

COMPARISON OF THE OHIO ACADEMIC CONTENT STANDARDS AND PROFICIENCY LEARNING OUTCOMES

Science - Grade Six (Grade-band 3 – 5)

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 3-5 BENCHMARKS	SIXTH-GRADE PROFICIENCY LEARNING OUTCOMES AND EXCERPTS FROM <i>INFORMATION GUIDE</i>
<p>Life Sciences Standard B. Analyze plant and animal structures and functions needed for survival and describe the flow of energy through a system that all organisms use to survive.</p> <p>Physical Science Standard B. Identify and describe the physical properties of matter in its various states.</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. Use appropriate instruments safely to observe, measure and collect data when conducting a scientific investigation.</p> <p>Scientific Inquiry Standard C. Develop, design and safely conduct scientific investigations and communicate the results.</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. Organize and evaluate observations, measurements and other data to formulate inferences and conclusions.</p> <p>Scientific Inquiry Standard C. Develop, design and safely conduct scientific investigations and communicate the results.</p> <p>Scientific Ways of Knowing Standard A. Distinguish between fact and opinion and explain how ideas and conclusions change as new knowledge is gained.</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. Describe how technology affects human life.</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. 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 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. Organize and evaluate observations, measurements and other data to formulate inferences and conclusions.</p> <p>Scientific Ways of Knowing Standard B. Describe different types of investigations and use results and data from investigations to provide the evidence to support explanations and conclusions.</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. Describe how technology affects human life.</p> <p>Science and Technology Standard B. Describe and illustrate the design process.</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>Strand II – Physical Science</p>

<p>Physical Sciences Standard C. Describe the forces that directly affect objects and their motion.</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. Compare the characteristics of simple physical and chemical changes.</p> <p>Physical Sciences Standard B. Identify and describe the physical properties of matter in its various states.</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 Science Standard D. Summarize the way changes in temperature can be produced and thermal energy transferred.</p> <p>Physical Science Standard E. Trace how electrical energy flows through a simple electrical current and describe how the electrical energy can produce thermal energy, light, sound and magnetic forces.</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 explanations.</p>
	<p>Strand II – Physical Science</p>

<p>Earth and Space Sciences Standard A. Explain the characteristics, cycles and patterns involving Earth and its place in the solar system.</p> <p>Physical Sciences Standard D. Summarize the way changes in temperature can be produced and thermal energy transferred.</p> <p>Physical Sciences Standard E. Trace how electrical energy flows through a simple electrical circuit and describe how the electrical energy can produce thermal energy, light, sound and magnetic forces.</p> <p>Physical Sciences Standard F. Describe the properties of light and sound energy.</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. Explain the characteristics, cycles, and patterns involving Earth and its place in the solar system.</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 C. Describe Earth's resources including rocks, soil, water, air, animals and plants and the ways in which they can be conserved.</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 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 Earth’s resources including rocks, soil, water, air, animals and plants and the ways in which they can be conserved.</p> <p>Earth and Space Sciences Standard D. Analyze weather and changes that occur over a period of time.</p> <p>Life Science Standard B. Analyze plant and animal structures and functions needed for survival and describe the flow of energy through a system that all organisms use to survive.</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 B. Analyze plant and animal structures and functions needed for survival and describe the flow of energy through a system that all organisms use to survive.</p> <p>Life Sciences Standard C. Compare changes in an organism’s ecosystem / habitat that affect its survival.</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; and some energy is lost every time energy is transferred. Terms commonly used in discussion (such as producer, consumer,</p>

	decomposer) should have strong experiential association for students.
<p>Life Sciences Standard A. Differentiate between the life cycles of different plants and animals.</p> <p>Life Sciences Standard B. Analyze plant and animal structures and functions needed for survival and describe the flow of energy through a system that all organisms use to survive.</p> <p>Life Sciences Standard C. Compare changes in an organism's ecosystem / habitat that affect its survival.</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>Earth and Space Sciences Standard C. Describe Earth's resources including rocks, soil. Water, air, animals, and plants and the ways they can be conserved.</p> <p>Life Sciences Standard C. Compare changes in an organism's ecosystem / habitat that affect its survival.</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>Strand IV – Life Science</p> <p>17. Analyze the impacts of human activity on the ecosystems of the earth.</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</p>

	students should be able to identify or discuss these from multiple viewpoints.
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