

6th GRADE SCIENCE
Semester 2
Benchmark Blueprint

Strand 1: Inquiry Process			
<p>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.</p>			
CONCEPT	CATS CONCEPTS	PERFORMANCE OBJECTIVES	
<p>Concept 1: Observations, Questions, and Hypotheses Formulate predictions, questions, or hypotheses based on observations. Locate appropriate resources.</p>	<p>Goal 3: Inquiry</p> <ul style="list-style-type: none"> A. Collect, synthesize and evaluate information related to an investigation. B. Identify relative information to support a hypothesis. C. Demonstrate research skills necessary to support the hypothesis. D. Formulate a hypothesis. <p>Goal 4: Critical and Creative Thinking</p> <ul style="list-style-type: none"> A. Demonstrate effective use of critical and creative thinking in devising hypotheses. <p>Goal 5: Communication</p> <ul style="list-style-type: none"> A. Synthesize knowledge and skills to communicate questions and make hypothesis and predictions. 	<p>PO 1. Differentiate among a question, hypothesis, and prediction.</p> <hr/> <p>PO 2. Formulate questions based on observations that lead to the development of a hypothesis. (See M06-S2C1-01)</p> <hr/> <p>PO 3. Locate research information, not limited to a single source, for use in the design of a controlled investigation. (See W-E8-01)</p>	

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<p>Concept 2: Scientific Testing (Investigating and Modeling) Design and conduct controlled investigations.</p>	<p>Goal 3: Inquiry</p> <ul style="list-style-type: none"> A. Define central problem or issue. B. Collect, synthesize, and evaluate information from relevant sources to the issue or problem. C. Design an investigation to address problem or issue. D. Demonstrate appropriate methods and procedures. E. Demonstrate management skills in recording data. F. Apply ethical standards in conducting research. 	<p><i>PO 1. Demonstrate safe behavior and appropriate procedures (e.g., use and care of technology, materials, organisms) in all science inquiry.</i></p>
		<p>PO 2. Design an investigation to test individual variables using scientific processes.</p>
		<p>PO 3. Conduct a controlled investigation using scientific processes.</p>
	<p>Goal 4: Critical and Creative Thinking</p> <ul style="list-style-type: none"> A. Demonstrate effective use of critical and creative thinking skills.in conducting an investigation. 	<p>PO 4. Perform measurements using appropriate scientific tools (e.g., balances, microscopes, probes, micrometers). (See M06-S4C4-02)</p>
		<p>PO 5. Keep a record of observations, notes, sketches, questions, and ideas using tools such as written and/or computer logs.</p>

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CONCEPT	CATS CONCEPTS	PERFORMANCE OBJECTIVES
<p>Concept 3: Analysis and Conclusions Analyze and interpret data to explain correlations and results; formulate new questions.</p>	Goal 3: Inquiry A. Collect, synthesize, and evaluate information from a scientific investigation.	PO 1. Analyze data obtained in a scientific investigation to identify trends. (See M06-S2C1-03)
	Goal 4: Critical and Creative thinking A. Demonstrate effective use of critical and creative thinking skills by comparing the data to the hypothesis and formulating a conclusion.	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).
	Goal 5: Communication A. Synthesize collected data and communicate ideas, relationships and issues effectively through writing or verbally presenting a conclusion. B. Analyze and evaluate the quality, effectiveness, and substantive content of investigation.	PO 3. Evaluate the observations and data reported by others.
		PO 4. Interpret simple tables and graphs produced by others.
		PO 5. Analyze the results from previous and/or similar investigations to verify the results of the current investigation.
		PO 6. Formulate new questions based on the results of a completed investigation.

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<p>Concept 4: Communication Communicate results of investigations.</p>	<p>Goal 3: Inquiry</p> <ul style="list-style-type: none"> A. Assess relevant information to be communicated. B. Apply intellectual standards and aesthetic criteria to assess the quality of their research products and presentations. C. Synthesize and analyze data gathered and patterns identified to draw conclusions and present findings in appropriate graphic representations without bias and distortion as a means of communication. <p>Goal 4: Critical and Creative Thinking</p> <ul style="list-style-type: none"> A. Demonstrates effective depth of knowledge when communicating results of investigation. B. Assess the effectiveness of a specified form of argument when communicating results. C. Construct an appropriate form of argument when creating persuasive communication. <p>Goal 5: Communication</p> <ul style="list-style-type: none"> A. Clearly defend solutions, strategies and relationships investigated. B. Analyze and evaluate quality and effectiveness of an investigation. 	<p>PO 1. Choose an appropriate graphic representation for collected data:</p> <ul style="list-style-type: none"> • line graph • double bar graph • stem and leaf plot • histogram <p>(See M06-S2C2-02)</p>
	<p>PO 2. Display data collected from a controlled investigation. (See M06-S2C1-02)</p>	

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Concept 4: Communication Communicate results of investigations.		PO 3. Communicate the results of an investigation with appropriate use of qualitative and quantitative information. (See W-E6-PO1)
		PO 4. Create a list of instructions that others can follow in carrying out a procedure (without the use of personal pronouns).
		PO 5. Communicate the results and conclusion of the investigation.

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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	CATS CONCEPTS	PERFORMANCE OBJECTIVES
<p>Concept 1: History of Science as a Human Endeavor Identify individual, cultural, and technological contributions to scientific knowledge.</p>	<p>Goal 2: Concepts and Themes</p> <p style="padding-left: 20px;">A. Analyze a scientific issue or topic in regards to its historical impact.</p> <p>Goal 3: Inquiry</p> <p style="padding-left: 20px;">A. Evaluate how scientists of the past have used science process skills to contribute and influence modern science.</p> <p style="padding-left: 20px;">B. Investigate then compare and contrast various consequences in regards to technological advancement and the impacts on scientific knowledge.</p> <p style="padding-left: 20px;">C. Collect and evaluate information from relevant sources in regards to the impact of technology.</p>	<p><i>PO 1. Identify how diverse people and/or cultures, past and present, have made important contributions to scientific innovations (e.g., Jacques Cousteau [inventor, marine explorer], supports Strand 4; William Beebe [scientist], supports Strand 4; Thor Heyerdahl [anthropologist], supports Strand 6).</i></p>
		<p><i>PO 2. Describe how a major milestone in science or technology has revolutionized the thinking of the time (e.g., Cell Theory, sonar, SCUBA, underwater robotics).</i></p>

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	<p>D. Evaluate technology standards and aesthetic criteria to the quality of human lives.</p> <p>Goal 4: Critical and Creative Thinking</p> <ul style="list-style-type: none">A. Critique scientific investigations from the past and analyze their influence on scientific investigations and science-related technology in the present and future.B. Generate higher level questions about science and technological impacts on society.C. Develop a defensible conclusion based on details relating to a technological advance.D. Use divergent thinking processes in construction of a technological solution. <p>Goal 5: Communication</p> <ul style="list-style-type: none">A. Investigate science-related technology contributions and their effects on cultural, individual, and scientific knowledge.	<p>PO 3. Analyze the impact of a major scientific development occurring within the past decade.</p>
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CONCEPT	CATS CONCEPTS	PERFORMANCE OBJECTIVES
<p>Concept 2: Nature of Scientific Knowledge Understand how science is a process for generating knowledge.</p>	<p>Goal 2: Concepts and Themes</p> <ul style="list-style-type: none"> A. Explain and model the dynamic nature of knowledge and how scientists generate ideas through experimentation. B. Analyze how scientific knowledge and ideas change as technological advancements change. <p>Goal 3: Inquiry</p> <ul style="list-style-type: none"> A. Critique various scientific ideas and systems related to scientific experimentation. B. Select and apply an appropriate methodology for researching a given topic, problem, or issue. <p>Goal 4: Critical and Creative Thinking</p> <ul style="list-style-type: none"> A. Analyze various past experiments, theories and ideas by describing their influence on present/future experiments, theories and ideas. <p>Goal 5: Communicate</p> <ul style="list-style-type: none"> A. Synthesize and communicate ideas about relationships with past, present, and future theories, ideas and experiments. 	<p>PO 1. Describe how science is an ongoing process that changes in response to new information and discoveries.</p> <hr/> <p>PO 2. Describe how scientific knowledge is subject to change as new information and/or technology challenges prevailing theories.</p> <hr/> <p>PO 3. Apply the following scientific processes to other problem solving or decision making situations:</p> <ul style="list-style-type: none"> • observing • questioning • communicating • comparing • measuring • classifying • predicting • organizing data • inferring • generating hypothesis • 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	CATS CONCEPTS	PERFORMANCE OBJECTIVES
<p>Concept 1: Changes in Environments Describe the interactions between human populations, natural hazards, and the environment.</p>	<p>Goal 3: Inquiry</p> <ul style="list-style-type: none"> A. Investigate then compare and contrast various consequences in regards to natural hazards in the environment and their effects on human populations. B. Collect and evaluate information from relevant sources in regards to natural hazards in the environment and their effects on human populations. <p>Goal 4: Critical and creative thinking</p> <ul style="list-style-type: none"> A. Generate higher level questions about an environmental topic. B. Develop a defensible conclusion based on details relating to an environmental topic. C. Analyze persuasive communications to formulate a point of view based on the environmental topic. <p>Goal 5: Communication</p> <ul style="list-style-type: none"> A. Communicate point of view demonstrating effective depth of knowledge. B. Evaluate and present various points of view in regards to an issue while effectively defending an individual point of view. C. Critique substantive content of the presentations formulate a conclusion. 	<p>PO 1. Evaluate the effects of the following natural hazards:</p> <ul style="list-style-type: none"> • sandstorm • hurricane • tornado • ultraviolet light • lightning-caused fire <p>PO 2. Describe how people plan for, and respond to, the following natural disasters:</p> <ul style="list-style-type: none"> • drought • flooding • tornadoes

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<p>Concept 2: Science and Technology in Society Develop viable solutions to a need or problem.</p>	<p>Goal 3: Inquiry</p> <ul style="list-style-type: none"> A. Investigate then compare and contrast various consequences in regards to a problem or technological discovery. B. Collect, synthesize and evaluate information related to an investigation. C. Apply case study and comparative study techniques to research an appropriate topic, problem or technological discovery. <p>Goal 4: Critical and Creative Thinking</p> <ul style="list-style-type: none"> A. Demonstrate effective use of critical and creative thinking in devising hypotheses. B. Generate higher level questions about science and technological impacts on society. C. Develop a defensible conclusion based on details relating to a problem or technological advance. D. Use divergent thinking processes in construction of a problem or technological solution. <p>Goal 5: Communication</p> <ul style="list-style-type: none"> B. Synthesize knowledge and skills to communicate questions and make hypothesis and predictions. 	<p>PO 1. Propose viable methods of responding to an identified need or problem.</p>
		<p>PO 2. Compare possible solutions to best address an identified need or problem.</p>
		<p>PO 3. Design and construct a solution to an identified need or problem using simple classroom materials.</p>
		<p>PO 4. Describe a technological discovery that influences science.</p>

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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	CATS CONCEPTS	PERFORMANCE OBJECTIVES
<p>Concept 1: Structure and Function in Living Systems Understand the relationships between structures and functions of organisms.</p>	Goal 3: Inquiry A. Explore and analyze structure and functions of organisms and the importance of water. B. Infer the functions of various cell structures and parts based on observations. C. Collect and evaluate information from relevant sources in relation to structure and functions in living systems.	PO 1. Explain the importance of water to organisms.
		PO 2. Describe the basic structure of a cell, including: <ul style="list-style-type: none"> • cell wall • cell membrane • nucleus
	Goal 4: Critical and Creative Thinking A. Evaluate the relationships between form and function. B. Select an appropriate organizational pattern to show differences between plant and animal cells and to demonstrate knowledge of hierarchy of cells, tissues, organs, and systems for animal cells and plant cells.	PO 3. Describe the function of each of the following cell parts: <ul style="list-style-type: none"> • cell wall • cell membrane • nucleus
	Goal 5: Communication A. Develop and present a classification system based on observations and research.	PO 4. Differentiate between plant and animal cells.
		PO 5. Explain the hierarchy of cells, tissues, organs, and systems.

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		<p>PO 6. Relate the following structures of living organisms to their functions:</p> <p>Animals</p> <ul style="list-style-type: none">• respiration – gills, lungs• digestion – stomach, intestines• circulation – heart, veins, arteries, capillaries• locomotion – muscles, skeleton <p>Plants</p> <ul style="list-style-type: none">• transpiration – stomata, roots, xylem, phloem• absorption – roots, xylem, phloem• response to stimulus (phototropism, hydrotropism, geotropism) – roots, xylem, phloem
		<p>PO 7. Describe how the various systems of living organisms work together to perform a vital function:</p> <ul style="list-style-type: none">• respiratory and circulatory• muscular and skeletal• digestive and excretory

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CONCEPT	CATS CONCEPTS	PERFORMANCE OBJECTIVES
<p>Concept 3: Populations of Organisms in an Ecosystem Analyze the relationships among various organisms and their environment.</p>	<p>Goal 3: Inquiry</p> <p>A. Develop a model that demonstrates an in depth inquiry investigation of the complexity and abstractness between environmental conditions and the affect of life.</p> <p>B. Analyze various characteristics of environmental conditions.</p>	<p>PO 1. Explain that sunlight is the major source of energy for most ecosystems. (See Strand 5 Concept 3 and Strand 6 Concept 2)</p>
	<p>Goal 4: Critical and Creative Thinking</p> <p>A. Use effective critical thinking skills and deductive reasoning skills to model changes in environmental conditions and the affects on life.</p> <p>B. Analyze and model the complexities of various organisms and their environment.</p> <p>Goal 5: Communication</p> <p>A. Synthesize knowledge pertaining various organisms and their environment.</p>	<p>PO 2. Describe how the following environmental conditions affect the quality of life:</p> <ul style="list-style-type: none"> • water quality • climate • population density • smog

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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	PERFORMANCE OBJECTIVE	ASSESSMENT
<p>Concept 3: Transfer of Energy Understand that energy can be stored and transferred.</p>	Goal 3: Inquiry A. Develop a model that demonstrates an in depth inquiry investigation of the complexity and abstractness of transfer of energy. B. Analyze various ways energy is stored.	PO 1. Identify various ways in which electrical energy is generated using renewable and nonrenewable resources (e.g., wind, dams, fossil fuels, nuclear reactions).
	Goal 4: Critical and Creative Thinking C. Use effective critical thinking skills and deductive reasoning skills to model changes in the transfer of energy and storage. D. Analyze and model the complexities of energy transfer and storage.	PO 2. Identify several ways in which energy may be stored.
	Goal 5: Communication C. Synthesize knowledge pertaining to energy transfer and storage.	PO 3. Compare the following ways in which energy may be transformed: <ul style="list-style-type: none"> • mechanical to electrical • electrical to thermal
		PO 4. Explain how thermal energy (heat energy) can be transferred by: <ul style="list-style-type: none"> • conduction • convection • radiation

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Strand 6: Earth and Space Science		
<p>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.</p>		
CONCEPT	PERFORMANCE OBJECTIVE	ASSESSMENT
<p>Concept 1: Structure of the Earth Describe the composition and interactions between the structure of the Earth and its atmosphere.</p>	<p>Goal 3: Inquiry</p> <p>A. Develop a model that demonstrates an in depth inquiry investigation of the complexity and abstractness of the composition and interaction between the structure of earth and its atmosphere.</p> <p>B. Analyze the composition, properties, and structure of earth and its atmosphere.</p>	<p>PO 1. Describe the properties and the composition of the layers of the atmosphere.</p>
		<p>PO 2. Explain the composition, properties, and structure of the Earth's lakes and rivers.</p>
	<p>Goal 4: Critical and Creative Thinking</p>	<p>PO 3. Explain the composition, properties, and structures of the oceans' zones and layers.</p>
	<p>A. Use effective critical thinking skills and deductive reasoning skills to model interactions between the structure of earth and it's atmosphere.</p> <p>B. Analyze the complexities of the interrelationships between interactions within earth's systems.</p>	<p>PO 4. Analyze the interactions between the Earth's atmosphere and the Earth's bodies of water (water cycle).</p>

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	<p>between interactions within earth's systems.</p> <p>C. Apply divergent thinking processes to explore the effect of changes in the earth's systems.</p> <p>Goal 5: Communication</p> <p>A. Communicate evidence of environmental factors and human impact that changed earth's composition and interaction between earth and its atmosphere.</p>	<p>PO 5. Describe ways scientists explore the Earth's atmosphere and bodies of water. (See Strand 2 Concept 1)</p>
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CONCEPT	PERFORMANCE OBJECTIVE	ASSESSMENT
<p>Concept 2: Earth's Processes and Systems</p> <p>Understand the processes acting on the Earth and their interaction with the earth systems.</p>	<p>Goal 3: Inquiry</p> <p>A. Demonstrate research skills necessary to support the hypothesis.</p> <p>B. Collect, synthesize, and evaluate information from relevant resources relating to water and its impact on earth systems.</p>	<p>PO 1. Explain how water is cycled in nature.</p>
		<p>PO 2. Identify the distribution of water within or among the following:</p> <ul style="list-style-type: none"> • atmosphere • lithosphere • hydrosphere
	<p>Goal 4: Critical and Creative Thinking</p> <p>A. Analyze the relationship between climates and sources of water in the environment.</p>	<p>PO 3. Analyze the effects that bodies of water have on the climate of a region.</p>
		<p>PO 4. Analyze the following factors</p>

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	<p>Goal 5: Communication</p> <p>C. Compare various geographical areas in regards to climate, weather and water source.</p>	<p>that affect climate:</p> <ul style="list-style-type: none"> • ocean currents • elevation • location
		<p>PO 5. Analyze the impact of large-scale weather systems on the local weather.</p>
		<p>PO 6. Create a weather system model that includes:</p> <ul style="list-style-type: none"> • the Sun • the atmosphere • bodies of water