

SCIENCE STANDARDS

Grade – Fifth

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 3-5 program, students will...

- A. Explain the characteristics, cycles and patterns involving Earth and its place in the solar system.
- B. Summarize the processes that shape Earth's surface and describe evidence of those processes.
- C. Describe Earth's resources including rocks, soil, water, air, animals and plants and the ways in which they can be conserved.
- D. Analyze weather and changes that occur over a period of time.

1. Describe how night and day are caused by Earth's rotation.
2. Explain that Earth is one of several planets to orbit the sun, and that the moon orbits Earth.
3. Describe the characteristics of Earth and its orbit about the sun (e.g., three-fourths of Earth's surface is covered by a layer of water [some of it frozen], the entire planet surrounded by a thin blanket of air, elliptical orbit, tilted axis and spherical planet).
4. Explain that stars are like the sun, some being smaller and some larger, but so far away that they look like points of light.
5. Explain how the supply of many non-renewable resources is limited and can be extended through reducing, reusing and recycling but cannot be extended indefinitely.
6. Investigate ways Earth's renewable resources (e.g., fresh water, air, wildlife and trees) can be maintained.

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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 3-5 program, students will...

- A. Differentiate between the life cycles of different plants and animals.
- B. Analyze plant and animal structures and functions needed for survival and describe the flow of energy through a system that all organisms use to survive.
- C. Compare changes in an organism's ecosystem/habitat that affect its survival.

1. Describe the role of producers in the transfer of energy entering ecosystems as sunlight to chemical energy through photosynthesis.
2. Explain how almost all kinds of animals' food can be traced back to plants.
3. Trace the organization of simple food chains and food webs (e.g., producers, herbivores, carnivores, omnivores and decomposers).
4. Summarize that organisms can survive only in ecosystems in which their needs can be met (e.g., food, water, shelter, air, carrying capacity and waste disposal). The world has different ecosystems and distinct ecosystems support the lives of different types of organisms.
5. Support how an organism's patterns of behavior are related to the nature of that organism's ecosystem, including the kinds and numbers of other organisms present, the availability of food and resources, and the changing physical characteristics of the ecosystem.

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Benchmark

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By the end of the 3-5 program, students will...

6. Analyze how all organisms, including humans, cause changes in their ecosystems and how these changes can be beneficial, neutral or detrimental (e.g., beaver ponds, earthworm burrows, grasshoppers eating plants, people planting and cutting trees and people introducing a new species).

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Grade – Fifth

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Benchmark

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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 3-5 program, students will...

- A. Compare the characteristics of simple physical and chemical changes.
- B. Identify and describe the physical properties of matter in its various states.
- C. Describe the forces that directly affect objects and their motion.
- D. Summarize the way changes in temperature can be produced and thermal energy transferred.
- E. Trace how electrical energy flows through a simple electrical circuit and describe how the electrical energy can produce thermal energy, light, sound and magnetic forces.
- F. Describe the properties of light and sound energy.

- 1. Define temperature as the measure of thermal energy and describe the way it is measured.
- 2. Trace how thermal energy can transfer from one object to another by conduction.
- 3. Describe that electrical current in a circuit can produce thermal energy, light, sound and/or magnetic forces.
- 4. Trace how electrical current travels by creating a simple electric circuit that will light a bulb.
- 5. Explore and summarize observations of the transmission, bending (refraction) and reflection of light.
- 6. Describe and summarize observations of the transmission, reflection, and absorption of sound.
- 7. Describe that changing the rate of vibration can vary the pitch of a sound.

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Grade – Fifth

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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 3-5 program, students will...

- A. Describe how technology affects human life.
- B. Describe and illustrate the design process.

1. Investigate positive and negative impacts of human activity and technology on the environment.
2. Revise an existing design used to solve a problem based on peer review.
3. Explain how the solution to one problem may create other problems.

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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 3-5 program, students will...

- A. Use appropriate instruments safely to observe, measure and collect data when conducting a scientific investigation.
- B. Organize and evaluate observations, measurements and other data to formulate inferences and conclusions.
- C. Develop, design and safely conduct scientific investigations and communicate the results.

1. Select and safely use the appropriate tools to collect data when conducting investigations and communicating findings to others (e.g., thermometers, timers, balances, spring scales, magnifiers, microscopes and other appropriate tools).
2. Evaluate observations and measurements made by other people and identify reasons for any discrepancies.
3. Use evidence and observations to explain and communicate the results of investigations.
4. Identify one or two variables in a simple experiment.
5. Identify potential hazards and/or precautions involved in an investigation.
6. Explain why results of an experiment are sometimes different (e.g., because of unexpected differences in what is being investigated, unrealized differences in the methods used or in the circumstances in which the investigation was carried out, and because of errors in observations).

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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 the 3-5 program, students will...

- A. Distinguish between fact and opinion and explain how ideas and conclusions change as new knowledge is gained.
- B. Describe different types of investigations and use results and data from investigations to provide the evidence to support explanations and conclusions.
- C. Explain the importance of keeping records of observations and investigations that are accurate and understandable.
- D. Explain that men and women of diverse countries and cultures participate in careers in all fields of science.

- 1. Summarize how conclusions and ideas change as new knowledge is gained.
- 2. Develop descriptions, explanations and models using evidence to defend/support findings.
- 3. Explain why an experiment must be repeated by different people or at different times or places and yield consistent results before the results are accepted.
- 4. Identify how scientists use different kinds of ongoing investigations depending on the questions they are trying to answer (e.g., observations of things or events in nature, data collection and controlled experiments).
- 5. Keep records of investigations and observations that are understandable weeks or months later.
- 6. Identify a variety of scientific and technological work that people of all ages, backgrounds and groups perform.