grade 6, students will cite evidence to explain the formation of a rock, given its characteristics and location. Students will also sort rocks into the categories of metamorphic, igneous, and sedimentary in grade 6.

The vocabulary for this unit includes *inner core*, *outer core*, *crust*, *mantle*, *igneous*, *sedimentary*, and *metamorphic*. Review of weathering and erosion may be necessary to help explain the process of rock formation.

Future Learning,

Because of the depth of the concepts, students will continue to represent the processes of the rock cycle in words, diagrams, and models in grade 6. Students will cite evidence and develop a logical argument to explain the formation of a rock, given its characteristics and location, to include classifying rock type using identification resources. They will plot the location of earthquakes and volcanoes to explain the relationship between the location of these phenomena and faults.

In grades 7–8, students will cite evidence and develop a logical argument for plate movement using fossil evidence, layers of sedimentary rock, locations of mineral deposits, and the shapes of the continents. They will evaluate slow processes (e.g., weathering, erosion, mountain building, sea floor spreading) and fast processes (e.g., erosion, volcanoes, and earthquakes) to determine how the earth has changed and will continue to change over time. Students will also investigate the effect of flowing water on landforms.

Additional Research Findings

A major goal of science in the middle grades is for students to develop an understanding of the four major interacting components of the earth system—geosphere (crust, mantle, core), hydrosphere (water), atmosphere (air), and biosphere (the realm of all living things). There are physical, chemical, and biological processes that act within and among the four components on a wide range of time scales to continuously change earth's crust, oceans, atmosphere, and organisms. For this unit of study, it is fundamental for students to understand that some changes in the solid earth can be described as the rock cycle. Old rocks at the earth's surface weather, forming sediments that are buried, then compacted, heated, and often recrystallized into new rock. Eventually, those new rocks may be brought to the surface by the forces that drive plate motions, and the rock cycle continues. (*National Science Education Standards*, pp. 158–160).

Students of all ages may hold the view that the world was always as it is now, or that changes that have occurred must have been sudden and comprehensive (*Atlas of Science Literacy, Vol. 1*, p. 50). Students should understand that change happens to many things, some changes are so slow or so fast that they are difficult to see, and that things change in steady, repetitive or irregular ways—or sometimes in more than one way at the same time. Rock is composed of different combinations of minerals. Smaller rocks come from the breakage and weathering of bedrock and larger rocks. Soil is made partly from weathered rock, partly from plant remains, and also contains many living organisms. Sediments of sand and smaller particles are gradually buried and are cemented together by dissolved minerals to form solid rock again. Sedimentary rock buried deep enough may be reformed by pressure and heat, perhaps melting and

recrystallizing into different kinds of rock. These reformed rock layers may be forced up again to become land surface. Subsequently, this new rock too will erode (p. 51).

According to *Benchmarks for Science Literacy*, students in grades 3–5 should become adept at using magnifiers to inspect a variety of rocks and soils; however, the point is not to classify rigorously but to notice the variety of components. They should also observe elementary processes of the rock cycle—weathering, erosion, and deposition. Water and sand boxes and rock tumblers can provide them with some firsthand examples. Later, they can connect the features to the processes and follow explanations of how the features came to be and still are changing (p. 72).

According to the research found in *Making Sense of Secondary Science*, very few children appreciate the relationship between sedimentary rocks and the sedimentary processes by which they are formed. Additional confusion arises when children confuse the layers apparent in sedimentary rocks with the cleavage planes often associated with metamorphic rocks. Small minorities of children associate igneous rocks with fire or volcanoes. Children sometimes associate the word metamorphism with metamorphosis in animals, and they linked metamorphic rocks with butterflies and plants in general (p. 113).

Notes About Resources and Materials

The Rock Cycle

Houghton Mifflin Discovery Works—Grade 5

- Information on igneous, sedimentary and metamorphic rocks (pp. E40–49)
- Concept map E2 “Rocks”
- Activity: ‘Round and ‘Round She Goes—to demonstrate the rock cycle (pp. E56–57)
- Rock cycle (pp. E60–62)
- Overhead transparency #25 “The Rock Cycle”
- Teacher Resource Book: Investigation Review #1 (p. 122)
- Teacher Resource Book: Investigation Review #3 (p. 124)
- The AAAS website (www.Project2061.org) contains *Benchmarks for Science Literacy* (read only) and provides excellent background information.
<<http://www.project2061.org/publications/bsl/online/index.php?chapter=C2>>

The Layers of the Earth

Houghton Mifflin Discovery Works—Grade 5

Overhead transparency #26 “Earth’s Layers”

- Concept map E3 “Earth’s Layers”
- Activity (p. E66–67) “A Model Earth” (Can be used as a demonstration, however, there is probably a better representation.)
- Information on earth’s layers can be found on pp. 68–69 (skip pp. 70–71)
- Teacher Resource Book: Investigation Review #1 (p. 128)

Processes that Shape the Earth—Weather

Overview

Number of instructional days 15 (1 day = 45 minutes)

Content to be learned

- Diagram and label the processes of the water cycle, including evaporation, precipitation, runoff, condensation, transpiration, and groundwater.
- Explain the processes of the water cycle.
- Identify the composition and layers of earth’s atmosphere.
- Describe how differential heating of the ocean affects ocean currents, which influence weather.
- Predict temperature and precipitation changes related to the passing of various weather fronts.

Processes to be used

- Diagram and label the structures and processes within a system.
- Explain the interaction between structures and processes that cause change within a system.
- Describe how a change in a system affects all parts of the system.
- Describe and predict changes caused by heating.
- Use models and collect data in order to make predictions and explain changes that occur over time.

Essential questions

- How does water change and move through the water cycle?
- What characteristics distinguish one layer of the earth’s atmosphere from another?
- How does differential heating of the oceans affect ocean currents?
- How does the temperature of the ocean currents influence weather?
- How do air fronts affect temperature and precipitation where you live?

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 (5-8) SAE–2

Explain the processes that cause the cycling of water into and out of the atmosphere and their connections to our planet’s weather patterns.

ESS1 (5-6)–2 Students demonstrate an understanding of processes and change over time within earth systems by ...

2a diagramming, labeling and explaining the processes of the water cycle including evaporation, precipitation, and run-off, condensation, transpiration, and groundwater.

2d identifying composition and layers of earth’s atmosphere.

ESS1 (5-8) SAE+ POC –4

Explain the role of differential heating or convection in ocean currents, winds, weather and weather patterns, atmosphere, or climate.

ESS1 (5-6)–4 Students demonstrate an understanding of processes and change over time within earth systems by ...

4b describing how differential heating of the oceans affects ocean currents which in turn influence weather ~~and climate.~~

4e predicting temperature and precipitation changes associated with the passing of various fronts.

Clarifying the Standards

Prior Learning

In grades K–2, students used a variety of weather tools to collect data about weather, and observed and recorded weather changes throughout the school year. They observed, recorded, and summarized local weather data, and observed how clouds are related to forms of precipitation.

In grades 3–4, students identified air as one of the four basic earth materials. They explained how the use of scientific tools helps to extend the senses and gather data about the weather, and selected appropriate tools for a given task, describing the information they would provide. Students also observed, recorded, compared, and analyzed weather data to describe changes and patterns in the weather. They explained how the water cycle relates to weather and the formation of clouds, and described how water changes into vapor when heated and reappears as liquid when cooled.

Current Learning

The earth and earth materials as we know them today have developed over long periods of time, through continual change processes. In this unit, grade 5 students demonstrate an understanding of processes and change over time within earth systems. Students identify the composition and layers of the earth's atmosphere, and they diagram, label, and explain the processes of the water cycle including evaporation, precipitation, and run-off, condensation, transpiration, and groundwater. They describe how differential heating of the oceans affects ocean currents which in turn influence weather, and predict temperature and precipitation changes associated with the passing of various fronts.

Students are taught at the developmental level of instruction when identifying the names and composition of the layers of earth's atmosphere, and when describing how differential heating of the ocean affects ocean currents and weather. This is also students' first exposure to predicting temperature and precipitation changes that are associated with the passing of various fronts. However, when diagramming, labeling, and explaining the processes of the water cycle, students are taught at the reinforcement level to the drill and practice level of instruction. Students were introduced to the processes of the water cycle in grades 3–4, and grade 5 is the last grade level to address this concept.

Grade 5 is the only grade that learns about the layers of the atmosphere. Students need to know differences in composition, temperature, and location of, as well as the significant occurrences that take place in each layer (i.e., weather occurs in the troposphere, the ozone is located in the stratosphere).

During this unit of study, students conduct various investigations (e.g., using different temperatures of colored water to simulate ocean currents), hands-on activities (e.g., create drawings of air fronts), and use models (water cycle models) and other representations in order to develop a conceptual understanding of patterns of change in weather. Students should diagram and label the structures, or layers of the atmosphere, and describe the characteristics of each layer. Students need opportunities to use models and collect data to show how the heating of the ocean affects currents. They should then diagram and label the structures (sun, water, currents, air, air masses, fronts) and processes (heating from the sun, movement of water, movement of air, processes of the water cycle) that interact to cause ocean heating, and describe how ocean currents affect weather patterns. Students explain the processes that cause the cycling of water into and out of the atmosphere and their connections to our planet's weather patterns. They use diagrams to look at past weather patterns to predict changes in precipitation and temperature in a given location. Students will then be able to make predictions about how temperature and precipitation changes are related to the passing of various weather fronts.

In grades K–4, students spent a lot of time learning about different weather instruments and tools, and used these tools to collect weather data over time. The concepts of evaporation, condensation, and precipitation are reinforced during this unit, and students will be introduced to the role of run-off, groundwater, and transpiration in the water cycle. In 5th grade, students learn to make predictions based on temperature and precipitation. They investigate heating of oceans and frontal systems to make predictions about weather. Students demonstrate an understanding of processes and change over time within earth systems by identifying composition and layers of earth's atmosphere.

Vocabulary terms to be introduced/reinforced this unit include *troposphere*, *stratosphere*, *mesosphere*, *thermosphere*, *exosphere*, *ozone layer*, *water cycle*, *precipitation*, *condensation*, *evaporation*, *groundwater*, *run-off*, *transpiration*, *current*, *air mass*, *warm front*, and *cold front*.

Future Learning

In grade 6, students will learn to explain *how* condensation of water vapor forms clouds that affect climate and weather. They will develop models to explain how humidity, temperature, and altitude affect air

pressure and how this affects local weather. They will describe events and the effect they may have on climate, (e.g. El Niño, glacier melting, greenhouse gases). Students will explain how differential heating and convection affect earth's weather patterns, and will describe how differential heating of the ocean affects ocean currents, which in turn influences climate. They will explain the relationship between differential heating/convection and the production of winds, and they will analyze global patterns of atmospheric movements to explain effects on weather.

In grades 7–8, students will explain cause and effect relationships between global climate and energy transfer. They will use evidence to make inferences or predictions about global climate issues.

Additional Research Findings

A major goal of science in the middle grades is for students to develop an understanding of the four major interacting components of the earth system—geosphere (crust, mantle, core), hydrosphere (water), atmosphere (air), and biosphere (the realm of all living things). Some fundamental concepts include that water, which covers the majority of the earth's surface, circulates through the crust, oceans, and atmosphere in what is known as the water cycle. Water evaporates from the earth's surface, rises and cools as it moves to higher elevations, condenses as rain or snow, and falls to the surface where it collects in lakes, oceans, soil, and in rocks underground. The atmosphere has different properties at different elevations. Clouds formed by the condensation of water vapor, affect weather and climate. Global patterns of atmospheric movement influence local weather. Oceans have a major effect on weather and climate because water in the oceans holds a large amount of heat (*National Science Education Standards*, pp. 158–160).

According to the *Atlas of Science Literacy*, although upper elementary students may identify air as existing even in static situations and recognize that it takes up space, recognizing that air has weight may be challenging even for high-school students. Students of all ages, including college students, may believe that air exerts force or pressure only when it is moving and only in a downward direction. Few middle-school students use the idea of pressure differences between regions of the atmosphere to account for wind; instead they may account for winds in terms of visible moving objects or the movement of the earth (Vol. 2, p. 20).

Before students understand that water is converted to an invisible form, they may initially believe that when water evaporates it ceases to exist, or that it changes location but remains a liquid, or that it is transformed into some other perceptible form (fog, steam, droplets, etc.). With special instruction, some students in 5th grade may be able to identify the air as the final location of evaporating water. Students must accept air as a permanent substance before they can identify the air as the final location of evaporating water. For many students, difficulty understanding the existence of water vapor in the atmosphere persists in middle school years. Students can understand rainfall in terms of gravity once they attribute weight to little drops of water (typically in upper elementary grades), but the mechanism through which condensation occurs may not be understood until high school (*Atlas of Science Literacy*, Vol. 2, p. 20).

According to *Benchmarks for Science Literacy*, water offers another important set of experiences for students at this level. Students can conduct investigations that go beyond the observations made in the earlier grades to learn the connection between liquid and solid forms, but recognizing that water can also be a gas, while much more difficult, is still probably accessible. Perhaps the main thrust for students should be to try to figure out where water in an open container goes. This is neither self-evident nor easy to detect. But the water cycle is of such profound importance to life on earth that students should certainly have experiences that will in time contribute to their understanding of evaporation, condensation, and the conservation of matter (p. 68).

By the end of the 3–5 grade span, students should know that air is a material that surrounds us and takes up space and whose movement we feel as wind. When liquid water disappears, it turns into a gas (vapor) in the air and can reappear as a liquid when cooled, or as a solid if cooled below the freezing point of water. Clouds and fog are made of tiny droplets or frozen crystals of water. The weather is always changing and can be described by measurable quantities such as temperature, wind direction, speed, and precipitation. Large masses of air with certain properties move across the surface of the earth. The movement and interaction of these air masses is used to forecast the weather (*Atlas for Science Literacy, Vol. 2, p. 21*).

Notes About Resources and Materials

Houghton-Mifflin Discovery Works—Grade 4

- Activity p. E26–27 “It’s a Pressing Problem” (focus on how air pressure changes with temperature.)
- Page E33 provides information on the relationship between air pressure and temperature.
- Page E46 provides information on the water cycle.
- Pages E86–87 “Climate Controls” (skip El Niño)

The Water Cycle

- A great website that diagrams and provides information about the different parts of the water cycle.
<http://ga.water.usgs.gov/edu/watercycle.html>
- This website contains the book National Science Education Standards (read only) and provides excellent background information on the topic of water cycle.
http://books.nap.edu/openbook.php?record_id=4962&page=160

Differential Heating of the Ocean

- Experiment that deals with ocean currents. Teacher may demonstrate.
<http://school.discoveryeducation.com/lessonplans/programs/oceans/index.html>
- This website deals with information about the physical temperature of the ocean.
<http://sealevel.jpl.nasa.gov/overview/overviewclimate/overviewclimatewater/>

The Layers of Earth’s Atmosphere

Houghton Mifflin Discovery Works—Grade 4 (This topic will not be taught in grade 4.)

- Layers of the earth’s atmosphere (pp. E12–E13)
- This website provides animations and various characteristics of the earth’s layers.
<http://earthguide.ucsd.edu/earthguide/diagrams/atmosphere/>
- Information about layers of the earth
<http://pubs.usgs.gov/gip/dynamic/inside.html>

Grade 5 Science, Quarter 3, Unit 3.3
Characteristics of Living Organisms

Overview

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

Content to be learned

- Use data and observations to recognize that all organisms have different features and behaviors for meeting their survival needs.
- Describe structures and behaviors that work together to help organisms survive in their environment (e.g., defense, obtaining nutrients, reproduction, eliminating wastes, etc.).
- Investigate and compare a variety of plant and animal life cycles.
- Identify cells as the building blocks of organisms.

Science processes to be integrated

- Use data and observations of organisms in order to describe relationships between structures, behaviors, and function.
- Investigate and compare changes that occur over time.
- Use science tools to make observations and identify structures.

Essential questions

- How do plant and animal life cycles compare?
- What structures and functions do all living things have in common? Why?
- How do the features, structures, and behaviors of animals work together to help them survive?
- How do the features, structures, and behaviors of plants work together to help them survive?

Written Curriculum

Grade Span Expectations

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

LS1 (5-8) – INQ+ SAE- 1

Using data and observations about the biodiversity of an ecosystem make predictions or draw conclusions about how the diversity contributes to the stability of the ecosystem.

LS1 (5-6) – 1 Students demonstrate understanding of biodiversity by...

1a recognizing that organisms have different features and behaviors for meeting their needs to survive (e.g., fish have gills for respiration, mammals have lungs, bears hibernate).

LS1 (5-8) SAE+FAF –2

Describe or compare how different organisms have mechanisms that work in a coordinated way to obtain energy, grow, move, respond, provide defense, enable reproduction, or maintain internal balance (e.g., cells, tissues, organs and systems).

LS1 (5-6) – 2 Students demonstrate understanding of structure and function-survival requirements by...

2a describing structures or behaviors that help organisms survive in their environment (e.g., defense, obtaining nutrients, reproduction, and eliminating waste).

LS1 (5-8) POC -3

Compare and contrast sexual reproduction with asexual reproduction.

LS1 (5-6) –3 Students demonstrate an understanding of reproduction by ...

3c investigating and comparing a variety of plant and animal life cycles. ***LS1 (5-8) FAF –4***

Explain relationships between or among the structure and function of the cells, tissues, organs, and organ systems in an organism.

LS1 (5-8) FAF -4

Explain the relationships between or among the structure and function of the cells, tissues, organs, and organ systems in an organism.

LS1 (5-6) –4 Students demonstrate understanding of differentiation by...

4a identifying cells as the building blocks of organisms.

Clarifying the Standards

Prior Learning

In grades K–2, students distinguished between living and non-living things. They observed and recorded the external features that make up living things, and identified and sorted organisms based on external features. Students identified the specific functions of the physical structures of a plant or an animal, and observed that plants and animals have basic needs in order to grow. Primary students also observed, scientifically drew, and labeled the stages in the life cycle of a familiar plant or animal, and sequenced the life cycle of a plant or animal when given a set of pictures.

In grades 3–4, students learned to cite evidence to distinguish between living and non-living things. They identified, sorted, and compared organisms based on external features, they cited evidence to explain why organisms are grouped or not grouped, and they recorded and analyzed observations and data about external features of organisms. Students observed that organisms have basic needs in order to grow and reproduce. They identified and explained how the physical structures of an organism allow it to survive and defend itself in its environment, and analyzed the structures needed for survival of populations of plants and animals in a particular habitat/environment. Students observed, recorded data, and scientifically drew and labeled the stages in the life cycle of familiar organisms. They also sequenced life cycles given a set of data or pictures, and compared the life cycles of two animals or two plants.

Current Learning

In this unit, grade 5 students identify that cells are the building blocks of organisms. This is new content for students, and should be taught at the developmental level of instruction. Teachers should be aware that students do not need to learn the parts of a cell (i.e., nucleus, cell wall). The intent of the GSE is for students to understand that all organisms, both plants and animals, are made up of cells.

At the reinforcement level of instruction, students use data and observe that all organisms have different external features that help them meet their needs. At the developmental level of instruction, they observe that some behaviors of organisms also help them meet their needs, and they describe structures and behaviors that work together to help organisms survive in their environment. Some examples include defense, obtaining nutrients, reproduction, and eliminating wastes.

At the reinforcement level to drill practice level of instruction, students investigate and compare a variety of plant and animal life cycles. In grades K–4, students have observed and compared the life cycles of both plants and animals. In 5th grade, students should conduct an open-ended investigation to compare a variety of plant and animal life cycles. The concept of sexual and asexual reproduction, however, is not taught in this grade level.

In order to integrate science processes with the content in this unit, students will use data and observations of organisms in order to describe the relationship between structures, behaviors, and function. They will use their observations and data to describe how organisms use their unique structures and behaviors to help them survive in their environment. Students will also select a variety of plants and animals to investigate in order to compare the changes that occur over time when observing the life cycles of different organisms. In addition, fifth-graders will use microscopes to observe that cells are structures that all organisms have in common, and therefore are the building blocks of organisms. Students should have opportunities to examine samples of plant and animal cells using a microscope. This may be students' first experience using microscopes, so they may need additional time and instruction in order to use this science tool correctly.

Prior to grade 5, students have distinguished between living and non-living things, and have identified, sorted, compared, and cited evidence to prove why something is living or non-living. They have

identified, sorted, and compared organisms using different external features, and have identified and explained how the physical structures of an organism (plant or animal) allow it to survive in its habit/environment. In 5th grade, students describe the structures or behaviors that help organisms survive, and they recognize that organisms have different features and behaviors for meeting their needs.

Prior to grade 5, students have had opportunities to directly observe the changes that living organisms undergo as they move through their life cycles, and then learned to sequence life cycles using pictures and data. In 5th grade, students are asked to investigate, as they compare and contrast the life cycles of various plants and animals.

The vocabulary for this unit includes *cell* and *biodiversity*. Other science terms, such as *feature*, *organism*, *structure*, *function*, and *behavior*, have been introduced previously.

Future Learning

In grade 6, students will define reproduction as a process through which organisms produce offspring. They will also describe reproduction in terms of being essential for the continuation of a species. Finally, students will recognize and illustrate the structural organization of an organism from a cell to tissue to organs to organ systems to organisms.

In grades 7–8, students will give examples of adaptations and behaviors that are specific to a niche (role) within an ecosystem, and will explain how organisms with different structures and behaviors have roles that contribute to each other’s survival and the stability of the ecosystem. They will also observe, describe, and chart the growth, motion, and responses of living organisms. Students will observe and describe individual cells as seen through a microscope, targeting cell membrane, cell wall, nucleus, and chloroplasts, and will explain how the cell, as the basic unit of life, has the same survival needs as an organism (i.e., obtain energy, eliminate waste, reproduce, and provide for defense). They will explain reproduction as a fundamental process by which the new individual receives genetic information from parents, and will describe forms of asexual reproduction that involve the genetic contribution of only one parent, while describing sexual reproduction as a process that combines genetic material of two parents to produce a new organism. Students will also explain that specialized cells perform specialized functions, they will compare individual cells of tissues and recognize similarities of cells and how they work together to perform specific functions, and will explain how each type of cell, tissue, and organ has a distinct structure and set of functions that serve the organism as a whole.

Additional Research Findings

In the middle-school years (grades 5–8), students should progress from studying life science from the point of view of individual organisms to recognizing patterns in ecosystems and developing understandings about the cellular dimensions of living systems. Students should understand that all organisms are composed of cells—the fundamental unit of life. All organisms must be able to obtain and use resources to grow, reproduce, and maintain stable internal conditions while living in a constantly changing external environment. Behavior is one kind of response an organism can make to an internal or environmental stimulus. Behavioral responses are determined in part by heredity and in part from experience, and an organism’s behavior evolves through adaptation to its environment. How a species moves, obtains food, reproduces, and responds to danger is based in the species’ evolutionary history (*National Science Education Standards*, pp. 155–157).

According to *Benchmarks for Science Literacy*, students in grades 3–5 should have the opportunity to learn about an increasing variety of living organisms, both the familiar and the exotic, and should become

more precise in identifying similarities and differences among them. Although the emphasis can still be on external features, finer detail than before should be included in students' observations (p. 103). Students should also begin to look for ways in which organisms in one habitat differ from those in another and consider how some of those differences are helpful to survival. The focus should be on the consequences of different features of organisms for their survival and reproduction. Students should know that individuals of the same kind differ in their characteristics, and sometimes the differences give individuals an advantage in surviving and reproducing (p. 123). Students should also explore how various organisms satisfy their needs in the environments in which they are typically found. They can examine survival needs of different organisms and consider how the conditions in particular habitats can limit what kinds of interactions among organisms within an environment should start with relationships they can directly observe (p. 116).

Notes About Resources and Materials

Life Cycles

Houghton-Mifflin Discovery Works—Grade 5

- pp. A28–29 “Staying Alive” Information (not p. 30)
- Concept Map A4 “The Life Cycle of a Flowering Plant”
- Activity “Life Cycle of a Brine Shrimp” pp. A70–71
- pp. A74–75 “The Life Cycle of an Insect”
- pp. 76–77 “Vertebrate Life Cycle”
- pp. A86–87 “The Story of a Flowering Tree” provides information on Life Cycles.

Cells as the building blocks of organisms:

- pp. A12–13

Website with information on cells and cell parts including diagrams, and a quiz.
www.myschoolhouse.com/courses/O/1/70.asp

Understanding features, structures and behaviors for meeting survival needs:

Houghton-Mifflin Discovery Works—Grade 5

- pp. A24–25 “Plant Responses”

Houghton-Mifflin Discovery Works—Grade 5

- Activity: “Feather Feats” pages C50–51 (students examine feathers and conclude some are used for warmth, and others for flight).

Website: Activity to design an animal, which will survive using certain criteria
www.lessonplanspage.com/ScienceAnimalAdaptations58.htm