Science
Curriculum Framework

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Science Curriculum Framework

Archdiocese of Louisville

The *National Science Education Standards (NSES)* are a set of guidelines for science education in elementary and secondary schools. They were established by the National Research Council in 1996.

An understanding of the concepts and processes of science helps create a scientifically literate population who can reason, think creatively, make decisions, and solve problems. Scientific literacy is a necessity for all people.

The *National Science Education Standards* outline what students need to know, understand, and be able to do. Students will achieve understanding in different ways based on their readiness, interests and learning profiles. High expectations, which are developmentally appropriate, engaging, and relevant to the students' lives, are set for all students. Students must be provided with multiple opportunities for inquiry, exploration, and discovery. In turn, they will demonstrate understanding in multiple ways.

The National Science Content Standards are divided into eight categories:

1. Unifying concepts and processes in science
2. Science as inquiry
3. Physical science
4. Life science
5. Earth and space science
6. Science and technology
7. Science in personal and social perspectives
8. History and nature of science

-Presented by the National Academy of Sciences

Important Notes:
Five of the above categories – Physical Science; Life Science; Earth and Space Science; Personal and Social Perspectives; and History and Nature of Science – are content-based standards. Three of the categories—Unifying Concepts and Processes in Science; Science as Inquiry; and Technology – are processes which are infused throughout the five content-based standards.

In the context of this document, K-5 science teachers should use a "broad brush" approach, exposing students to numerous topics over the year and making the learning engaging and hands-on. In grades 6-8, science teachers should go deeper into the subject matter, providing opportunities for application while expecting proficiency and mastery to prepare students for high school.

National Science Content Standards

Grades K - 4	Grades 5 – 8
1) Unifying Concepts and Processes: a. Systems, order, and organization b. Evidence, models, and explanation c. Change, constancy, and measurement d. Evolution and equilibrium e. Form and function	1) Unifying Concepts and Processes: a. Systems, order, and organization b. Evidence, models, and explanation c. Change, constancy, and measurement d. Evolution and equilibrium e. Form and function
2) Science as Inquiry: a. Abilities necessary to do scientific inquiry b. Understandings about scientific inquiry	2) Science as Inquiry: a. Abilities necessary to do scientific inquiry b. Understandings about scientific inquiry
3) Physical Science: a. Properties of objects and materials b. Position and motion of objects c. Light, heat, electricity, and magnetism	3) Physical Science: a. Properties and changes of properties in matter b. Motions and forces c. Transfer of energy
4) Life Science: a. Characteristics of organisms b. Life cycles of organisms c. Organisms and environments	4) Life Science: a. Structure and function in living systems b. Reproduction and heredity c. Regulation and behavior d. Populations and ecosystems e. Diversity and adaptation of organisms
5) Earth and Space Science: a. Properties of earth materials b. Objects in the sky c. Changes in earth and sky	5) Earth and Space Science: a. Structure of the earth system b. Earth's history c. Earth in the solar system
6) Science and Technology: a. Abilities of technological design b. Understandings about science and technology c. Abilities to distinguish between natural and man-made objects	6) Science and Technology: a. Abilities of technological design b. Understandings about science and technology
7) Science in Personal and Social Perspectives: a. Personal health b. Characteristics and changes in populations c. Types of resources d. Changes in environment e. Science and technology in local challenges	7) Science in Personal and Social Perspectives: a. Personal health b. Populations, resources, environments c. Natural hazards d. Risks and benefits e. Science and technology in society
8) History and Nature of Science: a. Science as a human endeavor	8) History and Nature of Science: a. Science as a human endeavor b. Nature and history of science *Source: National Research Council, 1996*

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<tr><th>Academic Expectations</th><th>Kindergarten</th><th>Grade One</th><th>Grade Two</th></tr>
<tr><td rowspan="2">Academic Expectation 1.3
Students make sense of the various things they observe.

Academic Expectation 2.1
Students understand scientific ways of thinking and working and use those methods to solve real-life problems.

Academic Expectation 2.3
Students identify and analyze systems and the ways their components work together or affect each other.

Academic Expectation 2.4
Students use the concept of scales and scientific models to explain the organization and functioning of living and nonliving things and predict other characteristics that might be observed.

Related Academic Expectations:
1.1, 1.2, 1.10, 1.16, 2.10, 3.3, 3.4, 5.1, 5.2, 5.3, 5.4, 5.5, 6.2, 6.3

National Standards: 1a, 1b, 1c, 1d, 1e, 2a, 2b, 3a, 3b, 3c, 6a, 6b, 6c, 7b</td><td>• Properties of matter (e.g., solids, liquids, gases)
• Properties of materials (e.g., clay, cloth, paper, plastic, glass)
• Changes in matter (e.g., condensation, evaporation, precipitation)
• Forces that move objects (e.g., sliding, rolling, magnetism)</td><td>• Characteristics of matter and energy
• Changes in matter
• Forces that affect objects (e.g., pushes, pulls)
• Properties and uses of forces
• Sound: vibrations</td><td>• Forces used to move objects (e.g., gravity, magnets, wind)
• Properties and forces that make work easier
• Sound: volume, pitch
• Sources of light and heat</td></tr>
<tr><td colspan="3">Performance Standards</td></tr>
<tr><td>Teacher’s Notes</td><td>Students will:
• name objects based on their properties - solids, liquids, and gases
• classify objects based on their material properties
• determine the differences between forms of matter
• identify changes in matter
• predict which objects will slide or roll
• investigate and experiment with magnetism</td><td>Students will:
• compare/contrast solids, liquids, and gases
• investigate changes in matter when substances are mixed, cooled, or heated
• identify the forces that affect objects (e.g., pushes, pulls)
• predict the way forces affect the direction of an object’s movement
• recognize that stringed instruments and percussion instruments produce sound through vibrations</td><td>Students will:
• describe forces used to move objects (e.g., wind, gravity, magnets)
• demonstrate how machines help people
• explain how variables change sound, volume, and pitch
• investigate sources of light and heat</td></tr>
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Academic Expectation 2.3
Students identify and analyze systems and the ways their components work together or affect each other.

Academic Expectation 2.39
Students demonstrate an understanding of God as Creator of all things.

Academic Expectation 2.4
Students use the concept of scales and scientific models to explain the organization and functioning of living and nonliving things and predict other characteristics that might be observed.

Academic Expectation 2.5
Students understand that under certain conditions, nature tends to remain the same or move toward a balance.

Academic Expectation 2.6
Students understand how living and nonliving things change over time and the factors that influence the changes.

Academic Expectation 7.1
Students practice respect and care for all creation seeing it as a gift of God’s love.

Related Academic Expectations:
1.1, 1.2, 1.10, 1.16, 2.10, 2.41, 2.58, 2.60, 3.3, 3.4, 4.3, 5.1, 5.2, 5.3, 5.4, 5.5, 6.2, 6.3

National Standards: 1a, 1b, 1c, 1d, 1e, 2a, 2b, 4a, 4b, 4c, 6a, 6b, 6c, 7b, 7d</td><td>• Five senses
• Characteristics of living and nonliving things
• Structures of plants and animals
• Habitats and environments
• God’s creations</td><td>• Living and nonliving things
• Needs of plants and animals
• Ways plants and animals meet their needs
• Stages of plant and animal growth
• Plants and animals and their habitats
• God’s creations</td><td>• Life cycles
• Characteristics of living things
• Needs of living things
• Habitats
• Living and nonliving things over time
• God’s creations</td></tr>
<tr><td colspan="3">Performance Standards</td></tr>
<tr><td>Students will:
• explore a variety of items through the five senses
• identify living and nonliving things
• observe and describe plant and animal life cycles
• classify plants and animals by their structures
• illustrate and label plant and animal structures
• identify environments of plants and animals
• discuss and practice taking care of God’s creations</td><td>Students will:
• classify living and nonliving things
• list needs of plants and animals
• compare ways plants and animals meet their needs
• observe, record, and illustrate the stages of animal growth
• classify similarities and differences in plants, animals, and their habitats
• discuss and practice taking care of God’s creations</td><td>Students will:
• illustrate a life cycle of a plant or an animal
• explain the basic needs of living things
• compare/contrast living things
• compare/contrast different habitats
• predict the variables that will cause change in living and nonliving things over time
• illustrate the diversity of God’s creations</td></tr>
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Academic Expectation 2.5
Students understand that under certain conditions, nature tends to remain the same or move toward a balance.

Academic Expectation 7.1
Students practice respect and care for all creation seeing it as a gift of God’s love.

Related Academic Expectations:
1.1, 1.2, 1.10, 1.16, 2.10, 2.19, 2.41, 2.60, 3.3, 3.4, 5.1, 5.2, 5.3, 5.4, 5.5, 6.2, 6.3

National Standards: 1a, 1b, 1c, 1d, 1e, 2a, 2b, 3b, 5a, 5b, 5c, 6a, 6b, 6c, 7b, 7d, 7e</td><td>• Seasonal changes
• Environmental changes
• Weather systems
• Simple weather instruments
• Earth components (e.g., land, air, water)
• Solar system
• God’s creations</td><td>• Weather patterns
• Daily and seasonal weather
• Weather instruments
• Water cycle
• Conservation
• Day and night
• God’s creations</td><td>• Energy of the Sun
• Changes in the sky
• The Moon
• Rocks, minerals, and other natural resources
• Fossils
• Weathering
• Conservation
• God’s creations</td></tr>
<tr><th colspan="3">Performance Standards</th></tr>
<tr><td>Students will:
• identify four seasons
• observe and measure seasonal changes
• recognize events that determine relationships between living things
• compare/contrast different types of weather
• identify and observe weather instruments
• create weather instruments
• distinguish and investigate the Earth as land, air, and water
• identify planetary bodies in the solar system
• monitor the changes of the Sun and the Moon and their effects on the Earth
• distinguish the parameters of day and night
• identify examples of God’s creations</td><td>Students will:
• analyze ways people, plants, and animals respond to weather patterns
• observe and record changes in weather using weather instruments
• illustrate the water cycle
• propose a plan to reduce, reuse, and recycle
• describe the causes of day and night
• dramatize/illustrate examples of caring for God’s Earth</td><td>Students will:
• analyze how the energy of the Sun affects living things
• relate changes in the sky to their causes
• observe and record weather patterns
• illustrate or dramatize a Moon cycle
• classify rocks, minerals, and other natural resources
• determine ways fossils provide evidence about plants and animals that lived long ago
• investigate ways weathering changes the surface of the Earth
• design and implement a conservation plan to preserve God’s creations</td></tr>
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Academic Expectation 2.3
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Academic Expectation 2.39
Students demonstrate an understanding of God as Creator of all things.

Academic Expectation 2.6
Students understand how living and nonliving things change over time and the factors that influence the changes.

Academic Expectation 3.2
Students demonstrate the ability to maintain a healthy lifestyle.

Academic Expectation 7.1
Students practice respect and care for all creation seeing it as a gift of God’s love.

Related Academic Expectations:
1.1, 1.2, 1.10, 1.16, 2.10, 2.29, 2.31, 3.3, 3.4, 4.1, 4.2, 5.1, 5.2, 5.3, 5.4, 5.5, 6.2, 6.3

National Standards: 1a, 1b, 1c, 1e, 2a, 2b, 4a, 4b, 4c, 6a, 6b, 7a, 7c, 7d, 8a</td><td>• Personal health, wellness, and safety
• Major body parts
• Healthy choices (e.g., diet, nutrition)</td><td>• Nutrition and growth
• Health and safety maintenance
• Major organs of the body</td><td>• Five senses and sense organs
• Food Guide Pyramid
• Health and safety maintenance</td></tr>
<tr><th colspan="3">Performance Standards</th></tr>
<tr><td>Students will:
• describe how germs are spread
• explain and dramatize emergency procedures for personal safety
• identify and practice proper dental hygiene
• demonstrate and participate in healthy movements
• describe and model the function of body parts
• clarify and rationalize healthy choices
• investigate the connection between nutrition and growth</td><td>Students will:
• identify a proper nutrition plan, an exercise plan, and sleep needs
• recognize healthy food choices that contribute to good nutrition and growth
• discuss good safety habits
• identify and explain the functions of the major organs</td><td>Students will:
• explain ways sense organs help us learn about our environment
• utilize a food pyramid to implement a proper nutrition and exercise plan
• explain health and safety care</td></tr>
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National Standards: 1a, 1b, 1c, 1d, 1e, 2a, 2b, 6a, 6b, 6c, 7e, 8a</td><td>• Qualities of a scientist
• Qualities of an inventor
• Scientific method of problem solving</td><td>• Science as a career
• Inquiry in experimentation</td><td>• Contributions made by scientists
• Technology for scientific research
• Technology in scientific inventions
• Scientific inquiry in simple experiments</td></tr>
<tr><td colspan="3">Performance Standards</td></tr>
<tr><td></td><td>Students will:
• research famous scientists
• investigate characteristics of scientists
• research famous inventors
• investigate characteristics of inventors
• explore a scientific method of problem solving
• experiment utilizing a scientific method of problem solving</td><td>Students will:
• investigate scientific careers
• conduct science inquiry by using a scientific method</td><td>Students will:
• investigate inventions and their impact
• utilize technology to acquire information
• explain how technology has improved the quality of life
• conduct science inquiry by using a scientific method</td></tr>
<tr><td colspan="4">Teacher’s Notes</td></tr>
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Essential Understandings	Guided Questions
2.1 and 2.4	
• Properties define living and nonliving things.	• What do our senses tell us about our environment? • How are properties of living and nonliving things different? • How can properties be used to sort and compare objects and events? • How do heat and light from the Sun affect living and nonliving things?
• Measurement describes properties and events.	• How does the weather change throughout the year? • How do people measure objects and events?
• Models organize and represent ideas about the world**.**	• How do graphs and charts show patterns and changes in the environment?
2.2 and 2.3	
• Systems consist of interactive parts.	• How do parts of a whole work together? • How does change in one part of the system affect the whole?
2.5 and 2.6	
• Living things interact with their environment.	• How are plants and animals interdependent?
• Natural processes and human activity cause change.	• How do plants, animals, and people change their environment? • What effect does weather have on living and nonliving things? • What causes matter to change? • What are the patterns in the life cycles of plants and animals? • What are examples of changes that occur rapidly and slowly?
2.31	
• A healthy lifestyle is the responsibility of the individual.	• How do you maintain a safe and healthy lifestyle? • What are examples of healthy nutritional choices? • What are examples of healthy activities?
7.1	
• All creation is a gift from God.	• What gifts from God are observed in the world? • How do we utilize the gifts from God in our daily lives? • How do you show respect for God's creations?

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Essential Processes and Skills			
Thinking and Learning	**Communicating**	**Collaborating**	**Connecting and Applying**
Conduct scientific investigations • Ask questions about objects, organisms, and events in the environment (scientific inquiry) • Plan and conduct a simple investigation • Utilize simple equipment and tools to gather data and extend the senses	**Use listening, observing, reading, writing and oral language to obtain and share science information** • Use data to construct a reasonable explanation • Communicate investigations and explanations • Use different instruments such as magnifiers, thermometers, and computers for measuring, observing, and recording	**Work with others to undertake investigations and presentations** • Work effectively in small and large groups • Demonstrate responsibility when working in a group	**Interpret and apply science as used in the world** • Determine ways science is used in daily life • Investigate ways scientific issues impact individual lives

Suggested Topics of Study		
Kindergarten	**Grade One**	**Grade Two**
• Matter and Materials • Water Cycle • Force • Senses • Living and Nonliving Things • Plants • Animals • Habitats • Seasons • Environmental Changes • Weather • Solar System • Personal Perspectives • Scientists and Inventors • Scientific Method	• Matter • Forces • Magnetism • Motion • Sound • Living and Nonliving Things • Plant Characteristics • Animal Characteristics • Habitats • Life Cycles • Weather • Water Cycle • Conservation • Sun: Day and Night • Landforms and Rocks • Healthy Living • Food Pyramid • Major Organs	• Forces • Gravity and Magnetism • Heat and Light • Sound • Matter • Plant Classification • Animal Classification • Animal and Plant Adaptations • Features of Habitats • Life Cycles • Sun, Moon, Stars, and Planets • Rocks and Minerals • Weathering • Earth's Resources • Dinosaurs and Fossils • Endangered and Extinct Animals • Environmental Changes • Conservation • Senses • Food Pyramid • Health and Safety • Scientific Inquiry

Suggested Technology / Library Media

- Organize data using a database (e.g., Excel, Access)
- Create models from graphic and/or writing software
- Conduct research using electronic and/or print media
- Use laboratory resources and equipment
- Videotape student performances
- Use word processing programs to communicate information
- Research information using a variety of print materials
- Participate in the observation and creation of multimedia presentations
- Show videos and video clips
- Engage in activities using an interactive white board
- Engage in activities using a question/response system
- Research information using Web-quests
- Research information with appropriate websites

Examples of Assessments

Pre- and post-assessments
Rubrics
Portfolio entries
Writing pieces
Self and peer evaluations
Graphic organizers
Anecdotal observation checklists
Written presentations
Illustrations
PowerPoint presentations
Cooperative group projects
Interviews
Oral presentations
Performance presentations/experiments
Drama or role play
Constructions (models)

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Students understand scientific ways of thinking and working and use those methods to solve real-life problems.

Academic Expectation 2.2
Students identify, analyze, and use patterns such as cycles and trends to understand past and present events and predict possible future events.

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Academic Expectation 2.4
Students use the concept of scale and scientific models to explain the organization and functioning of living and nonliving things and predict other characteristics that might be observed.

Academic Expectation 2.41
Students recognize the interconnectedness of humans with all creation.

Academic Expectation 2.5
Students understand that under certain conditions, nature tends to remain the same or move toward a balance

Related Academic Expectations:
1.1, 1.16, 3.3, 4.1, 5.2, 6.3

National Standard:
1a, 1e, 2a, 3a, 3b, 3c, 6b, 6c</td><td>• Matter: properties of solids, liquids, and gases; changes in matter, structure and movement of molecules
• Forces and motion
• Energy: heat (conduction, insulation); light (sources, properties); sound (vibration, transmission, amplification)
• Magnets: properties</td><td>• Properties of matter: states, measurement, classification, changes
• Forces and motions: pushes and pulls
• Properties and uses of magnets
• Electricity: sources, properties, Resources, and new technologies
• Light: lenses, spectrum of color, prisms
• Simple machines: types and uses</td><td>• Matter: properties, physical and chemical changes
• Forces: properties and application, Newton’s Laws
• Energy: kinetic, potential, sound, light, thermal
• Electricity: sources, properties, simple and complex circuits, relationships to magnetism
• Simple machines</td></tr>
<tr><td colspan="3">Performance Standards</td></tr>
<tr><td></td><td>Students will:
• identify states of matter by providing examples, comparing and contrasting, and modeling
• identify or demonstrate work
• explain uses and transfer of energy (e.g., process of heat transfer)
• describe the components of an electrical circuit
• identify sources of light
• describe properties of sound
• demonstrate how sound is produced by vibrating objects
• explain how sound is transmitted and amplified
• explore the properties of magnets</td><td>Students will:
• classify states of matter
• predict and observe changes in matter
• describe and measure motion
• demonstrate pushes and pulls
• describe properties of magnets and their poles
• predict types of materials attracted to or repelled by magnets
• observe and evaluate results of electricity and light under a variety of conditions
• construct simple machines and demonstrate their uses</td><td>Students will:
• distinguish between physical and chemical changes
• explore ways force and effort combine to get work accomplished with or without machines
• identify real-life situations in which Newton’s Laws apply
• compare and contrast kinetic and potential energy
• examine sound, light, and thermal energy
• identify, demonstrate, or construct circuits
• examine applications of relationships between magnetism and electricity
• explain applications of simple machines</td></tr>
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Academic Expectation 2.6
Students understand how living and nonliving things change over time and the factors that influence the changes.

Academic Expectation 2.60
Students exercise responsible stewardship toward all creation.

Related Academic Expectations:
1.1, 3.3, 4.1, 5.1, 6.3, 7.1

National Standard: 1 a, 1b, 1c, 1d, 1e, 2a, 2b, 4 a, 4b, 4c, 6 b, 6c, 7a, 7b, 7c, 7d, 8a</td><td>• Cell as the basic unit of life
• Animals: habitats, needs for survival, types, and life cycles
• Plants: needs for survival, life cycle, photosynthesis, structure
• Interrelationship of plants and animals (e.g., food chain/web)</td><td>• Living things: classification, cell, structure, ecosystem
• Food chain
• Animal kingdom: classifications, adaptations and survival, life cycles, inherited and learned characteristics
• Plant kingdom: structure, function, adaptations, life cycle, photosynthesis
• Body systems</td><td>• Cells: single cell and multi-cellular organisms, functions of cells
• Animal kingdom: body systems, life cycle
• Plant kingdom: classification, structure, life cycle
• Food chain and food web
• Biomes
• Ecosystems
• Body systems</td></tr>
<tr><td colspan="3">Performance Standards</td></tr>
<tr><td></td><td>Students will:
• identify basic parts of animal and plant cells
• compare/contrast features and characteristics of living things in various habitats
• describe survival adaptations of plants and animals
• analyze life cycles of living things
• explore relationships between plants and animals</td><td>Students will:
• compare and contrast structure and function of plant cells and animal cells
• analyze food chains to determine relationships between plants and animals
• investigate the animal kingdom: characteristics, examples, similarities, and differences
• distinguish between inherited and learned characteristics
• explain plant structure, parts, and their functions (e.g., model, diagram, experiment)
• illustrate the process of photosynthesis to show how plants use energy to make sugars
• list factors that influence plant and animal adaptations
• give examples and influencing factors of endangerment and/or extinction
• identify parts and purpose of body systems</td><td>Students will:
• examine characteristics of single cell and multi-cellular organisms
• explain components of plant and animal life cycles
• utilize food chains and food webs to examine the relationships between plants and animals
• determine the roles of the various components of a food chain or food web
• locate and identify characteristics of biomes
• analyze the relationships among living and nonliving organisms in an ecosystem
• identify parts and purpose of body systems</td></tr>
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National Standards:
1a, 1b, 1c, 1d, 1e, 2a, 2b, 5a, 5b, 5c, 6a, 6b, 6c, 7a, 7b, 7c, 7d, 7e, 8a</td><td>• Rocks and minerals
• Landforms: types, characteristics, locations
• Solar system: Sun, Moon, planets, and stars
• Rotation and revolution of Earth and Moon in relation to seasonal changes</td><td>• Water cycle: impact on weather
• Weather: patterns, seasons, instruments, predictions
• Earth structure: erosion, weathering, changes, rocks and minerals, water
• Solar system: Earth, Sun, Moon, objects in space, movements, and cycles</td><td>• Water: sources, precipitation, evaporation, condensation
• Weather: patterns, climate, atmosphere
• Earth structure: minerals, rocks, rock cycle, erosion, weathering
• Conservation: soil, water, resources, alternative energy
• Fossils
• Solar system: objects in space, movements, cycles</td></tr>
<tr><td colspan="3">Performance Standards</td></tr>
<tr><td>Students will:
• identify characteristics of rocks and minerals
• identify types and characteristics of landforms
• illustrate positions and motion of Sun, Moon, planets, and stars over time
• predict seasonal changes as a result of the movement of the Earth</td><td>Students will:
• evaluate the impact of the water cycle on weather, agriculture, social/cultural behavior
• predict the influence of various factors on seasonal and weather changes
• utilize weather instruments and analyze weather maps
• identify changes to the Earth’s structure over time
• compare and contrast characteristics and uses of rocks and minerals
• identify objects in space
• examine relationships among objects in space</td><td>Students will:
• identify sources of water
• demonstrate the water cycle
• analyze the impact of severe weather
• examine the impact of human activity on climate changes
• describe local and global patterns of atmospheric conditions
• compare/contrast rocks, minerals, and fossils
• describe the rock cycle
• analyze factors that influence/impact land use (e.g., erosion, weather, agriculture, politics)
• explore the value of conservation and uses of alternative energy
• integrate conservation into personal lifestyle
• explore the creation of fossils over time
• analyze the formation and structure of components of the solar system</td></tr>
</table>

<table>
<tr><th colspan="4">Content Guidelines: Science in Personal and Social Perspectives</th></tr>
<tr><th>Academic Expectations</th><th>Grade Three</th><th>Grade Four</th><th>Grade Five</th></tr>
<tr><td rowspan="3">Academic Expectation 2.1
Students understand scientific ways of thinking and working and use those methods to solve real-life problems.

Academic Expectation 2.2
Students identify, analyze, and use patterns such as cycles and trends to understand past and present events and predict possible future events.

Academic Expectation 2.3
Students identify and analyze systems and the ways their components work together or affect each other.

Academic Expectation 2.41
Students recognize the interconnectedness of humans with all creation.

Academic Expectation 2.5
Students understand that under certain conditions, nature tends to remain the same or move toward a balance.

Academic Expectation 2.6
Students understand how living and nonliving things change over time and the factors that influence the changes.

Academic Expectation 2.60
Students exercise responsible stewardship toward all creation.

Academic Expectation 3.2
Students demonstrate the ability to maintain a healthy lifestyle.

Related Academic Expectations:
1.1, 3.3, 4.1, 5.1, 6.3, 7.1

National Standards:
1a-e, 2a, 2b, 6b, 6c, 7 a-e, 8a</td><td>• Nutrition; food pyramid, personal food choices, sanitary food practices
• Personal hygiene and dental care
• Safety rules (e.g., water safety, telephone use, Internet use)
• Conservation of resources</td><td>• Wellness and disease prevention
• Environmental disasters: natural (e.g., earthquakes, volcanoes, weather), and man-made (e.g., improper uses of natural resources)</td><td>• Wellness and disease prevention: immunizations; health practices; safety rules; drug, alcohol and tobacco
• Conservation of resources</td></tr>
<tr><td colspan="3">Performance Standards</td></tr>
<tr><td>Students will:
• compare healthy and unhealthy foods
• create a personal menu using the food pyramid
• investigate ways to improve food selections and safety rules at school
• explain reasons for sanitary food practices and personal care
• demonstrate safety rules and their purposes
• determine methods of conservation at home, school, or other environments</td><td>Students will:
• identify practices that encourage wellness and disease prevention
• describe a recent environmental disaster and analyze the impact on humans, plants, and animals
• distinguish between natural and man-made environmental disasters</td><td>Students will:
• analyze the effects of accidents, disasters, and epidemics where safety and health laws were violated
• analyze the implications of drug, alcohol, and tobacco use
• evaluate the impact of conservation on natural resources
• investigate efforts or practices that impact land use, planning, and conservation</td></tr>
</table>

<table>
<tr><th colspan="4">Content Guidelines: History and Nature of Science</th></tr>
<tr><th>Academic Expectations</th><th>Grade Three</th><th>Grade Four</th><th>Grade Five</th></tr>
<tr><td rowspan="3">Academic Expectation 2.1
Students understand scientific ways of thinking and working and use those methods to solve real-life problems.

Academic Expectation 2.3
Students identify and analyze systems and the ways their components work together or affect each other.

Academic Expectation 2.41
Students recognize the interconnectedness of humans with all creation.

Academic Expectation 2.60
Students exercise responsible stewardship toward all creation.

Related Academic Expectations:
1.1, 3.3, 4.1, 5.1, 6.3, 7.1

National Standards:
1c, 1d, 1e, 2a, 2b, 7d, 7e, 8a</td><td>• Science as a career
• Contributions made by scientists</td><td>• Contributions made by scientists
• Future applications of science (e.g., medicine, engineering)</td><td>• Future applications of science (e.g., medicine, engineering)
• Climate and global changes</td></tr>
<tr><th colspan="3">Performance Standards</th></tr>
<tr><td>Students will:
• identify and research careers in science (e.g., medicine, engineering, aeronautics, manufacturing, research)
• research/report on famous scientists and their contributions</td><td>Students will:
• research/report on famous scientists and their contributions (e.g., Newton’s theory of gravity, Wegener’s continental drift theory, Curie’s work in radiation, Galileo’s work with constellations/stars, Rachel Carson’s work with environmental issues)
• analyze future applications of science and evaluate the effects on society and the environment</td><td>Students will:
• research trends/events in science (e.g., biotechnology, medical research)
• evaluate factors that influence global changes (e.g., global warming, ozone layer, satellite technology)</td></tr>
</table>

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Essential Understandings	Guided Questions
2.1 and 2.4 • Properties characterize objects, organisms, substances, and materials. • Scientific ways of thinking and working can be used to solve real-life problems. • Science and technology are interrelated and can be used to further the study of scientific models and explanations.	• How are properties such as height, weight, and density used to measure, sort, classify, and describe organisms and materials? • How do properties of living and nonliving materials determine their uses? • How does the unique design of an organism enable survival in a specific environment? • How can properties be used to describe or predict an event? • What new sources of energy can be made readily available using advanced technologies? • How do fossil records show patterns of change over time?
2.2 and 2.3 • Some systems have cycles and trends that can be used to understand past and present events or predict future events. • Systems consist of organized groups of interrelated parts.	• What are the components of an ecosystem and how do variables affect the success of a system? • How do the parts of living systems work together to sustain life? • How can cycles and patterns be used to understand history or predict future events? • How is energy changed and maintained in various systems? • What is required for a particular system to function effectively? • How do forces within the environment impact living and nonliving things?
2.5 and 2.6 • Natural processes and human activity cause change over time. • Factors such as cycles and stages influence the rate at which living and nonliving things experience change.	• What are the factors that enable some species to survive while others become extinct or endangered? • How does the life cycle of a plant or animal support the continuation of that species? • How do simple machines make work easier? • How can properties of electricity and light be used to describe experiences with electric current and light? • How do tools and technology help scientists make better observations of change and measurement?
2.41 • Students recognize the interconnectedness of humans with all creation.	• How does the survival of one species affect the existence or survival of another species in an ecosystem? • How would a major change in weather affect humans and their communities? • What is the impact to an ecosystem when a species becomes extinct?
3.2 • Students demonstrate the ability to maintain a healthy lifestyle.	• What affect does illegal drug use have on a person, the family, and a community? • What is the role of good nutrition in a healthy lifestyle? • How does exercise affect mental, physical, and emotional health? • What are some occupations or practices that endanger the life of an individual?

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Essential Processes and Skills			
Thinking and Learning	**Communicating**	**Collaborating**	**Connecting and Applying**
Conduct scientific investigations • Ask questions that can be answered through scientific investigations (scientific inquiry) • Design, conduct, and evaluate a scientific investigation • Use appropriate tools and techniques to gather, analyze, and interpret data • Recognize and analyze alternative explanations and predictions • Design, implement, and evaluate a solution or product	**Use listening, observing, reading, writing, and oral language to obtain and share science information** • Develop descriptions, explanations, predictions, and models using evidence • Communicate scientific procedures and explanations	**Work with others to undertake investigations and presentations** • Work effectively in small and large groups • Demonstrate responsibility when working in a group	**Interpret and apply science as used in the world** • Recognize contributions to science and technology by many peoples and cultures

Suggested Topics of Study		
Grade Three	**Grade Four**	**Grade Five**
• States of Matter • Sources of Energy • Cells • Animals • Plants • Rocks and Minerals • Landforms • Solar System • Nutrition and Safety • Natural Resources • Science Careers • Technology Applications	• Properties of Matter • Forces and Motion • Magnets and Electricity • Light • Simple Machines • Animal Kingdom • Animal Adaptations • Plant Kingdom • Body Systems • Water • Weathering and Erosion • Solar System • Famous Scientists • Technology Applications	• Matter • Work and Force • Energy and Electricity • Simple Machines • Cells • Animal Kingdom • Plant Kingdom • Body Systems • Water • Climate and Global Change • Minerals, Rocks, and Fossils • Rock Cycle • Land Use and Conservation • Personal Wellness • Technology Applications

Suggested Applications for Technology / Library Media

- Represent information graphically using charts, tables, and graphs
- Utilize appropriate videos, video clips, presentation software, or projection devices to display information
- Conduct research and gather data using electronic and/or print media (encyclopedias, almanacs, atlases, or periodicals)
- Demonstrate results of experimentation and access key information by using the interactive white board
- Assess using a classroom response system
- Gather information through the use of a global positioning system
- Retrieve information using Web-quests
- Access appropriate websites to gather data and information
- Calculate measurement with electronic tools (sensors, thermometers, barometers, light meters)

Examples of Assessments

Pre- and post-assessments	Debates	Video productions
PowerPoint presentations	Persuasive essays	Multiple choice assessments
Student-created museums	Interviews	Dramatizations
Oral presentations	Informative essays	Open response questions
Graphic organizers	R-A-F-T writing	Mobiles
Dioramas and models	Descriptive essays	Brochures
K-W-L charts	Collages, posters	Group projects
Speeches	Summaries	Diagrams
3-2-1 writing activities	Readers' Theatre	Art, dance, and music performances
Expository essays	Exit tickets	

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Academic Expectations	Content Guidelines: Grade Six/Earth and Space Science
Academic Expectation 2.1 Students understand scientific ways of thinking and working and use those methods to solve real-life problems. **Academic Expectation 2.2** Students identify, analyze, and use patterns such as cycles and trends to understand past and present events and predict possible future events. **Academic Expectation 2.3** Students identify and analyze systems and the ways their components work together or affect each other. **Academic Expectation 2.4** Students use the concept of scale and scientific models to explain the organization and functioning of living and nonliving things and predict other characteristics that might be observed. **Academic Expectation 2.5** Students understand that under certain conditions, nature tends to remain the same or move toward a balance. **Academic Expectation 2.6** Students understand how living and nonliving things change over time and the factors that influence the changes. **Related Academic Expectations:** 1.1, 1.2, 1.3, 1.10, 1.16, 2.10, 2.60 **National Standards:** 1a, 1b, 1c, 2a, 2b, 3a, 5a, 5b, 5c, 6b, 7b, 7c, 7d, 8b, 8c	Science as inquiry • Scientific methods • Laboratory safety Rocks and minerals • Characteristics, composition, identification, uses • Rock cycle Renewable and nonrenewable sources of energy • Types, uses, advantages/disadvantages Changing surface of the Earth • Weathering and soil formation • Layers of the Earth • Erosion and deposition: gravity, wind, water • Plate tectonics: continental drift, seafloor spreading, plate tectonic theory • Earthquakes and volcanoes: causes and effects on people **Performance Standards** Students will: • describe a scientific method • describe characteristics and physical properties of rocks and minerals • explain the formation of rocks and minerals • explore uses of rocks and minerals • explain the rock cycle • categorize renewable and nonrenewable sources of energy • determine the uses of various resources • explain the advantages/disadvantages of resources • describe the difference between mechanical and chemical weathering • explain effects of climate on weathering • organize and describe factors that affect the development of soil • explain differences between erosion and deposition • identify and explain types of mass movement caused by gravity • explain how wind causes deflation and abrasion • assess ways water erodes the surface of the Earth • describe evidence of glacial erosion and deposition • explain the hypothesis of continental drift (e.g., Pangaea) • define seafloor spreading • analyze the theory of plate tectonics • evaluate the effects of earthquake movement, the strengths, and the effects on people • describe the conditions that cause volcanoes, their relationship to the moving plates on Earth, and the effects on people

Academic Expectations	Content Guidelines: Grade Six/Earth and Space Science
	Geologic time • Formation of fossils • Ages of rocks: relative and absolute • Life in geologic time: time scale Air and water • Atmosphere of the Earth: makeup, energy transfer, and air movement • Weather: factors, patterns, forecast instruments • Climate: factors, types, and changes • Ocean: development of water, currents, waves and tides
	Performance Standards
	Students will: • describe several processes of fossil formation • interpret methods used to assign relative ages to rock layers • determine how absolute age differs from relative age • organize geologic time into units and categorize important events in each unit • analyze the structure of the atmosphere of the Earth (e.g., gases) • explain the cause of air pressure • compare and contrast radiation, conduction, and convection • explain what happens to energy the Earth receives from the Sun • analyze and demonstrate the water cycle • analyze the relationships between doldrums, trade winds, prevailing westerlies, polar easterlies, and jet streams • identify factors that influence weather • describe how weather is associated with fronts and high and low pressure areas • discuss dangers of severe weather • identify and explain how data is collected for weather maps and forecasts • determine which factors influence climate • describe the different types of climatic regions • identify the origin of water in the oceans • identify the forces that cause surface currents and deep currents • describe the characteristics of waves and tides and how they form

Academic Expectations	Content Guidelines: Grade Six/Earth and Space Science
	Astronomy • Exploring space: telescopes, satellites, probes, space missions, space stations • Earth and Moon: rotation, revolution, phases, and eclipses • Solar system: inner and outer planets, comets, meteors, and asteroids • Stars and galaxies: constellations, evolution of stars, types of galaxies
	Performance Standards
	Students will: • explore past, present, and future instruments for collecting data about our solar system • discuss rotation and revolution of the Earth and Moon and how they cause moon phases and eclipses • compare and contrast the inner and outer planets • construct a constellation and explain the associated mythology • describe how a star evolves • identify the three main types of galaxies
Teacher's Notes	

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Academic Expectations	Content Guidelines: Grade Seven/Life Science
Academic Expectation 2.1 Students understand scientific ways of thinking and working and use those methods to solve real-life problems. **Academic Expectation 2.2** Students identify, analyze, and use patterns such as cycles and trends to understand past and present events and predict possible future events. **Academic Expectation 2.3** Students identify and analyze systems and the ways their components work together or affect each other. **Academic Expectation 2.4** Students use the concept of scale and scientific models to explain the organization and functioning of living and nonliving things and predict other characteristics that might be observed. **Academic Expectation 2.41** Students recognize the interconnectedness of humans with all creation. **Academic Expectation 2.5** Students understand that under certain conditions, nature tends to remain the same or move toward a balance. **Academic Expectation 2.6** Students understand how living and nonliving things change over time and the factors that influence the changes. **Academic Expectation 2.60** Students exercise responsible stewardship toward all creation. **Related Academic Expectations:** 1.1, 1.2, 1.3, 1.10, 1.16, 2.10, 2.29, 2.31, 3.2 **National Standards:** 1a, 1b, 1c, 1d, 1e, 2a, 2b, 3c, 4a, 4b, 4c, 4d, 4e, 7a, 7b, 7c, 7d, 7e, 8a, 8b	• Science as inquiry: scientific methods and measuring using SI units • Characteristics of life and classification of organisms: cell structure, types of living things, cell processes • Body systems: structure and function of vital organs and systems • Structure and function of organisms in six kingdoms • Molecular basis of heredity and inheritance of traits • Diversity, adaptations, and evolution of organisms • Interdependence of organisms within ecosystems and awareness of the balance of life • Personal health and wellness • Discoveries in the life sciences and impact on human society • Chronological and biographical information about key people, places, and events in life sciences **Performance Standards** Students will: • design and conduct experiments using a scientific method • construct an appropriate representation of collected data • identify all cell organelles and relate the structure to the function of each organelle • justify the categorization of an object as an organism • demonstrate knowledge of osmosis, diffusion, active/passive transport, and anaerobic/aerobic respiration • classify any given organism into one of the six kingdoms based on structure and function • relate structure to function of the major body organs • analyze how the vital body systems work together • describe the structure and function of DNA and the role in heredity and biological evolution • construct a food chain and/or food web indicating the flow of energy throughout • analyze and evaluate the effects that environmental decisions have on food chains/webs, cycles, and organisms in an ecosystem • develop a plan for personal wellness and a healthy lifestyle • analyze the significant contributions that people have made in the life sciences throughout history

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Academic Expectations	Content Guidelines: Grade Eight/Physical Science
Academic Expectation 2.1 Students understand scientific ways of thinking and working and use those methods to solve real-life problems. **Academic Expectation 2.2** Students identify, analyze, and use patterns such as cycles and trends to understand past and present events and predict possible future events. **Academic Expectation 2.3** Students identify and analyze systems and the ways their components work together or affect each other. **Academic Expectation 2.4** Students use the concept of scale and scientific models to explain the organization and functioning of living and nonliving things and predict other characteristics that might be observed. **Academic Expectation 2.5** Students understand that under certain conditions, nature tends to remain the same or move toward a balance. **Academic Expectation 2.6** Students understand how living and nonliving things change over time and the factors that influence the changes. **Related Academic Expectations:** 1.1, 1.2, 1.3, 1.10, 1.16, 2.10, 2.60 **National Standards:** 1a, 1b, 1c, 1d, 2a, 2b, 3a, 3b, 3c, 6a, 6b, 8a, 8b	• Science as inquiry: scientific methods, models, and measurement • Mathematics to support all aspects of scientific inquiry • Physical and chemical properties of matter • Structure of the atom • Organization of elements on the periodic table • Chemical bonds and reactions • Conservation of mass • Motion and forces as they affect objects in the universe • Energy transformation and energy transfer • Technological design • Discoveries in the physical and chemical sciences and impact on human society • Chronological and biographical information about key people, places, and events in physical sciences **Performance Standards** Students will: • design, conduct, and critique experiments • determine the appropriate method for presenting data • compare and contrast the states of matter in terms of the kinetic theory • describe atomic structures • use the periodic table to predict physical and chemical properties of matter • identify covalent, ionic, and hydrogen bonding and write the resulting formulas • express a chemical reaction by using a balanced equation • identify chemical and physical properties of acids, bases, salts, and special compounds • describe physical relationships (e.g., displacement, time, distance, acceleration, velocity, speed, gravity, mass) • use mathematical formulas to calculate and graph physical relationships • state Newton's Laws and apply to forces and motions • use the Law of Conservation of Energy to explain energy transfer/transformation in systems • identify qualitative and measure quantitative relationships associated with energy (e.g., change in temperature, calculation of kinetic and potential energy) • design, engineer, and evaluate a solution to a problem • analyze the significant contributions of people throughout history in the physical sciences
Teacher's Notes	

Essential Understandings	Guided Questions
2.3 Systems consist of organized groups of interactive and related elements that form a whole.	• What laws explain how a system is organized and functions? • How do systems at different levels of organization manifest different properties and functions? • Why are classification systems used? • How are systems interactive and interdependent?
2.4 Evidence consists of observations and data on which to base scientific explanations. Models organize and represent ideas about the world.	• How are observations, data, and models used to describe processes and represent interactions within a system? • How are observations, data, and models used to make predictions? • How are models used to represent events over time? • What are strengths and limitations of a model?
2.3 Measurement expresses properties on a numerical scale and changes can be quantified. Most things are in the process of changing; however, some properties of objects and processes are characterized by constancy.	• How are instruments and laboratory procedures used with SI? • What factors cause change? • How is energy transferred/transformed within systems? • How does the energy of the Sun affect biological and physical relationships on Earth?
2.2, 2.3, and 2.6 Changes over time account for the structure and function of objects and organisms in the natural and designed world. Equilibrium is a state in which changes occur in opposite and off-setting directions.	• How did objects, organisms, and systems develop their present structure? • How is equilibrium maintained?
2.3 Structure and function are complementary aspects of objects, organisms, and systems in the natural and designed world.	• How does the structure of an object, organism, or system relate to its use, operation, or function?
2.1 Science is a process of inquiry.	• How do scientists acquire new knowledge?

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Essential Processes and Skills			
Thinking and Learning	**Communicating**	**Collaborating**	**Connecting and Applying**
Conduct scientific investigations • Ask questions that can be answered through scientific investigations (scientific inquiry) • Design, conduct, and evaluate a scientific investigation • Use appropriate tools and techniques to gather, analyze, and interpret data • Recognize and analyze alternative explanations and predictions • Design, implement, and evaluate a solution or product	**Use listening, observing, reading, writing, and oral language to obtain and share science information** • Develop descriptions, explanations, predictions, and models using evidence • Communicate scientific procedures and explanations	**Work with others to undertake investigations and presentations** • Work effectively in small and large groups • Demonstrate responsibility when working in a group	**Interpret and apply science as used in the world** • Locate and use a variety of resources, tools, and technologies for designing/developing products • Apply skills and academic knowledge in home, school, and community settings

Suggested Topics of Study		
Grade Six	**Grade Seven**	**Grade Eight**

Earth and Space Science
• Scientific Methodology
• Rocks and Minerals
• Renewable and Nonrenewable Energy
• Changing Surface of the Earth
• Geologic Time
• Air and Water of the Earth
• Astronomy
	Life Science
	• Structure and Function of Living Systems
	  • Cell Biology and Processes
	  • Organization of Living Things
	  • Six Kingdoms
	  • Body Systems
	• Reproduction and Heredity
	  • Plant and Animal Reproduction
	  • Genetics
	• Regulation and Behavior
	  • Homeostasis
	  • Plants and Animals
	  • Populations and Ecosystems
	  • Interdependence of Organisms and Abiotic Factors
	  • Transfer of Energy
	• Diversity and Adaptations of Organisms
	  • Biological Evolution
	  • Extinction
		Physical Science
		• Properties and Changes of Properties in Matter
		  • States of Matter
		  • Physical and Chemical Properties
		  • Structure of the Atom
		  • Chemical Bonds and Reactions
		  • Periodic Table
		  • Conservation of Mass
		• Motions and Forces
		  • Measurements of Position and Motion
		  • Newton's Laws
		• Energy
		  • Types of Energy
		  • Transfer of Energy
		  • Energy Transformation
		  • Law of Conservation of Energy

Suggested Applications for Technology/Library Media
• Classify and sort data using spreadsheets or databases • Retrieve information from online data sources or print media • Retrieve information using Web-quests, interactive CD's, or scavenger hunts • Represent information graphically using multiple formats (e.g., charts, graphing calculators) • Create web pages and multimedia presentations to publish results of experimentation (e.g., interactive white boards, LCD projectors, TV) • Conduct scientific inquiry using probes or sensory simulation software • Calculate measurements with electronic tools (e.g., graphing calculators) • Assess using a student response system • Show video clips

Examples of Assessment		
Pre-assessment of prior knowledge	Models and projects	Creative writing assignments
Objective tests	Lab reports	PowerPoint presentations
Open-response questions	Journals	Summaries
Compare/contrast essays	Peer/self evaluation	Timelines
Exit tickets	Oral presentations	K-W-L charts
Charts, graphic organizers, graphs, posters, and maps	Cooperative group presentations	Rubrics
Performance assessments (e.g., measurement, use of microscopes)	Teacher observations	Experiments