

SCIENCE STANDARD ARTICULATED BY GRADE LEVEL

GRADE 7

The goal in the development of the standard was to assure that the six strands and five unifying concepts are interwoven into a fabric of science that represents the true nature of science. Students have the opportunity to develop both the skills and content knowledge necessary to be scientifically literate members of the community.

Strands 1, 2, and 3 are designed to be explicitly taught *and* embedded *within* each of the content Strands 4, 5, and 6, and are not intended to be taught in isolation. The processes, skills, and content of the first three strands are designed to “umbrella” and complement the content of Life Science, Physical Science, and Earth and Space Science.

Strand 1: Inquiry Process

Inquiry Process establishes the basis for students’ learning in science. Students use scientific processes: questioning, planning and conducting investigations, using appropriate tools and techniques to gather data, thinking critically and logically about relationships between evidence and explanations, and communicating results.

Concept 1: Observations, Questions, and Hypotheses

Formulate predictions, questions, or hypotheses based on observations. Locate appropriate resources.

*PO 1. Formulate questions based on observations that lead to the development of a hypothesis.
(See M07-S2C1-01)*

*PO 2. Select appropriate resources for background information related to a question, for use in the design of a controlled investigation.
(See W07-S3C6-01, R07-S3C1-06, and R07-S3C2-03)*

PO 3. Explain the role of a hypothesis in a scientific inquiry.

Concept 2: Scientific Testing (Investigating and Modeling)

Design and conduct controlled investigations.

PO 1. Demonstrate safe behavior and appropriate procedures (e.g., use and care of technology, materials, organisms) in all science inquiry.

PO 2. Design an investigation to test individual variables using scientific processes.

PO 3. Conduct a controlled investigation, utilizing multiple trials, to test a hypothesis using scientific processes.

PO 4. Perform measurements using appropriate scientific tools (e.g., balances, microscopes, probes, micrometers).

*PO 5. Keep a record of observations, notes, sketches, questions, and ideas using tools such as written and/or computer logs.
(See W07-S3C2-01 and W07-S3C3-01)*

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Concept 3: Analysis and Conclusions

Analyze and interpret data to explain correlations and results; formulate new questions.

PO 1. Analyze data obtained in a scientific investigation to identify trends.

(See M07-S2C1-07 and M07-S2C1-08)

PO 2. Form a logical argument about a correlation between variables or sequence of events (e.g., construct a cause-and-effect chain that explains a sequence of events).

PO 3. Analyze results of data collection in order to accept or reject the hypothesis.

PO 4. Determine validity and reliability of results of an investigation.

PO 5. Formulate a conclusion based on data analysis.

PO 6. Refine hypotheses based on results from investigations.

PO 7. Formulate new questions based on the results of a previous investigation.

Concept 4: Communication

Communicate results of investigations.

PO 1. Choose an appropriate graphic representation for collected data:

- *line graph*
- *double bar graph*
- *stem and leaf plot*
- *histogram*

(See M07-S2C1-03)

PO 2. Display data collected from a controlled investigation.

(See M07-S2C1-03)

PO 3. Communicate the results of an investigation with appropriate use of qualitative and quantitative information.

(See W07-S3C2-01)

PO 4. Write clear, step-by-step instructions for following procedures (without the use of personal pronouns).

(See W07-S3C3-01)

PO 5. Communicate the results and conclusion of the investigation.

(See W07-S3C6-02)

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Strand 2: History and Nature of Science

Scientific investigation grows from the contributions of many people. History and Nature of Science emphasizes the importance of the inclusion of historical perspectives and the advances that each new development brings to technology and human knowledge. This strand focuses on the human aspects of science and the role that scientists play in the development of various cultures.

Concept 1: History of Science as a Human Endeavor

Identify individual, cultural, and technological contributions to scientific knowledge.

- PO 1. Identify how diverse people and/or cultures, past and present, have made important contributions to scientific innovations (e.g., Rachel Carson [scientist], supports Strand 4; Luis Alvarez [scientist] and Walter Alvarez [scientist], support Strand 6; Percival Lowell [scientist], supports Strand 6; Copernicus [scientist], supports Strand 6).*
- PO 2. Describe how a major milestone in science or technology has revolutionized the thinking of the time (e.g., global positioning system, telescopes, seismographs, photography).*
- PO 3. Analyze the impact of a major scientific development occurring within the past decade.*
- PO 4. Analyze the use of technology in science-related careers.*

Concept 2: Nature of Scientific Knowledge

Understand how science is a process for generating knowledge.

- PO 1. Describe how science is an ongoing process that changes in response to new information and discoveries.*
- PO 2. Describe how scientific knowledge is subject to change as new information and/or technology challenges prevailing theories.*
- PO 3. Apply the following scientific processes to other problem solving or decision making situations:*
- *observing*
 - *questioning*
 - *communicating*
 - *comparing*
 - *measuring*
 - *classifying*
 - *predicting*
 - *organizing data*
 - *inferring*
 - *generating hypotheses*
 - *identifying variables*

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Strand 3: Science in Personal and Social Perspectives

Science in Personal and Social Perspectives emphasizes developing the ability to design a solution to a problem, to understand the relationship between science and technology, and the ways people are involved in both. Students understand the impact of science and technology on human activity and the environment. This strand affords students the opportunity to understand their place in the world – as living creatures, consumers, decision makers, problem solvers, managers, and planners.

Concept 1: Changes in Environments

Describe the interactions between human populations, natural hazards, and the environment.

- PO 1. Analyze environmental risks (e.g., pollution, destruction of habitat) caused by human interaction with biological or geological systems.
- PO 2. Analyze environmental benefits of the following human interactions with biological or geological systems:
- reforestation
 - habitat restoration
 - construction of dams
- PO 3. Propose possible solutions to address the environmental risks in biological or geological systems.

Concept 2: Science and Technology in Society

Develop viable solutions to a need or problem.

- PO 1. Propose viable methods of responding to an identified need or problem.*
- PO 2. Compare solutions to best address an identified need or problem.*
- PO 3. Design and construct a solution to an identified need or problem using simple classroom materials.*
- PO 4. Describe a scientific discovery that influences technology.

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Strand 4: Life Science

Life Science expands students' biological understanding of life by focusing on the characteristics of living things, the diversity of life, and how organisms and populations change over time in terms of biological adaptation and genetics. This understanding includes the relationship of structures to their functions and life cycles, interrelationships of matter and energy in living organisms, and the interactions of living organisms with their environment.

Concept 1: Structure and Function in Living Systems

Understand the relationships between structures and functions of organisms.

No performance objectives at this grade level

Concept 2: Reproduction and Heredity

Understand the basic principles of heredity.

No performance objectives at this grade level

Concept 3: Populations of Organisms in an Ecosystem

Analyze the relationships among various organisms and their environment.

PO 1. Compare food chains in a specified ecosystem and their corresponding food web.

PO 2. Explain how organisms obtain and use resources to develop and thrive in:

- niches
- predator/prey relationships

PO 3. Analyze the interactions of living organisms with their ecosystems:

- limiting factors
- carrying capacity

PO 4. Evaluate data related to problems associated with population growth (e.g., overgrazing, forest management, invasion of non-native species) and the possible solutions.

PO 5. Predict how environmental factors (e.g., floods, droughts, temperature changes) affect survival rates in living organisms.

PO 6. Create a model of the interactions of living organisms within an ecosystem.

Concept 4: Diversity, Adaptation, and Behavior

Identify structural and behavioral adaptations.

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Strand 5: Physical Science

Physical Science affords students the opportunity to increase their understanding of the characteristics of objects and materials they encounter daily. Students gain an understanding of the nature of matter and energy, including their forms, the changes they undergo, and their interactions. By studying objects and the forces that act upon them, students develop an understanding of the fundamental laws of motion, knowledge of the various ways energy is stored in a system, and the processes by which energy is transferred between systems and surroundings.

Concept 1: Properties and Changes of Properties in Matter

Understand physical and chemical properties of matter.

No performance objectives at this grade level

Concept 2: Motion and Forces

Understand the relationship between force and motion.

No performance objectives at this grade level

Concept 3: Transfer of Energy

Understand that energy can be stored and transferred.

No performance objectives at this grade level

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Strand 6: Earth and Space Science

Earth and Space Science provides the foundation for students to develop an understanding of the Earth, its history, composition, and formative processes, and an understanding of the solar system and the universe. Students study the regularities of the interrelated systems of the natural world. In doing so, they develop understandings of the basic laws, theories, and models that explain the world (NSES, 1995). By studying the Earth from both a historical and current time frame, students can make informed decisions about issues affecting the planet on which they live.

Concept 1: Structure of the Earth

Describe the composition and interactions between the structure of the Earth and its atmosphere.

PO 1. Classify rocks and minerals by the following observable properties:

- grain
- color
- texture
- hardness

PO 2. Describe the properties and the composition of the following major layers of the Earth:

- crust
- mantle
- core

PO 3. Explain the following processes involved in the formation of the Earth's structure:

- erosion
- deposition
- plate tectonics
- volcanism

PO 4. Describe how the rock and fossil record show that environmental conditions have changed over geologic and recent time.

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Concept 2: Earth's Processes and Systems

Understand the processes acting on the Earth and their interaction with the Earth systems.

PO 1. Explain the rock cycle.

PO 2. Distinguish the components and characteristics of the rock cycle for the following types of rocks:

- igneous
- metamorphic
- sedimentary

PO 3. Analyze the evidence that lithospheric plate movements occur.

PO 4. Explain lithospheric plate movement as a result of convection.

PO 5. Relate plate boundary movements to their resulting landforms, including:

- mountains
- faults
- rift valleys
- trenches
- volcanoes

PO 6. Describe how earthquakes are measured.

Concept 3: Earth in the Solar System

Understand the relationships of the Earth and other objects in the solar system.

PO 1. Explain the phases of the Moon in terms of the relative positions of the Earth, Sun, and Moon.

PO 2. Construct a model for the relative positions of the Earth, Sun, and Moon as they relate to corresponding eclipses.

PO 3. Explain the interrelationship between the Earth's tides and the Moon.

PO 4. Explain the seasons in the Northern and Southern Hemispheres in terms of the tilt of the Earth's axis relative to the Earth's revolution around the Sun.

PO 5. Identify the following major constellations visible (seasonally) from the Northern Hemisphere:

- Orion
- Ursa Major (Great Bear)
- Cygnus
- Scorpius
- Cassiopeia

PO 6. Explain the relationship among common objects in the solar system, galaxy, and the universe.

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