

Earth Space Science Progression
ESS1.C The history of planet Earth

K-2

Some events on Earth occur very quickly; others can occur very slowly.

3-5

Certain features on Earth can be used to order events that have occurred in a landscape.

6-8

Rock strata and the fossil record can be used as evidence to organize the relative occurrence of major historical events in Earth's history.

9-12

The rock record resulting from tectonic and other geoscience processes as well as objects from the solar system can provide evidence of Earth's early history and the relative ages of major geologic formations.

Earth Space Science Progression
ESS2.A Earth materials and systems

K-2

Wind and water change the shape of the land.

3-5

Four major Earth systems interact. Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, organisms, and gravity break rocks, soils, and sediments into smaller pieces and move them around.

6-8

Energy flows and matter cycles within and among Earth's systems, including the sun and Earth's interior as primary energy sources. Plate tectonics is one result of these processes.

9-12

Feedback effects exist within and among Earth's systems.

Earth Space Science Progression

ESS2.B Plate tectonics and large-scale system interactions

K-2

Maps show where things are located. One can map the shapes and kinds of land and water in any area.

3-5

Earth's physical features occur in patterns, as do earthquakes and volcanoes. Maps can be used to locate features and determine patterns in those events.

6-8

Plate tectonics is the unifying theory that explains movements of rocks at Earth's surface and geological history. Maps are used to display evidence of plate movement.

9-12

Radioactive decay within Earth's interior contributes to thermal convection in the mantle.

Earth Space Science Progression

ESS2.C The roles of water in Earth's surface processes

K-2

Water is found in many types of places and in different forms on Earth.

3-5

Most of Earth's water is in the ocean and much of the Earth's fresh water is in glaciers or underground.

6-8

Water cycles among land, ocean, and atmosphere, and is propelled by sunlight and gravity. Density variations of sea water drive interconnected ocean currents. Water movement causes weathering and erosion, changing landscape features.

9-12

The planet's dynamics are greatly influenced by water's unique chemical and physical properties.

Earth Space Science Progression

ESS2.D Weather and climate

K-2

Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region and time. People record weather patterns over time.

3-5

Climate describes patterns of typical weather conditions over different scales and variations. Historical weather patterns can be analyzed.

6-8

Complex interactions determine local weather patterns and influence climate, including the role of the ocean.

9-12

The role of radiation from the sun and its interactions with the atmosphere, ocean, and land are the foundation for the global climate system. Global climate models are used to predict future changes, including changes influenced by human behavior and natural factors.

Earth Space Science Progression

ESS3.A Natural resources

K-2

Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do.

3-5

Energy and fuels humans use are derived from natural sources and their use affects the environment. Some resources are renewable over time, others are not.

6-8

Humans depend on Earth's land, ocean, atmosphere, and biosphere for different resources, many of which are limited or not renewable. Resources are distributed unevenly around the planet as a result of past geologic processes.

9-12

Resource availability has guided the development of human society and use of natural resources has associated costs, risks, and benefits.

Earth Space Science Progression

ESS3.C Human impacts on Earth systems

K-2

Things people do can affect the environment but they can make choices to reduce their impacts.

3-5

Societal activities have had major effects on the land, ocean, atmosphere, and even outer space. Societal activities can also help protect Earth's resources and environments.

6-8

Human activities have altered the biosphere, sometimes damaging it, although changes to environments can have different impacts for different living things. Activities and technologies can be engineered to reduce people's impacts on Earth.

9-12

Sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources, including the development of technologies.

Earth Space Science Progression

ESS3.D Global climate change

K-2 n/a

3-5 n/a

6-8

Human activities affect global warming. Decisions to reduce the impact of global warming depend on understanding climate science, engineering capabilities, and social dynamics.

9-12

Global climate models used to predict changes continue to be improved, although discoveries about the global climate system are ongoing and continually needed.

Life Science Progression

LS1.C Organization for matter and energy flow in organisms

K-2: Animals obtain food they need from plants or other animals. Plants need water and light.

3-5: Food provides animals with the materials and energy they need for body repair, growth, warmth, and motion. Plants acquire material for growth chiefly from air, water, and process matter and obtain energy from sunlight, which is used to maintain conditions necessary for survival.

6-8: Plants use the energy from light to make sugars through photosynthesis. Within individual organisms, food is broken down through a series of chemical reactions that rearrange molecules and release energy.

9-12: The hydrocarbon backbones of sugars produced through photosynthesis are used to make amino acids and other molecules that can be assembled into proteins or DNA. Through cellular respiration, matter and energy flow through different organizational levels of an organism as elements are recombined to form different products and transfer energy.

Life Science Progression

LS2.A Interdependent relationships in ecosystems

K-2

Plants depend on water and light to grow, and also depend on animals for pollination or to move their seeds around.

3-5

The food of almost any animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants, while decomposers restore some materials back to the soil.

6-8

Organisms and populations are dependent on their environmental interactions both with other living things and with nonliving factors, any of which can limit their growth. Competitive, predatory, and mutually beneficial interactions vary across ecosystems but the patterns are shared.

9-12

Ecosystems have carrying capacities resulting from biotic and abiotic factors. The fundamental tension between resource availability and organism populations affects the abundance of species in any given ecosystem.

Life Science Progression

LS2.B Cycles of matter and energy transfer in ecosystems

K-2

Animals obtain food they need from plants or other animals. Plants need water and light.

3-5

Matter cycles between the air and soil and among organisms as they live and die.

6-8

The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem. Food webs model how matter and energy are transferred among producers, consumers, and decomposers as the three groups interact within an ecosystem.

9-12

Photosynthesis and cellular respiration provide most of the energy for life processes. Only a fraction of matter consumed at the lower level of a food web is transferred up, resulting in fewer organisms at higher levels. At each link in an ecosystem elements are combined in different ways and matter and energy are conserved. Photosynthesis and cellular respiration are key components of the global carbon cycle

Life Science Progression

LS2.C Ecosystem dynamics, functioning, and resilience

K-2 n/a

3-5

When the environment changes some organisms survive and reproduce, some move to new locations, some move into the transformed environment, and some die.

6-8

Ecosystem characteristics vary over time. Disruptions to any part of an ecosystem can lead to shifts in all of its populations. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health.

9-12

If a biological or physical disturbance to an ecosystem occurs, including one induced by human activity, the ecosystem may return to its more or less original state or become a very different ecosystem, depending on the complex set of interactions within the ecosystem.

Life Science Progression

LS4.A Evidence of common ancestry and diversity

K-2 n/a

3-5

Some living organisms resemble organisms that once lived on Earth. Fossils provide evidence about the types of organisms and environments that existed long ago.

6-8

The fossil record documents the existence, diversity, extinction, and change of many life forms and their environments through Earth's history. The fossil record and comparisons of anatomical similarities between organisms enables the inference of lines of evolutionary descent

9-12

The ongoing branching that produces multiple lines of descent can be inferred by comparing DNA sequences, amino acid sequences, and anatomical and embryological evidence of different organisms.

Life Science Progression

LS4.B Natural selection

K-2 n/a

3-5

Differences in characteristics between individuals of the same species provide advantages in surviving and reproducing.

6-8

Both natural and artificial selection result from certain traits giving some individuals an advantage in surviving and reproducing, leading to predominance of certain traits in a population.

9-12

Natural selection occurs only if there is variation in the genes and traits between organisms in a population. Traits that positively affect survival can become more common in a population.

Life Science Progression

LS4.C Adaptation

K-2 n/a

3-5

Particular organisms can only survive in particular environments.

6-8

Species can change over time in response to changes in environmental conditions through adaptation by natural selection acting over generations. Traits that support successful survival and reproduction in the new environment become more common.

9-12

Evolution results primarily from genetic variation of individuals in a species, competition for resources, and proliferation of organisms better able to survive and reproduce. Adaptation means that the distribution of traits in a population, as well as species expansion, emergence or extinction, can change when conditions change.

Life Science Progression

LS4.D Biodiversity and humans

K-2

A range of different organisms lives in different places.

3-5

Populations of organisms live in a variety of habitats. Change in those habitats affects the organisms living there.

6-8

Changes in biodiversity can influence humans' resources and ecosystem services they rely on.

9-12

Biodiversity is increased by formation of new species and reduced by extinction. Humans depend on biodiversity but also have adverse impacts on it. Sustaining biodiversity is essential to supporting life on Earth.

Physical Science Progression

PS3.D Energy in chemical processes and everyday life

K-2

Sunlight warms Earth's surface.

3-5

Energy can be "produced," "used," or "released" by converting stored energy. Plants capture energy from sunlight, which can later be used as fuel or food.

6-8

Sunlight is captured by plants and used in a reaction to produce sugar molecules, which can be reversed by burning those molecules to release energy.

9-12

Photosynthesis is the primary biological means of capturing radiation from the sun; energy cannot be destroyed, it can be converted to less useful forms.