

COMPARISON OF THE OHIO ACADEMIC CONTENT STANDARDS AND PROFICIENCY LEARNING OUTCOMES

Science - Grade Six (Grade-band 6-8)

Ohio has adopted academic content standards in science. These standards describe what students should know and be able to do and go beyond the proficiency learning outcomes. Over the next several years, Ohio will implement a standards-based assessment system. New achievement tests will replace the proficiency tests.

This chart shows the match between the academic content standards and the sixth-grade proficiency learning outcomes. The academic content standards provide the basis for instructional planning, and educators can use this chart as a supplementary resource while new achievement tests are being developed.

OHIO ACADEMIC CONTENT STANDARDS GRADES 6 - 8 BENCHMARKS	SIXTH-GRADE PROFICIENCY LEARNING OUTCOMES AND EXCERPTS FROM <i>INFORMATION GUIDE</i>
<p>Earth and Space Sciences Standard D. Identify that the lithosphere contains rocks and minerals and that minerals make up rocks. Describe how rocks and minerals are formed and / or classified.</p>	<p>Strand I – Nature of Science</p> <p>1. Use a simple key to classify objects, organisms, and/or phenomena.</p> <p>This outcome tests students' abilities to classify or identify things using a simple identification key (dichotomous key, flow chart, key in table or chart format).</p>
<p>Scientific Inquiry Standard A. Explain that there are differing sets of procedures for guiding scientific investigations and procedures are determined by the nature of the investigation, safety considerations and appropriate tools.</p>	<p>Strand I – Nature of Science</p> <p>2. Identify the potential hazards and/or precautions involved in scientific investigations.</p> <p>This outcome focuses on identifying basic safety measures (or precautions); explaining the reasons for existing precautions or safety measures; identifying possible dangers to human safety (hazards), equipment or materials, and /or natural ecosystems; and predicting potential hazards or bad results from circumstances. Safety measures addressed in items may</p>

	include the following: fire, glassware, eye and face, chemical, electrical, and sharps safety, dress code, and clean up.
<p>Scientific Inquiry Standard B. Analyze and interpret data from scientific investigations using appropriate mathematical skills in order to draw valid conclusions.</p>	<p>Strand I – Nature of Science</p> <p>3. Make inferences from observations of phenomena and/or events.</p> <p>Students should be able to identify inferences that are consistent with data or observations; use known characteristics of plants or animals or their remains to infer or extrapolate other characteristics of those plants or animals (or remains); and use inductive and deductive reasoning with visual representations, charts, text, or graphs in items, to make or identify correct inferences.</p>
<p>Science and Technology Standard A. Give examples of how technological advances, influenced by scientific knowledge, affect the quality of life.</p> <p>Science and Technology Standard B. Design a solution or product taking into account needs and constraints (e.g., cost, time, trade-offs, properties of materials, safety and aesthetics).</p>	<p>Strand I – Nature of Science</p> <p>4. Identify the positive and/or negative impacts of technology on human activity.</p> <p><i>Technology</i> is defined as the application or use of scientific knowledge or inventions; human activity is interpreted to mean “human life activities” broadly, so topics addressed range from health tests and regulations to environmental regulations and issues that impact humans, to procurement of “crucial resources” such as water, food, shelter, etc. Students should be able to identify or deduce from text and/or prior knowledge the positive or negative impacts of a particular technology on human life activities.</p> <p>Students should be aware that there are few human activities in which impacts are entirely positive or entirely negative. In their explorations and asking of questions, students should have frequent experience in discussing both sides of human activities. From these discussions and explorations, students should be able to make decisions and provide written justification for their decisions.</p>

<p>Scientific Inquiry Standard B. Analyze and interpret data from scientific investigations using appropriate mathematical skills in order to draw valid conclusions.</p> <p>Scientific Ways of Knowing Standard B. Explain the importance of reproducibility and reduction of bias in scientific methods.</p>	<p>Strand I – Nature of Science</p> <p>5. Evaluate conclusions based on scientific data.</p> <p>This outcome tests students’ abilities to identify or evaluate conclusions from graphs, tables, charts, and/or text information; make conclusions about relationships from data; summarize or identify summaries or data from charts, tables, or graphs; and analyze whether conclusions about test results can be made based on previous test results and known changes to a test set-up.</p> <p>Students should be able to interpret data and make conclusions and decisions based on the data that are critical. Also, since learning in science is often linked to finding flaws in data or conclusions, students should be practiced in relying on their own data (or others’ data) and examining their conclusions for flaws, as well as in examining data for flaws. Students should be practiced in making observations about data, and inferences from observations.</p>
<p>Science and Technology Standard A. Give examples of how technological advances, influenced by scientific knowledge, affect the quality of life.</p> <p>Science and Technology Standard B. Design a solution or product taking into account needs and constraints (e.g., cost, time, trade-offs, properties or materials, safety, and aesthetics).</p>	<p>Strand II – Physical Science</p> <p>6. Recognize the advantages and/or disadvantages to the user in the operations of simple technological devices.</p> <p>Students should understand that simple machines do not reduce work, but they commonly make an action less effort for people. Students should also know that the principle “you don’t get something for nothing” applies to simple machines; when a machine is used and the effort gets easier, something else (like speed, or the distance of the effort) is sacrificed. Students should be practiced at discussing the advantages and disadvantages of any simple technological device as they explore its functions and uses in a real-world context.</p>

<p>Physical Sciences Standard C. In simple cases, describe the motion of objects and conceptually describe the effects of forces on an object.</p>	<p>Strand II – Physical Science</p> <p>7. Predict the influence of the motion of some objects on other objects.</p> <p>Students should have a practical understanding of Newton’s laws of motion. Students should be able to predict the motion of objects thrown or released by people who are in motion; identify or describe how the motion of one object can affect the motion of other; and identify or describe the apparent forces or impacts people can feel as a result of a change in an object’s motion.</p>
<p>Physical Sciences Standard A. Relate uses, properties and chemical processes to the behavior and/or arrangement of the small particles that compose matter.</p>	<p>Strand II – Physical Science</p> <p>8. Propose and/or evaluate an investigation of simple physical and/or chemical changes.</p> <p>This outcome tests students’ abilities to distinguish between or identify changes that are physical changes only and changes that involve chemical changes; identify or describe procedures that would resolve investigations of physical and/or chemical changes; identify or describe the rate or nature of physical and/or chemical changes that are taking place’ and evaluate how well a particular investigation or procedure measures physical and/or chemical changes.</p>
<p>Physical Sciences Standard A. Relate uses, properties and chemical processes to the behavior and/or arrangement of the small particles that compose matter.</p> <p>Physical Sciences Standard D. Describe that energy take may forms, some forms represent kinetic energy and some forms represent potential energy and during energy transformation the total amount of energy remains constant.</p>	<p>Strand II – Physical Science</p> <p>9. Provide examples of transformation and/or conservation of matter and energy in simple physical systems.</p> <p>In any system, energy must be accounted for, and students should be practiced in explaining how the energy in a given system has changed through an event. Because energy can be a difficult and abstract concept for students, students should be accustomed to discussing and describing familiar energy movements in their surroundings, such as those involved with a light bulb or a cup of hot tea. Specific names for the types of energy are learned as students use them in discussions and</p>

	explanations.
<p>Earth and Space Sciences Standard A. Describe how the positions and motions of the objects in the universe cause predictable and cyclic events.</p> <p>Physical Sciences Standard D. Describe that energy take may forms, some forms represent kinetic energy and some forms represent potential energy and during energy transformation the total amount of energy remains constant.</p>	<p>Strand II – Physical Science</p> <p>10. Identify simple patterns in physical phenomena.</p> <p>Simple patterns in physical phenomena includes such things as reflection and refraction of light and waves (e.g., in water); properties of waves (e.g., light and sound); production of high-pitched and low-pitched sounds (vibrating columns of air); elasticity and/or compressibility of materials; seasonal patterns (e.g., light and shadows) due to orientation of sun and earth’ daily or seasonal temperature patterns of land and/or water; and movement of heat in a system and/or factors affecting heat movement (e.g., surface area). Students should be able to identify, deduce, and/or explain simple patterns and relationships from text, graphs, charts, drawings, or prior knowledge.</p>
<p>Earth and Space Sciences Standard A. Describe how the positions and motions of the objects in the universe cause predictable and cyclic events</p>	<p>Strand III – Earth and Space Science</p> <p>11. Describe simple cycles of the earth, sun, and moon.</p> <p>Students should have a basic understanding of the relationship between the earth’s tilt and the seasons; the relationship between hemispherical location and seasonal temperatures or cycles; the revolution of the earth around the sun and the moon around the earth; tides; and changing daylight/darkness hours. Particularly important is that students not retain common misconceptions regarding cycles or phenomena (e.g., the misconception that the earth’s distance from the sun causes the seasons, or that a crescent moon is the result of the earth’s shadow on the moon.</p>
<p>Earth and Space Sciences Standard D. Identify that the lithosphere contains rocks and minerals and that minerals make up rocks. Describe how rocks and minerals are formed and/or classified.</p>	<p>Strand III – Earth and Space Science</p> <p>12. Identify characteristics and/or patterns in rocks and soil.</p> <p>Students should be familiar with those characteristics or patterns</p>

	<p>of rocks and soil that can be directly observed or tested; erosion, weathering, layering, hardness testing, and scratch testing are things with which students should have direct experience.</p>
<p>Earth and Space Sciences Standard C. Describe interactions of matter and energy throughout the lithosphere, hydrosphere and atmosphere (e.g., water cycles, weather and pollution).</p>	<p>Strand III- Earth and Space Science</p> <p>13. Demonstrate an understanding of the cycling of resources on earth, such as carbon, nitrogen, and/or water.</p> <p>Students should be able to identify major steps or processes in the carbon, nitrogen, and water cycles (e.g., respiration, combustion, photosynthesis, decomposition, evaporation, condensation, precipitation); identify or describe organisms or pathways through which these processes occur; identify or describe physical or biological factors that affect these processes; and identify where organisms get the nutrients or gases they need in the cycles, and/or how they make those nutrients or gases available to other organisms. Understanding of cycling or resources, plants' importance to all these processes, and environmental results of deforestation are important to this outcome.</p>
<p>Life Sciences Standard C. Explain how energy entering the ecosystems as sunlight supports the life of organisms through photosynthesis and the transfer of energy through the interactions of organisms and the environment.</p>	<p>Strand IV – Life Science</p> <p>14. Trace the transmission of energy in a small simple ecosystem and/or identify the roles of organisms in the energy movement in an ecosystem.</p> <p>Students should be able to analyze food changes and/or food webs and trace the energy transfer among organisms or the level of dependence of groups/organisms on one another.</p> <p>Students should be accustomed to accounting for the conservation of energy in living systems, just as they are in simple physical systems. Students should understand that organisms ultimately lose energy as heat and gain energy, directly or indirectly, from the sun. Energy can be stored in chemical bonds and passed on as organisms consume this food;</p>

	<p>and some energy is lost every time energy is transferred. Terms commonly used in discussion (such as producer, consumer, decomposer) should have strong experiential association for students.</p>
<p>Life Sciences Standard B. Describe the characteristics of an organism in terms of a combination of inherited traits and recognize reproduction as a characteristic of living organisms essential to the continuation of the species.</p> <p>Life Sciences Standard C. Explain how energy entering the ecosystems as sunlight supports the life of organisms through photosynthesis and the transfer of energy through the interactions of organisms and the environment.</p>	<p>Strand IV – Life Science</p> <p>15. Compare and/or contrast the diversity of ways in which living things meet their needs.</p> <p>Students must be familiar not only with the basic needs of living things, but with characteristics and behaviors through which those needs are met. Since the environments that provide basic needs often change with the season, students should be familiar with those changes, with organisms' responses to those changes, and with the effects those responses have. Students should have experiences of growing something or keeping something alive at home or in the classroom, or observations that provide similar understanding.</p>
<p><i>No comparison with learning outcome</i></p>	<p>Strand IV – Life Science</p> <p>16. Analyze behaviors and/or activities that positively or negatively influence human health.</p> <p>Students should be able to analyze and/or identify behaviors or activities that will have the most beneficial or harmful effects on human health in a given situation; identify the reasons for such effects; and identify actions to take in situations where there is potential for harm to human health.</p>
<p>Earth and Space Sciences Standard C. Describe interactions of matter and energy throughout the lithosphere, hydrosphere and atmosphere (e.g., water cycle, weather and pollution).</p>	<p>Strand IV – Life Science</p> <p>17. Analyze the impacts of human activity on the ecosystems of the earth.</p>

<p>Life Sciences Standard C. Explain how energy entering the ecosystems as sunlight supports the life of organisms through photosynthesis and the transfer of energy through the interactions of organisms and the environment.</p> <p>Science and Technology Standard A. Give examples of how technological advances, influenced by scientific knowledge, affect the quality of life.</p>	<p>Students should understand that human activity can have certain effects on the environment, just as the characteristics of an environment can have certain effects or limits on human activity. There are advantages and disadvantages to any activity, and students should be able to identify or discuss these from multiple viewpoints.</p>
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