

COMPARISON OF THE OHIO ACADEMIC CONTENT STANDARDS AND PROFICIENCY LEARNING OUTCOMES

Science - Grade Four

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 fourth-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	FOURTH-GRADE PROFICIENCY LEARNING OUTCOMES AND EXCERPTS FROM <i>INFORMATION GUIDE</i>
<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>Physical Science Standard B. Identify and describe the physical properties of matter in its various states.</p> <p>Scientific Ways of Knowing Standard C. Explain the importance of keeping record of observations and investigations that are accurate and understandable.</p>	<p>Strand I – Nature of Science</p> <p>1. Create and/or use categories to organize a set of objects, organisms, or phenomena.</p> <p>Students should be familiar with the process of sorting based on observable characteristics, and with explaining their reasons for creating categories. Memorized knowledge about specific classifications (such as mammals) is not nearly as important as a student’s ability to recognize or think through why something belongs (or doesn’t belong) in a certain group.</p>
<p>Scientific Inquiry Standard A. Use appropriate instruments safely to observe, measure and collect data when conducting a scientific investigations.</p> <p>Scientific Inquiry Standard B. Organize and evaluate observations, measurements and</p>	<p>Strand I – Nature of Science</p> <p>2. Select instruments, make observations, and/or organize observations of an event, object, or organism.</p> <p>Students should be able to select appropriate instruments (to make observations or perform a task); read or interpret data from</p>

<p>other data to formulate inferences and conclusions.</p>	<p>graphs or tables; take measurements from representations of objects and/or instruments; and organize data, events, or observations into graphs, tables, or sequences. This includes recognizing illustrations of real-life instruments, objects, or organisms, and will show appropriate scales or units as needed.</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 B. Organize and evaluate observations, measurements and other data to formulate inferences and conclusions.</p>	<p>Strand I – Nature of Science</p> <p>3. Identify and/or compare the mass, dimensions, and volume of familiar objects in standard and/or nonstandard units.</p> <p>Students should have familiarity with measurement and with various standard or nonstandard units through having measured things themselves using a variety of measurement systems. Students should be able to use and interpret representations of objects and measurements, and in doing so should focus on the measurements given, not on a visual impression of size.</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 I – Nature of Science</p> <p>4. Use a simple key to distinguish between objects.</p> <p>This outcome asks students to use a simple identification key (flow chart, dichotomous key, key in table or chart format) to distinguish between objects. The use of a dichotomous key relies on the student’s ability to make clear observations and follow a logical sequence. Students should know how to proceed through a dichotomous key step-by-step, from the beginning, to identify a single unknown object or organism.</p> <p>* Instruction of this outcome alone is not sufficient to meet the benchmark. It is a component of the instruction that can be used to teach the concept but it is not complete.</p>

<p>Earth and Space Sciences Standard B. Explain the characteristics, cycles and patterns involving Earth and its place in the solar system.</p> <p>Earth and Space Sciences Standard D. Analyze weather and changes that occur over a period of time.</p> <p>Life Sciences Standard A. Differentiate between the life cycles of different plants and animals</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 C. Explain the importance of keeping records of observations and investigations that are accurate and understandable.</p>	<p>Strand I – Nature of Science</p> <p>5. Analyze a series of events and/or simple daily or seasonal cycles and predict the next likely occurrence in the sequence.</p> <p>“Series of events” and “simple daily or seasonal cycles” include such things as phases of the moon; daily and seasonal orientation of the sun; daily cycles, seasonal cycles, or life cycles of plants and / or animals. Students should be able to identify and /or explain simple patterns and relationships from graphs, charts, or drawings and predict the next likely occurrence in a pattern or sequence of events.</p>
<p>Science and Technology Standard B. Describe and illustrate the design process.</p> <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>Strand I – Nature of Science</p> <p>6. Evaluate a simple procedure to carry out an exploration.</p> <p>Students need to identify which of several possible procedures should be used to explore or answer a particular question; identify which of several possible actions to take to gather information; evaluate whether a procedure or test will yield valid, “fair,” or accurate results; and identify what information could be gained from an exploration. The outcome focuses on several aspects of scientific methodology – in particular, information gathering, performing experiments, interpreting the results, and drawing conclusions. Students should be able to identify a poor set up or uncontrolled variables that could invalidate test results.</p>

	<p>Students should be aware that there are generally several different ways to investigate something in science; they should also be used to thinking up possible methods of investigation, focusing on procedures that are logical and safe, and discussing their reasons for using or not using a particular method.</p>
<p>Science and Technology Standard A. Describe how technology affects human life.</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 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>Strand I – Nature of Science</p> <p>7. Identify and/or discuss the selection of resources and tools used for exploring scientific phenomena.</p> <p>“Used for exploring scientific phenomena” is interpreted broadly to mean “used for a particular science process or with a particular desired result.” The focus is on identifying resources and tools that would be appropriate to use given the stated conditions. For instance, if a desired result is to build an outdoor storage container that would keep seeds from sprouting, the container would have to be waterproof.</p> <p>Selecting instruments and tools relies on students’ abilities to make accurate observations and think logically about the task they are doing. Students should learn these principles through classroom activities that involve methods the students design or modify themselves.</p>

<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>8. Evaluate observations and measurements made by other persons.</p> <p>Students should be able to evaluate the correctness or accuracy of simple observations or measurements; evaluate which, if any conclusions can be drawn from data (that is, what conclusion, if any, is supported by the data); distinguish observations from inferences; and make and/or explain conclusions from data, measurements, or observations. Inferences may be assumptions or reasonable conclusions, but they are not actual observations, and students should understand the difference.</p> <p>Students should be used to comparing observations made by themselves and others to see if they make sense and are logical and accurate. People learn when they compare their learning to a new situation and figure out what any differences mean.</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 1 – Nature of Science</p> <p>9. Demonstrate an understanding of safe use of materials and/or devices in science activities.</p> <p>This outcome focuses on identifying appropriate basic safety measures for certain situations or when dealing with certain materials and/or devices; identifying possible dangers to safety; and identifying which senses (sight, smell, hearing, taste, touch) are appropriate for certain situations. Safety measures and topics/ issues addressed include the following; power tools and electricity; laboratory and general safety procedures and precautions; presence or need of adult supervision or consultation; and handling of unknown plants, animals, dry substances, or solutions.</p> <p>Students should know the limits and rules of acceptable behavior in an activity; they should also be used to discussing safety as</p>

	<p>part of any activity, and should know they are to keep their teacher informed of things that go wrong in science activities.</p>
<p>Science and Technology Standard B. Describe and illustrate the design process.</p>	<p>Strand II – Physical Science</p> <p>10. Explain the operation of a simple mechanical device</p> <p>“Simple mechanical devices” are simple, one-function machines that are reasonably familiar to fourth grade students. Students should recognize or explain how simple mechanical devices work; and recognize how such a device can be used to reduce effort or force. The principle “you don’t get something for nothing” should be understood.</p> <p>* Instruction of this outcome alone is not sufficient to meet the benchmark. It is a component of the instruction that can be used to teach the concept but it is not complete.</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>11. Identify characteristics of a simple physical change.</p> <p>Students should be able to identify characteristics or examples of a simple physical change – that is, a change in the size, shape (configuration), or state of matter of a substance, without its producing or becoming a new substance. Students should also be able to distinguish between changes that are physical only and changes that are chemical as well as physical; describe the energy flow or force that can cause a physical change and identify properties of the different states of matter that indicate a physical change.</p>
<p>Physical Science Standard C. Describe the forces that directly affect objects and their motion.</p>	<p>Strand II – Physical Science</p> <p>12. Explain and/or predict the motion of objects and/or describe the effects of some objects on other objects.</p>

	<p>Students should have a basic understanding of the concept of inertia, gravity; friction, physical characteristics that are associated with causing or reducing friction, and the effect of friction on motion, magnetism, and related forces or concepts.</p>
<p>Earth and Space Science Standard D. Analyze weather and changes that occur over a period of time.</p>	<p>Strand III- Earth and Space Science</p> <p>13. Make predictions about the weather from observed conditions and weather maps.</p> <p>Students should be able to read and understand weather maps using keys, and make predictions from those maps or from stated conditions (times, temperatures, etc.). Students should have an understanding of the general west-to-east movement of weather in the continental U.S.; the association of storms, precipitation, or cloudy skies with colliding warm and cold fronts; the effect of air temperatures in clouds and below clouds on what form cloud precipitation will take; the association of high-pressure systems with clear skies; and the relationship between latitude and general temperature or weather patterns.</p> <p>Students should be able to read maps and weather reports commonly found in daily newspapers; make observations and predictions based on weather maps and on consistently observed phenomena; check predictions made by meteorologists; and identify the likely reasons for certain predictions.</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>Life Sciences Standard C. Compare changes in an organism’s ecosystem / habitat that affect its survival.</p> <p>Science and Technology Standard A. Describe how technology affects human life.</p>	<p>Strand III – Earth and Space Science</p> <p>14. Identify and/or describe the relationship between human activity and the environment..</p> <p>Students should be able to identify or describe the relationship between human activity and the environment, in terms of pollution (air, soil, water), conservation of resources (including plant and animal species), erosion, and agricultural activities; and identify or describe the physical qualities or characteristics of a particular environment that would make it suitable or unsuitable</p>

	<p>for various human activities (e.g., farming, mining).</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>
<p>Earth and Space Sciences Standard B. Summarize the processes that shape Earth's surface and describe evidence of those processes.</p>	<p>Strand III – Earth and Space Science</p> <p>15. Identify evidence and show examples of changes in the earth's surface.</p> <p>Students should be able to identify evidence of changes in the Earth's surface from analyzing "before and after" illustrations of the Earth's surface; from analyzing descriptions of events that would cause erosion, deposition, change in position, or other changes; or from analyzing the fossil record. Students should also be able to provide examples of changes in the Earth's surface and explain the likely causes of such changes – action by wind, water, glaciers, gravity, and plant or animal activity. Students should be able to observe and identify the effects of weathering and geological activity in their immediate world (building, sidewalks, playgrounds) as well as in the reports of events such as storms, floods or earthquakes. The focus at this level should be on what something was like before the event and what it is like as a result of the event, based on students' own observations or on their analysis of other people's observations.</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>Strand IV – Life Science</p> <p>16. Demonstrate an understanding of the basic needs of living things.</p> <p>Items will test student understanding of a living organism's need for a source of food or energy, water, gases to take in, and an environment that will allow the organisms to survive. Students</p>

Life Sciences Standard

C. Compare changes in an organism's ecosystem / habitat that affect its survival.

should be able to identify how a certain characteristic or behavior helps an organism meet its basic needs, or identify what basic need is being met by a characteristic or behavior; distinguish absolutely necessary conditions for growth or survival from conditions that aren't necessary; and identify how or why certain conditions can prevent organisms from surviving.

Students should be able to identify or discuss how to keep something alive, taking into account conditions as well as resources needed.

Strand IV – Life Science

17. Identify ways in which organisms react to changing environments.

This outcome includes ways in which organisms react to environmental changes that are daily, seasonal, regular, or irregular on both a population level and an individual level. Students should be able to identify which ways organisms react to such changes and the purpose that such reactions serve; and ways that organisms have to meet their basic needs when a changing environment stresses the organism.

Strand IV – Life Science

18. Distinguish between living and nonliving things and provide justification for these distinctions.

Students should recognize characteristics that can identify a things as living or nonliving. Students should understand that many nonliving things can show several characteristic of living things, but cannot show them all.

Strand IV – Life Science

19. Analyze and/or evaluate various nutritional plans for humans.