

5<sup>th</sup> Grade 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	CATS CONCEPTS	PERFORMANCE OBJECTIVES
<p><b>Concept 1: Observations, Questions, and Hypotheses</b> Formulate predictions, questions, or hypotheses based on observations. Locate appropriate resources.</p>	<p>Goal 3: Inquiry</p> <ul style="list-style-type: none"> <li>A. Collect and evaluate information related to an investigation.</li> <li>B. Identify relative information to support a hypothesis.</li> <li>C. Demonstrate research skills necessary to support the hypothesis.</li> </ul> <p>Goal 4: Critical and Creative Thinking</p> <ul style="list-style-type: none"> <li>A. Demonstrate effective use of critical and creative thinking in devising hypotheses.</li> </ul> <p>Goal 5: Communication</p> <ul style="list-style-type: none"> <li>A. Synthesize knowledge and skills to communicate questions and make hypothesis.</li> </ul>	<p><i>PO 1. Formulate a relevant question through observations that can be tested by an investigation. (See M05-S2C1-01)</i></p> <p><i>PO 2. Formulate predictions in the realm of science based on observed cause and effect relationships.</i></p> <p><i>PO 3. Locate information (e.g., book, article, website) related to an investigation. (See W-E8-01)</i></p>

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<p><b>Concept 2: Scientific Testing (Investigating and Modeling)</b> Design and conduct controlled investigations.</p>	<p>Goal 2: Concepts, Themes, and Issues (Aligns with PO3)</p> <ul style="list-style-type: none"> <li>A. Demonstrate comprehension of a discipline as a system of knowledge.</li> <li>B. Analyze the content of a discipline in terms of major concepts, themes, and issues of that discipline.</li> <li>C. Analyze a concept, theme, problem, or issue within and across the disciplines by using the different perspectives of those disciplines.</li> <li>D. Analyze the ethical dimensions of ideas, issues, problems, and themes.</li> </ul>	<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><i>PO 2. Plan a simple investigation that identifies the variables to be controlled.</i></p>
		<p>PO 3 Conduct simple investigations (e.g., related to forces and motion, earth processes) based on student-developed questions in life, physical, and earth and space sciences.</p>
		<p><i>PO 4. Measure using appropriate tools (e.g., ruler, scale, balance) and units of measure (i.e., metric, U.S. customary).</i></p>
	<p>Goal 3: Inquiry</p> <ul style="list-style-type: none"> <li>A. Define central problem or issue.</li> <li>B. Collect, synthesize, and evaluate information from relevant to the issue or problem.</li> <li>C. Design an investigation to address problem or issue.</li> <li>D. Demonstrate appropriate methods and procedures.</li> <li>E. Demonstrate management skills in recording data.</li> <li>F. Apply ethical standards in conducting research.</li> </ul>	<p><i>PO 5 Record data in an organized and appropriate format (e.g., t-chart, table, list, written log).</i></p>
<p>Goal 4: Critical and Creative Thinking</p> <ul style="list-style-type: none"> <li>A. Demonstrate effective use of critical and creative thinking skills.in conducting an investigation.</li> </ul>		

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CONCEPT	CATS CONCEPTS	PERFORMANCE OBJECTIVES
<b>Concept 3: Analysis and Conclusions</b> Analyze and interpret data to explain correlations and results; formulate new questions.	Goal 3: Inquiry  A. Collect, synthesize, and evaluate information from a scientific investigation.	PO 1.C. Analyze data obtained in a scientific investigation to identify trends and form conclusions. (See M05-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.C. Analyze whether the data is consistent with the proposed explanation that motivated the investigation.
	Goal 5: Communication  A. Synthesize collected data and communicate ideas, relationships and issues effectively through writing or verbally presenting a conclusion.	PO 3. Evaluate the reasonableness of the outcome of an investigation.
	B. Analyze and evaluate the quality, effectiveness, and substantive content of investigation.	PO 4. Develop new investigations and predictions based on questions that arise from the findings of an investigation.
		PO 5. Identify possible relationships between variables in simple investigations (e.g., time and distance; incline and mass of object).

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CONCEPT	CATS CONCEPTS	PERFORMANCE OBJECTIVES
<b>Concept 4: Communication</b> Communicate results of investigations.	Goal 3: Inquiry  A. Assess relevant information to be communicated. B. Apply intellectual standards and aesthetic criteria to assess the quality of their research products and presentations.	<i>PO 1. Communicate verbally or in writing the results of an inquiry. (See W-E6-01)</i>
	Goal 4: Critical and Creative Thinking  A. Demonstrates effective depth of knowledge when communicating results of investigation.	<i>PO 2. Choose an appropriate graphic representation for collected data:</i> <ul style="list-style-type: none"> <li>• <i>bar graph</i></li> <li>• <i>line graph</i></li> <li>• <i>Venn diagram</i></li> <li>• <i>model</i></li> </ul> <i>(See M05-S2C1-02)</i>
	Goal 5: Communication A. Clearly defend solutions, strategies and relationships investigated. B. Analyze and evaluate quality and effectiveness of an investigation.	<i>PO 3. Communicate with other groups or individuals to compare the results of a common investigation.</i>

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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.

<b>CONCEPT</b>	<b>CATS CONCEPTS</b>	<b>PERFORMANCE OBJECTIVES</b>
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### **Concept 1: History of Science as a Human Endeavor**

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

#### Goal 2: Concepts and Themes

- A. Analyze a scientific issue or topic in regards to its historical impact.

#### Goal 3: Inquiry

- A. Evaluate how scientists of the past have used science process skills to contribute and influence modern science.
- B. Investigate then compare and contrast various consequences in regards to technological advancement and the impacts on scientific knowledge.
- C. Collect and evaluate information from relevant sources in regards to the impact of technology.
- D. Evaluate technology standards and aesthetic criteria to the quality of human lives.

#### Goal 4: Critical and Creative Thinking

- 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.

#### Goal 5: Communication

- A. Investigate science-related technology contributions and their effects on cultural, individual, and scientific knowledge.

*PO 1. Identify how diverse people and/or cultures, past and present, have made important contributions to scientific innovations (e.g., Percy Lavon Julian [scientist], supports Strand 4; Niels Bohr [scientist], supports Strand 5; Edwin Hubble [scientist], supports Strand 6).*

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<p><b>Concept 2: Nature of Scientific Knowledge</b> Understand how science is a process for generating knowledge.</p>	<p>Goal 2: Concepts and Themes</p> <p>A. Explain and model the dynamic nature of knowledge and how scientists generate ideas through experimentation.</p>	<p>PO 1. Provide examples that support the premise that science is an ongoing process that changes in response to new information and discoveries (e.g., space exploration, medical advances).</p>
	<p>Goal 3: Inquiry</p> <p>A. Critique various scientific ideas and systems related to scientific experimentation.</p>	<p>PO 2. Explain the cycle by which new scientific knowledge generates new scientific inquiry.</p>
	<p>Goal 4: Critical and Creative Thinking</p> <p>A. Compare and contrast components of a system. B. Compare and contrast interactions between systems.</p>	<p>PO 3. Describe how scientific knowledge is subject to modification and/or change as new information/technology challenges prevailing theories.</p>
	<p>Goal 5: Communicate</p> <p>A. Synthesize and communicate ideas about relationships within and between systems.</p>	<p>PO 4. Compare collaborative approaches that scientists use for investigations (e.g., teams, individual with peer review).</p>
		<p>PO 5. Describe qualities of the scientists' habits of mind (e.g., openness, skepticism, integrity, tolerance).</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><b>Concept 1: Structure and Function in Living Systems</b> Understand the relationships between structures and functions of organisms.</p>	<p>Goal 3: Inquiry</p> <p>A. Explore and analyze structure and functions of organisms. B. Infer the functions of various structures based on observations. C. Collect and evaluate information from relevant sources in relation to structure and functions in living systems.</p>	<p>PO 1. Identify the functions and parts of the skeletal system:</p> <ul style="list-style-type: none"> <li>• protection – rib cage, cranium</li> <li>• support – vertebrae</li> <li>• movement – pelvis, femur, hip</li> </ul>
	<p>Goal 4: Critical and Creative Thinking</p> <p>A. Evaluate the relationships between form and function.</p>	<p>PO 2. Identify the following types of muscles:</p> <ul style="list-style-type: none"> <li>• cardiac – heart</li> <li>• smooth – stomach</li> <li>• skeletal – biceps</li> </ul>
	<p>Goal 5: Communication</p> <p>A. Develop and present a classification system based on observations and research.</p>	<p>PO 3. Identify the functions and parts of the nervous system:</p> <ul style="list-style-type: none"> <li>• control center – brain</li> <li>• relay mechanism – spinal cord</li> <li>• transport messages – nerves</li> </ul>



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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	PERFORMANCE OBJECTIVE
<p><b>Concept 1: Properties and Changes of Properties in Matter</b></p> <p>Understand physical and chemical properties of matter.</p>	<p>Goal 3: Inquiry</p> <p>A. Develop a model that demonstrates an in depth inquiry investigation of the complexity and abstractness properties and changes of properties in matter.</p> <p>B. Analyze various characteristics of mixtures and compounds.</p>	<p>PO 1. Identify that matter is made of smaller units called:</p> <ul style="list-style-type: none"> <li>• molecules (e.g., H<sub>2</sub>O, CO<sub>2</sub>)</li> <li>• atoms (e.g., H, N, Na)</li> </ul>
	<p>Goal 4: Critical and Creative Thinking</p> <p>A. Use effective critical thinking skills and deductive reasoning skills to model changes of matter.</p> <p>B. Analyze and model the complexities matter.</p>	<p>PO 2. Distinguish between mixtures and compounds.</p>
	<p>Goal 5: Communication</p> <p>A. Synthesize knowledge pertaining to chemical properties.</p>	<p>PO 3. Describe changes of matter:</p> <ul style="list-style-type: none"> <li>• physical – cutting wood, ripping paper, freezing water</li> <li>• chemical – burning of wood, rusting of iron, milk turning sour</li> </ul>

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<p><b>Concept 2: Motion and Forces</b></p> <p>Understand the relationship between force and motion.</p>	<p>Goal 3: Inquiry</p> <p>A. Develop a model that demonstrates an in depth inquiry investigation of the complexity and abstractness of motion and forces.</p> <p>B. Analyze various relationships between force and motion.</p>	<p>PO 1. Describe the following forces:</p> <ul style="list-style-type: none"> <li>• gravity</li> <li>• friction</li> </ul>
	<p>Goal 4: Critical and Creative Thinking</p> <p>A. Use effective critical thinking skills and deductive reasoning skills to model the relationship between force and motion.</p> <p>B. Analyze and model the complexities of force and motion.</p> <p>C. Apply divergent thinking processes to explore societies dependency on production of simple machines.</p>	<p>PO 2. Describe the various effects forces can have on an object (e.g., cause motion, halt motion, change direction of motion, cause deformation).</p>
	<p>Goal 5: Communication</p> <p>A. Synthesize knowledge and ideas pertaining to production of simple machines.</p>	<p>PO 3. Examine forces and motion through investigations using simple machines (e.g., wedge, plane, wheel and axle, pulley, lever).</p>
		<p>PO 4. Demonstrate effects of variables on an object's motion (e.g., incline angle, friction, applied forces).</p>