

SCIENCE STANDARDS

Grade – Fourth

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. Explain that air surrounds us, takes up space, moves around us as wind, and may be measured using barometric pressure.
- 2. Identify how water exists in the air in different forms (e.g., in clouds, fog, rain, snow and hail).
- 3. Investigate how water changes from one state to another (e.g., freezing, melting, condensation and evaporation).
- 4. Describe weather by measurable quantities such as temperature, wind direction, wind speed, precipitation and barometric pressure.
- 5. Record local weather information on a calendar or map and describe changes over a period of time (e.g., barometric pressure, temperature, precipitation symbols and cloud conditions).
- 6. Trace how weather patterns generally move from west to east in the United States.
- 7. Describe the weather which accompanies cumulus, cumulonimbus, cirrus and stratus clouds.

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

8. Describe how wind, water and ice shape and reshape Earth's land surface by eroding rock and soil in some areas and depositing them in other areas producing characteristic landforms (e.g., dunes, deltas and glacial moraines).

9. Identify and describe how freezing, thawing and plant growth reshape the land surface by causing the weathering of rock.

10. Describe evidence of changes on Earth's surface in terms of slow processes (e.g., erosion, weathering, mountain building and deposition) and rapid processes (e.g. volcanic eruptions, earthquakes and landslides).

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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. Compare the life cycles of different plants including germination, maturity, reproduction and death.
2. Relate plant structures to their specific functions (e.g., growth, survival and reproduction).
3. Classify common plants according to their characteristics (e.g., tree leaves, flowers, seeds, roots and stems).
4. Observe and explore that fossils provide evidence about plants that lived long ago and the nature of the environment at that time.
5. Describe how organisms interact with one another in various ways (e.g., many plants depend on animals for carrying pollen or dispersing seeds).

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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. Identify characteristics of a simple physical change (e.g., heating or cooling can change water from one state to another and the change is reversible).
- 2. Identify characteristics of a simple chemical change. When a new material is made by combining two or more materials, it has chemical properties that are different from the original materials (e.g., burning paper, vinegar and baking soda).
- 3. Describe objects by the properties of the materials from which they are made and that these properties can be used to separate or sort a group of objects (e.g., paper, glass, plastic and metal).
- 4. Explain that matter has different states (e.g., solid, liquid and gas) and that each state has distinct physical properties.
- 5. Compare ways the temperature of an object can be changed (e.g., rubbing, heating and bending of metal).

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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. Explain how technology from different areas (e.g., transportation, communication, nutrition, healthcare, agriculture, entertainment and manufacturing) has improved human lives.
2. Investigate how technology and inventions change to meet peoples' needs and wants.
3. Describe, illustrate and evaluate the design process used to solve a problem.

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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 the appropriate tools and use relevant safety procedures to measure and record length, weight, volume, temperature and area in metric and English units.
2. Analyze a series of events and/or simple daily or seasonal cycles, describe the patterns and infer the next likely occurrence.
3. Develop, design and conduct safe, simple investigations or experiments to answer questions.
4. Explain the importance of keeping conditions the same in an experiment.
5. Describe how comparisons may not be fair when some conditions are not kept the same between experiments.
6. Formulate instructions and communicate data in a manner that allows others to understand and repeat an investigation or experiment.

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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. Differentiate fact from opinion and explain that scientists do not rely on claims or conclusions unless they are backed by observations that can be confirmed.
- 2. Record the results and data from an investigation and make a reasonable explanation.
- 3. Explain discrepancies in an investigation using evidence to support findings.
- 4. Explain why keeping records of observations and investigations is important.