

Primary through grade 4

Academic Expectations: 2.2 Patterns of Change, 2.3 Systems, 2.4 Scale and Models, 2.5 Constancy, and 2.6 Change Over Time

Properties of Earth Materials

- SC-E-2.1.1 Earth materials include solid rocks and soils, water, and the gases of the atmosphere. Minerals that make up rocks have properties of color, texture, and hardness. Soils have properties of color, texture, the capacity to retain water, and the ability to support plant growth. Water on Earth and in the atmosphere can be a solid, liquid, or gas.
- SC-E-2.1.2 Earth materials provide many of the resources humans use. The varied materials have different physical and chemical properties, which make them useful in different ways, for example, as building materials (e.g., stone, clay, marble), as sources of fuel (e.g., petroleum, natural gas), or growing the plants we use as food.
- SC-E-2.1.3 Fossils found in Earth materials provide evidence about organisms that lived long ago and the nature of the environment at that time.

Changes in Earth and Sky

- SC-E-2.3.1 The surface of the Earth changes. Some changes are due to slow processes such as erosion or weathering. Some changes are due to rapid processes such as landslides, volcanic eruptions, and earthquakes.
- SC-E-2.3.2 Weather changes from day to day and over seasons. Weather can be described by observations and measurable quantities such as temperature, wind direction and speed, and precipitation.

The Characteristics of Organisms

- SC-E-3.1.1 Things in the environment are classified as living, nonliving, and once living. Living things differ from nonliving things. Organisms are classified into groups by using various characteristics (e.g., body coverings, body structures).
- SC-E-3.1.2 Organisms have basic needs. For example, animals need air, water, and food; plants need air, water, nutrients, and light. Organisms can survive only in environments in which their needs can be met.
- SC-E-3.1.3 Each plant or animal has structures that serve different functions in growth, survival, and reproduction. For example, humans have distinct body structures for walking, holding, seeing, and talking.

Life Cycles of Organisms

- SC-E-3.2.1 Plants and animals have life cycles that include the beginning of life, growth and development, reproduction, and death. The details of a life cycle are different for different organisms.
- SC-E-3.2.2 Plants and animals closely resemble their parents at some time in their life cycle. Some characteristics (e.g., the color of flowers, the number of appendages) are passed to offspring. Other characteristics are learned from interactions with the environment such as the ability to ride a bicycle, and these cannot be passed on to the next generation.

Organisms and Their Environments

- SC-E-3.3.1** Plants make their own food. All animals depend on plants. Some animals eat plants for food. Other animals eat animals that eat the plants.
- SC-E-3.3.2** The world has many different environments. Distinct environments support the lives of different types of organisms. When the environment changes, some plants and animals survive and reproduce, and others die or move to new locations.
- SC-E-3.3.3** All organisms, including humans, cause changes in the environment where they live. Some of these changes are detrimental to the organism or to other organisms; other changes are beneficial (e.g., dams built by beavers benefit some aquatic organisms but are detrimental to others).

Grades 5 - 7

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Structure of the Earth System: Lithosphere, Hydrosphere, Atmosphere

- SC-M-2.1.1** The Earth is layered. The lithosphere is the thin crust of the Earth. Lithospheric plates move slowly in response to movements in the mantle. There is a dense core at the center of the Earth.
- SC-M-2.1.2** Landforms are a result of a combination of constructive and destructive forces. Constructive forces include crustal deformation, volcanic eruption, and deposition of sediment, while destructive forces include weathering and erosion.
- SC-M-2.1.3** Materials found in the lithosphere and mantle are changed in a continuous process called the rock cycle.
- SC-M-2.1.4** Soil consists of weathered rocks and decomposed organic material from dead plants, animals, fungi, protists, and bacteria. Soils are often found in layers, with each having a different chemical composition and texture.
- SC-M-2.1.5** 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 dissolves minerals and gases and may carry them to the oceans.
- SC-M-2.1.7** Global patterns of atmospheric movement influence local weather. Oceans have a major effect on climate, because water in the oceans holds a large amount of heat.

Earth's History

- SC-M-2.2.1** The Earth's processes we see today, including erosion, movement of lithospheric plates, and changes in atmospheric composition, are similar to those that occurred in the past. Earth's history is also influenced by occasional catastrophes such as the impact of an asteroid or comet.

SC-M-2.2.2 Fossils provide important evidence of how environmental conditions and life have changed.

Diversity and Adaptations of Organisms

SC-M-3.4.1 Biological change over time accounts for the diversity of species developed through gradual processes over many generations. Biological adaptations include changes in structures, behaviors, or physiology that enhance survival and reproductive success in a particular environment.

SC-M-3.4.2 Extinction of a species occurs when the environment changes and the adaptive characteristics of a species are insufficient to allow its survival. Extinction of species is common; most of the species that have lived on Earth no longer exist.

Populations and Ecosystems

SC-M-3.5.1 A population consists of all individuals of a species that occur together at a given place and time. All populations living together and the physical factors with which they interact compose an ecosystem.

SC-M-3.5.2 Populations of organisms can be categorized by the function they serve in an ecosystem. Plants and some microorganisms are producers because they make their own food. All animals, including humans, are consumers, and obtain their food by eating other organisms. Decomposers, primarily bacteria and fungi, are consumers that use waste materials and dead organisms for food. Food webs identify the relationships among producers, consumers, and decomposers in an ecosystem.

SC-M-3.5.3 For most ecosystems, the major source of energy is sunlight. Energy entering ecosystems as sunlight is transferred by producers into chemical energy through photosynthesis. That energy then passes from organism to organism in food webs.

SC-M-3.5.4 The number of organisms an ecosystem can support depends on the resources available and abiotic factors (e.g., quantity of light and water, range of temperatures, soil composition). Given adequate biotic and abiotic resources and no diseases or predators, populations (including humans) increase at rapid rates. Lack of resources and other factors, such as predation and climate, limit the growth of populations in specific niches in the ecosystem.

Grades 8 through 11

Academic Expectations: 2.2 Patterns of Change, 2.3 Systems, 2.4 Scale and Models, 2.5 Constancy, and 2.6 Change Over Time

The Formation and Ongoing Changes of the Earth System

- SC-H-2.3.1** The Sun, Earth, and the rest of the solar system formed approximately 4.6 billion years ago from a nebular cloud of dust and gas.
- SC-H-2.3.2** Techniques used to estimate geological time include using radioactive dating, observing rock sequences, and comparing fossils to correlate the rock sequences at various locations.
- SC-H-2.3.3** Interactions among the solid Earth, the oceans, the atmosphere, and living things have resulted in the ongoing development of a changing Earth system. Earthquakes and volcanic eruptions can be observed on a human time scale, but many processes, such as mountain building and plate movements, take place over hundreds of millions of years.
- SC-H-2.3.4** Evidence for one-celled forms of life, the bacteria, extends back more than 3.5 billion years. The changes in life over time caused dramatic changes in the composition of the Earth's atmosphere, which did not originally contain oxygen.

Biological Change

- SC-H-3.4.1** Species change over time. Biological change over time is the consequence of the interactions of (1) the potential for a species to increase its numbers, (2) the genetic variability of offspring due to mutation and recombination of genes, (3) a finite supply of the resources required for life, and (4) natural selection. The consequences of change over time provide a scientific explanation for the fossil record of ancient life forms and for the striking molecular similarities observed among the diverse species of living organisms.
- SC-H-3.4.2** The great diversity of organisms is the result of more than 3.5 billion years of biological change over time that has filled every available niche with life forms. The millions of different species of plants, animals, and microorganisms that live on Earth today are related by descent from common ancestors.
- SC-H-3.4.3** Biological classifications are based on how organisms are related. Organisms are classified into a hierarchy of groups and subgroups based on similarities that reflect their relationships. Species is the most fundamental unit of classification. Different species are classified by the comparison and analysis of their internal and external structures and the similarity of their chemical processes.