

Correlations to National Standards

The activities in this module support several nationally recognized technology standards, including the list below, which are quoted from the *National Science Education Standards* (National Academies Press, 1996).

National Science Education Standards

Grades K-4

Science as Inquiry — Content Standard A

Understandings About Scientific Inquiry

- Scientific investigations involve asking and answering a question and comparing the answer with what scientists already know about the world.
- Scientists develop explanations using observations (evidence) and what they already know about the world (scientific knowledge). Good explanations are based on evidence from investigations.
- Scientists use different kinds of investigations depending on the questions they are trying to answer. Types of investigations include describing objects.
- Simple instruments, such as magnifiers, thermometers, and rulers, provide more information than scientists obtain using only their senses.

Abilities Necessary to Do Scientific Inquiry

- Plan and conduct a simple investigation.
- Employ simple equipment and tools to gather data and extend the senses.
- Use data to construct a reasonable explanation.
- Communicate investigations and explanations.

Physical Science — Content Standard B

Properties of Objects and Materials

- Objects have many observable properties, including size, weight, shape, color, temperature, and the ability to react with other substances. Those properties can be measured using tools, such as rulers, balances, and thermometers.
- Materials can exist in different states — solid, liquid, and gas. Some common materials, such as water (or rock), can be changed from one state to another by heating or cooling.

Life Science — Content Standard C

The Characteristics of Organisms

- Organisms have basic needs. For example, animals need air, water, and food; plants require air, water, nutrients, and light. Organisms can survive only in environments in which their needs can be met. The world has many different environments, and distinct environments support the life of different types of organisms.

Life Science — Content Standard D

Properties of Earth Materials

- Soils have properties of color and texture, capacity to retain water, and ability to support the growth of many types of plants, including those in our food supply.

Changes in the Earth and Sky

- The surface of Earth changes. Some changes are due to slow processes, such as erosion and weathering, and some changes are due to rapid processes, such as landslides, volcanic eruptions, and earthquakes.

Science and Technology — Content Standard E

Understanding About Science and Technology

- People have always had questions about their world. Science is one way of answering questions and explaining the natural world.
- Scientists and engineers often work in teams with different individuals doing different things that contribute to the results. This understanding focuses primarily on teams working together and secondarily on the combination of scientist and engineer teams.
- Tools help scientists make better observations, measurements, and equipment for investigations. They help scientists see, measure, and do things that they could not otherwise see, measure, and do.

History and Nature of Science — Content Standard G

Science as a Human Endeavor

- Although men and women using scientific inquiry have learned much about objects, events, and phenomena in nature, much more remains to be understood. Science will never be finished.

Grades 5-8

Science as Inquiry — Content Standard A

Abilities Necessary to Do Scientific Inquiry

- Identify questions that can be answered through scientific investigations.
- Use appropriate tools and techniques to gather data, analyze, and interpret data.
- Think critically and logically to make the relationships between evidence and explanation.

Understandings about Scientific Inquiry

- Different kinds of questions suggest different kinds of scientific investigations. Some investigations involve observing and describing objects, organisms, or events; some involve collecting specimens; some involve experiments; some involve seeking more information; some involve discovery of new objects and phenomena; and some involve making models.
- Current scientific knowledge and understanding guide scientific investigations.

- Technology used to gather data enhances accuracy and allows scientists to analyze and quantify results of investigations.
- Scientific explanations emphasize evidence, have logically consistent arguments, and use scientific principles, models, and theories. The scientific community accepts and uses such explanations until displaced by better scientific ones. When such displacement occurs, science advances.
- Science advances through legitimate skepticism. Asking questions and querying other scientists' explanations is part of scientific inquiry. Scientists evaluate the explanations proposed by other scientists by examining evidence, comparing evidence, identifying faulty reasoning, pointing out statements that go beyond the evidence, and suggesting alternative explanations for the same observations.

Physical Science — Content Standard B

Transfer of Energy

- The Sun is a major source of energy for changes on Earth's surface. The Sun's energy arrives as light with a range of wavelengths, consisting of visible light, infrared, and ultraviolet radiation.

Life Science — Content Standard C

Regulation and Behavior

- All organisms must be able to obtain and use resources, grow, reproduce, and maintain stable internal conditions while living in a constantly changing external environment.
- Extinction of a species occurs when the environment changes and the adaptive characteristics of a species are insufficient to allow its survival. Fossils indicate that many organisms that lived long ago are extinct. Extinction of species is common; most of the species that have lived on Earth no longer exist.

Life Science — Content Standard C

Structure and Function in Living Systems

Reproduction and Heredity

- Reproduction is a characteristic of all living systems; because no individual organism lives forever, reproduction is essential to the continuation of every species. Some organisms reproduce asexually. Other organisms reproduce sexually.

Science and Technology — Content Standard D

Earth in the Solar System

- Earth is the third planet from the Sun in a system that includes the Moon, the Sun, seven other planets and their moons, and smaller objects, such as asteroids and comets.

Earth's History

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

- Earth 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 history is also influenced by occasional catastrophes, such as the impact of an asteroid or comet.

Structure of the Earth System

- Landforms are the 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.
- Water covers the majority of Earth's surface.

Science and Technology — Content Standard E

Understandings about Science and Technology

- Science and technology are reciprocal. Science helps drive technology as it addresses questions that demand more sophisticated instruments and provides principles for better instrumentation and techniques perfectly designed solutions do not exist. All solutions have trade-offs such as safety, cost, efficiency, and appearance. Technological solutions have intended benefits.

History and Nature of Science — Content Standard G

Nature of Science

- Scientists formulate and test their explanations of nature using observation, experiments, and theoretical and mathematical models. Although all scientific ideas are tentative and subject to change and improvement in principle, for most major ideas in science, there is much experimental and observational confirmation. Those ideas are not likely to change greatly in the future. Scientists do and have changed their ideas about nature when they encounter new experimental evidence that does not match their existing explanations.

Nature of Science

Science as a Human Endeavor

- Scientists formulate and test their explanations of nature using observation, experiments, and theoretical and mathematical models. Although all scientific ideas are tentative and subject to change and improvement in principle, for most major ideas in science, there is much experimental and observational confirmation. Those ideas are not likely to change greatly in the future. Scientists do and have changed their ideas about nature when they encounter new experimental evidence that does not match their existing explanations.
- It is part of scientific inquiry to evaluate the results of scientific investigations, experiments, observations, theoretical models, and the explanations proposed by other scientists. Evaluation includes reviewing the experimental procedures, examining the evidence, identifying faulty reasoning, pointing out statements that go beyond the evidence, and suggesting alternative explanations for the same observations. Although scientists may disagree about explanations of phenomena, about interpretations of data, or about the value of rival theories, they do agree that questioning, response to criticism, and open communication

are integral to the process of science. As scientific knowledge evolves, major disagreements are eventually resolved through such interactions between scientists.

Language Arts Focus

- Practice listening to and understanding nonfiction text.
- Understand scientific terms and descriptive scientific language.
- Children use a variety of information resources to gather and synthesize information

Grades K-12

Unifying Concepts and Processes

Evidence, Models, and Explanation

- Models are tentative schemes or structures that correspond to real objects, events, or classes of events, and have explanatory power. Models help scientists and engineers understand how things work. Models take many forms, including physical objects, plans, mental constructs, mathematical equations, and computer simulations.