

SCIENCE STANDARDS

Grade – Sixth

Standard

Benchmark

Indicators

Earth and Space Sciences

Students demonstrate an understanding about how Earth systems and processes interact in the geosphere resulting in the habitability of Earth. This includes demonstrating an understanding of the composition of the universe, the solar system and Earth. In addition, it includes understanding the properties and the interconnected nature of Earth's systems, processes that shape Earth and Earth's history. Students also demonstrate an understanding of how the concepts and principles of energy, matter, motion and forces explain Earth systems, the solar system and the universe. Finally, they grasp an understanding of the historical perspectives, scientific approaches and emerging scientific issues associated with Earth and space sciences.

By the end of the 6-8 program, students will...

- A. Describe how the positions and motions of the objects in the universe cause predictable and cyclic events.
- B. Explain that the universe is composed of vast amounts of matter, most of which is at incomprehensible distances and held together by gravitational force. Describe how the universe is studied by the use of equipment such as telescopes, probes, satellites and spacecraft.
- C. Describe interactions of matter and energy throughout the lithosphere, hydrosphere and atmosphere (e.g., water cycle, weather and pollution).
- D. Identify that the lithosphere contains rocks and minerals and that minerals make up rocks. Describe how rocks and minerals are formed and/or classified.
- E. Describe the processes that contribute to the continuous changing of Earth's surface (e.g., earthquakes, volcanic eruptions, erosion, mountain building and lithospheric plate movements).

- 1. Describe the rock cycle and explain that there are sedimentary, igneous and metamorphic rocks that have distinct properties (e.g., color, texture) and are formed in different ways.
- 2. Explain that rocks are made of one or more minerals.
- 3. Identify minerals by their characteristic properties.

SCIENCE STANDARDS

Grade – Sixth

Standard

Benchmark

Indicators

Life Sciences

Students demonstrate an understanding of how living systems function and how they interact with the physical environment. This includes an understanding of the cycling of matter and flow of energy in living systems. An understanding of the characteristics, structure and function of cells, organisms and living systems will be developed. Students will also develop a deeper understanding of the principles of heredity, biological evolution, and the diversity and interdependence of life. Students demonstrate an understanding of different historical perspectives, scientific approaches and emerging scientific issues associated with the life sciences.

By the end of the 6-8 program, students will...

- A. Explain that the basic functions of organisms are carried out in cells and groups of specialized cells form tissues and organs; the combination of these cells make up multicellular organisms that have a variety of body plans and internal structure
- B. Describe the characteristics of an organism in terms of a combination of inherited traits and recognize reproduction as a characteristic of living organisms essential to the continuation of the species.
- C. Explain how energy entering the ecosystems as sunlight supports the life of organisms through photosynthesis and the transfer of energy through the interactions of organisms and the environment.
- D. Explain how extinction of a species occurs when the environment changes and its adaptive characteristics are insufficient to allow survival (as seen in evidence of the fossil record).

- 1. Explain that many of the basic functions of organisms are carried out by or within cells and are similar in all organisms.
- 2. Explain that multicellular organisms have a variety of specialized cells, tissues, organs and organ systems that perform specialized functions.
- 3. Identify how plant cells differ from animal cells (e.g., cell wall and chloroplasts).
- 4. Recognize that an individual organism does not live forever; therefore reproduction is necessary for the continuation of every species and traits are passed on to the next generation through reproduction.
- 5. Describe that in asexual reproduction all the inherited traits come from a single parent.
- 6. Describe that in sexual reproduction an egg and sperm unite and some traits come from each parent, so the offspring is never identical to either of its parents.
- 7. Recognize that likenesses between parents and offspring (e.g., eye color, flower color) are inherited. Other likenesses, such as table manners are learned.
- 8. Describe how organisms may interact with one another.

SCIENCE STANDARDS

Grade – Sixth

Standard

Benchmark

Indicators

Physical Sciences

Students demonstrate an understanding of the composition of physical systems and the concepts and principles that describe and predict physical interactions and events in the natural world. This includes demonstrating an understanding of the structure and properties of matter, the properties of materials and objects, chemical reactions and the conservation of matter. In addition, it includes understanding the nature, transfer and conservation of energy; motion and the forces affecting motion; and the nature of waves and interactions of matter and energy. Students demonstrate an understanding of the historical perspectives, scientific approaches and emerging scientific issues associated with the physical sciences.

By the end of the 6-8 program, students will...

A. Relate uses, properties and chemical processes to the behavior and/or arrangement of the small particles that compose matter.

B. In simple cases, describe the motion of objects and conceptually describe the effects of forces on an object.

C. Describe renewable and nonrenewable sources of energy (e.g., solar, wind, fossil fuels, biomass, hydroelectricity, geothermal and nuclear energy) and the management of these sources.

D. Describe that energy takes many forms, some forms represent kinetic energy and some forms represent potential energy; and during energy transformations the total amount of energy remains constant.

1. Explain that equal volumes of different substances usually have different masses.

2. Describe that in a chemical change new substances are formed with different properties than the original substance (e.g., rusting, burning).

3. Describe that in a physical change (e.g., state, shape and size) the chemical properties of a substance remain unchanged.

4. Describe that chemical and physical changes occur all around us (e.g., in the human body, cooking and industry).

5. Explain that the energy found in nonrenewable resources such as fossil fuels (e.g., oil, coal and natural gas) originally came from the sun and may renew slowly over millions of years.

6. Explain that energy derived from renewable resources such as wind and water is assumed to be available indefinitely.

7. Describe how electric energy can be produced from a variety of sources (e.g., sun, wind and coal).

8. Describe how renewable and nonrenewable energy resources can be managed (e.g., fossil fuels, trees and water).

SCIENCE STANDARDS

Grade – Sixth

Standard

Benchmark

Indicators

Science and Technology

Students recognize that science and technology are interconnected and that using technology involves assessment of the benefits, risks and costs. Students should build scientific and technological knowledge, as well as the skill required to design and construct devices. In addition, they should develop the processes to solve problems and understand that problems may be solved in several ways.

By the end of the 6-8 program, students will...

- A. Give examples of how technological advances, influenced by scientific knowledge, affect the quality of life.
- B. Design a solution or product taking into account needs and constraints (e.g., cost, time, trade-offs, properties of materials, safety and aesthetics).

1. Explain how technology influences the quality of life.
2. Explain how decisions about the use of products and systems can result in desirable or undesirable consequences (e.g., social and environmental).
3. Describe how automation (e.g., robots) has changed manufacturing including manual labor being replaced by highly-skilled jobs.
4. Explain how the usefulness of manufactured parts of an object depend on how well their properties allow them to fit and interact with other materials.
5. Design and build a product or create a solution to a problem given one constraint (e.g., limits of cost and time for design and production, supply of materials and environmental effects).

SCIENCE STANDARDS

Grade – Sixth

Standard

Benchmark

Indicators

Scientific Inquiry

Students develop scientific habits of mind as they use the processes of scientific inquiry to ask valid questions and to gather and analyze information. They understand how to develop hypotheses and make predictions. They are able to reflect on scientific practices as they develop plans of action to create and evaluate a variety of conclusions. Students are also able to demonstrate the ability to communicate their findings to others.

By the end of the 6-8 program, students will...

- A. Explain that there are differing sets of procedures for guiding scientific investigations and procedures are determined by the nature of the investigation, safety considerations and appropriate tools.
- B. Analyze and interpret data from scientific investigations using appropriate mathematical skills in order to draw valid conclusions.

1. Explain that there are not fixed procedures for guiding scientific investigations; however, the nature of an investigation determines the procedures needed.
2. Choose the appropriate tools or instruments and use relevant safety procedures to complete scientific investigations.
3. Distinguish between observation and inference.
4. Explain that a single example can never prove that something is always correct, but sometimes a single example can disprove something.

SCIENCE STANDARDS

Grade – Sixth

Standard

Benchmark

Indicators

Scientific Ways of Knowing

Students realize that the current body of scientific knowledge must be based on evidence, be predictive, logical, subject to modification and limited to the natural world. This includes demonstrating an understanding that scientific knowledge grows and advances as new evidence is discovered to support or modify existing theories, as well as to encourage the development of new theories. Students are able to reflect on ethical scientific practices and demonstrate an understanding of how the current body of scientific knowledge reflects the historical and cultural contributions of women and men who provide us with a more reliable and comprehensive understanding of the natural world.

By the end of 6-8 program, students will...

- A. Use skills of scientific inquiry processes (e.g., hypothesis, record keeping, description and explanation).
- B. Explain the importance of reproducibility and reduction of bias in scientific methods.
- C. Give examples of how thinking scientifically is helpful in daily life.

- 1. Identify that hypotheses are valuable even when they are not supported.
- 2. Describe why it is important to keep clear, thorough and accurate records.
- 3. Identify ways scientific thinking is helpful in a variety of everyday settings.
- 4. Describe how the pursuit of scientific knowledge is beneficial for any career and for daily life.
- 5. Research how men and women of all countries and cultures have contributed to the development of science.