



EarthComm Correlation to the Ohio Academic Content Standards for Earth and Space Sciences, Grades 9-10

Earth and Space Sciences

Students demonstrate an understanding about how Earth systems and processes interact in the geosphere resulting in the habitability of Earth. This includes demonstrating an understanding of the composition of the universe, the solar system and Earth. In addition, it includes understanding the properties and the interconnected nature of Earth's systems, processes that shape Earth and Earth's history. Students also demonstrate an understanding of how the concepts and principles of energy, matter, motion and forces explain Earth systems, the solar system and the universe. Finally, they grasp an understanding of the historical perspectives, scientific approaches and emerging scientific issues associated with Earth and space sciences.

Benchmark	Indicator	Location/Page where Standard is found
<u>Benchmark A:</u> Explain how evidence from stars and other celestial objects provide information about the processes that cause changes in the composition and scale of the physical universe.		
<i>The Universe(Grade 10)</i>	1. Describe that stars produce energy from nuclear reactions and that processes in stars have led to the formation of all elements beyond hydrogen and helium.	E58-68, E69-79, E4-13, E47-57
	2. Describe the current scientific evidence that supports the theory of the explosive expansion of the universe, the Big Bang, over 10 billion years ago.	E58-68, E69-79, E4-13, E37-46

<u>Benchmark B: Explain that many processes occur in patterns within the Earth's systems.</u>		
<i>Earth Systems(Grade9)</i>	4. Explain the relationships of the oceans to the lithosphere and atmosphere (e.g., transfer of energy, ocean currents and landforms).	E117-124, E125-135, E136-143, G4-13, U131-137, F4-12, F23-36, F37-47, F48-55, F158-166, F167-173, R146-155
<i>Earth Systems(Grade10)</i>	1. Summarize the relationship between the climatic zone and the resultant biomes. (This includes explaining the nature of the rainfall and temperature of the mid-latitude climatic zone that supports the deciduous forest.)	E84-95, E10-116, E117-124, G38-42, U131-137, F4-12, F23-36, E156-164
	2. Explain climate and weather patterns associated with certain geographic locations and features (e.g., tornado alley, tropical hurricanes and lake effect snow).	E84-95, E10-116, E117-124, E125-135, E136-143, F23-36, F48-55, F66-76, F77-87, F158-166
<u>Benchmark C: Explain the 4.5 billion-year-history of Earth and the 4 billion-year-history of life on Earth based on observable scientific evidence in the geologic record.</u>		
<i>The Universe(Grade 9)</i>	3. Explain that gravitational forces govern the characteristics and movement patterns of the planets, comets and asteroids in the solar system.	E14-27, E28-36, E37-46
<i>Earth Systems (Grade 10)</i>	3. Explain how geologic time can be estimated by multiple methods (e.g., rock sequences, fossil correlation and radiometric dating).	E37-46, E96-104, E148-155, E173-181, U4-13, U14-22, U23-32, U33-38, U49-56, U57-65, E165-173
	4. Describe how organisms on Earth contributed to the dramatic change in oxygen content of Earth's early atmosphere.	E96-104, E125-135, E148-155
<u>Benchmark D: Describe the finite nature of Earth's resources and those human activities that can conserve or deplete Earth's resources.</u>		

<i>Earth Systems(Grade10)</i>	5. Explain how the acquisition and use of resources, urban growth and waste disposal can accelerate natural change and impact the quality of life.	E125-135, U100-112, U113-119, U124-130, U131-137, U138-145, U155-162, F56-61, F149-157, R25-34, R43-52, R53-61, R72-82, R88-95, R127-135, R146-155, R156-168, R169-176, R184-195, R196-202
	6. Describe ways that human activity can alter biogeochemical cycles (e.g., carbon and nitrogen cycles) as well as food webs and energy pyramids (e.g., pest control, legume rotation crops vs. chemical fertilizers).	E125-135, E136-143, U100-112, U113-119, U131-137, U138-145, U155-162, F56-61, R25-34, R43-52, R53-61, R156-168, R184-195, R196-202
<u>Benchmark E:</u> Explain the processes that move and shape Earth's surface.		
<i>Processes That Shape Earth (Grade 9)</i>	5. Explain how the slow movement of material within Earth results from: a. thermal energy transfer (conduction and convection) from the deep interior; b. the action of gravitational forces on regions of different density.	G51-57, G62-73, G74-84, G85-94, G95-104
	6. Explain the results of plate tectonic activity (e.g., magma generation, igneous intrusion, metamorphism, volcanic action, earthquakes, faulting and folding).	G4-13, G14-22, G23-30, G43-50, G62-73, G74-84, G85-94, G95-104, G122-130, G138-146, U39-48
	7. Explain sea-floor spreading and continental drift using scientific evidence (e.g., fossil distributions, magnetic reversals and radiometric dating).	G14-22, G74-84, G85-94, G95-104, G105-117

Benchmark F: Summarize the historical development of scientific theories and ideas, and describe emerging issues in the study of Earth and space sciences.		
<i>Historical Perspectives and Scientific Revolutions(Grade 9)</i>	8. Use historical examples to explain how new ideas are limited by the context in which they are conceived; are often initially rejected by the scientific establishment; sometimes spring from unexpected findings; and usually grow slowly through contributions from many different investigators (e.g., heliocentric theory and plate tectonics theory).	G105-117, G131-137, E165-172, E4-13, E14-27, E58-68, E69-79
<i>Historical Perspectives and Scientific Revolutions(Grade 10)</i>	7. Describe advances and issues in Earth and space science that have important long-lasting effects on science and society (e.g., geologic time scales, global warming, depletion of resources and exponential population growth).	E125-135, E136-143, G131-137, G147-154, G155-163, G164-172, U155-162, F56-61, F88-94, R25-34, R43-61, R72-83, R88-95, R156-160, R169-176, R184-195, R196-202

Science and Technology

Students recognize that science and technology are interconnected and that using technology involves assessment of the benefits, risks and costs. Students should build scientific and technological knowledge, as well as the skill required to design and construct devices. In addition, they should develop the processes to solve problems and understand that problems may be solved in several ways.

Benchmark	Indicator	Location/Page where Standard is found
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<u>Benchmark A: Explain the ways in which the processes of technological design respond to the needs of society.</u>		
<i>Abilities To Do Technological Design (Grade 9)</i>	2. Identify a problem or need, propose designs and choose among alternative solutions for the problem.	F2-12, G51-57, G4-13, G14-22, G74-84, G95-104, G155-163
	3. Explain why a design should be continually assessed and the ideas of the design should be tested, adapted and refined.	G38-42, G14-22, G95-104, G122-130, G155-163
<i>Abilities To Do Technological Design (Grade 10)</i>	3. Explain that when evaluating a design for a device or process, thought should be given to how it will be manufactured, operated, maintained, replaced and disposed of in addition to who will sell, operate and take care of it. Explain how the costs associated with these considerations may introduce additional constraints on the design.	E173-177, E177-181, G105-109, G110-117, R184-195, G122-130, G131-137, G155-163
<u>Benchmark B: Explain that science and technology are interdependent; each drives the other.</u>		
<i>Understanding Technology (Grade 9)</i>	1. Describe means of comparing the benefits with the risks of technology and how science can inform public policy.	F88-94, F113-123, R16-24, G155-163
<i>Understanding Technology (Grade 10)</i>	1. Cite examples of ways that scientific inquiry is driven by the desire to understand the natural world and how technology is driven by the need to meet human needs and solve human problems.	F88-94, G131-137, G155-163
	2. Describe examples of scientific advances and emerging technologies and how they may impact society.	F88-94, F113-123, G151-163, G164-171, E4-13

Scientific Inquiry

Students develop scientific habits of mind as they use the processes of scientific inquiry to ask valid questions and to gather and analyze information. They understand how to develop hypotheses and make predictions. They are able to reflect on scientific practices as they develop plans of action to create and evaluate a variety of conclusions. Students are also able to demonstrate the ability to communicate their findings to others.

Benchmark	Indicator	Location/Page where Standard is found
Benchmark A: Participate in and apply the processes of scientific investigation to create models and to design, conduct, evaluate and communicate the results of these investigations.		
<i>Doing Scientific Inquiry</i> (Grade 9)	1. Distinguish between observations and inferences given a scientific situation.	G105-109, G110-114, G122-130
	2. Research and apply appropriate safety precautions when designing and conducting scientific investigations (e.g., OSHA, Material Safety Data Sheets [MSDS], eyewash, goggles and ventilation).	G14-22, G23-30, G38-42, G95-104
	3. Construct, interpret and apply physical and conceptual models that represent or explain systems, objects, events or concepts.	R184-195, G4-13, G14-22, G74-84, G122-130, G131-137, G155-163

	4. Decide what degree of precision based on the data is adequate and round off the results of calculator operations to the proper number of significant figures to reasonably reflect those of the inputs.	E28-36, E37-40, E41-46
	5. Develop oral and written presentations using clear language, accurate data, appropriate graphs, tables, maps and available technology.	R169-171, R173-176, R184-188, R189-195
	6. Draw logical conclusions based on scientific knowledge and evidence from investigations.	E173-181, G122-130, G131-137
<i>Doing Scientific Inquiry(Grade 10)</i>	1. Research and apply appropriate safety precautions when designing and conducting scientific investigations (e.g. OSHA, MSDS, eyewash, goggles and ventilation).	F4-12, F13-22, F77-87, F128-137, R25-34, R62-71
	2. Present scientific findings using clear language, accurate data, appropriate graphs, tables, maps and available technology.	U124-126, U131-134, R169-171, R173-176
	3. Use mathematical models to predict and analyze natural phenomena.	R184-188, R189-195, E125-129, G131-137
	4. Draw conclusions from inquiries based on scientific knowledge and principles, the use of logic and evidence (data) from investigations.	E173-181, G122-130, G155-163
	5. Explain how new scientific data can cause any existing scientific explanation to be supported, revised or rejected.	G105-109, G110-117, R184-188, R189-195

Scientific Ways of Knowing

Students realize that the current body of scientific knowledge must be based on evidence, be predictive, logical, subject to modification and limited to the natural world. This includes demonstrating an understanding that scientific knowledge grows and advances as new evidence is discovered to support or modify existing theories, as well as to encourage the development of new theories. Students are able to reflect on ethical scientific practices and demonstrate an understanding of how the current body of scientific knowledge reflects the historical and cultural contributions of women and men who provide us with a more reliable and comprehensive understanding of the natural world.

Benchmark	Indicator	Location/Page where Standard is found
<u>Benchmark A:</u> Explain that scientific knowledge must be based on evidence, be predictive, logical, subject to modification and limited to the natural world.		
<i>Nature of Science(Grade 9)</i>	1. Comprehend that many scientific investigations require the contributions of women and men from different disciplines in and out of science. These people study different topics, use different techniques and have different standards of evidence but share a common purpose - to better understand a portion of our universe.	E80, R142, R203, F124
	3. Demonstrate that reliable scientific evidence improves the ability of scientists to offer accurate predictions.	G62-67, G68-77, F37-47, F48-55
<i>Nature of Science(Grade 10)</i>	1. Discuss science as a dynamic body of knowledge that can lead to the development of entirely new disciplines.	G38-40, G40-42, F37-47, F48-55
	2. Describe that scientists may disagree about explanations of phenomena, about interpretation of data or about the value of rival theories, but they do agree that questioning, response to criticism and open communication are integral to the process of science.	G105-109, G110-116, E37-40, E41-46, E74-77, F45

	3. Recognize that science is a systematic method of continuing investigation, based on observation, hypothesis testing, measurement, experimentation, and theory building, which leads to more adequate explanations of natural phenomena.	F4-7, F8-12, G105-116, U57-65, F13-22, F37-47
<u>Benchmark B:</u> Explain how scientific inquiry is guided by knowledge, observations, ideas and questions.		
<i>Scientific Theories(Grade 9)</i>	5. Justify that scientific theories are explanations of large bodies of information and/or observations that withstand repeated testing.	G105-109, G110-116, F13-22, G155-163
	6. Explain that inquiry fuels observation and experimentation that produce data that are the foundation of scientific disciplines. Theories are explanations of these data.	G105-109, G110-116, F23-36, F37-47, G155-163
	7. Recognize that scientific knowledge and explanations have changed over time, almost always building on earlier knowledge.	G105-116, U57-65, E117-124, F23-36
<u>Benchmark C:</u> Describe the ethical practices and guidelines in which science operates.		
<i>Nature of Science(Grade 9)</i>	2. Illustrate that the methods and procedures used to obtain evidence must be clearly reported to enhance opportunities for further investigations.	F13-22, F37-47, G155-163
<i>Ethical Practices(Grade 9)</i>	4. Explain how support of ethical practices in science (e.g., individual observations and confirmations, accurate reporting, peer review and publication) are required to reduce bias.	U122-123, U124-130
<i>Ethical Practices(Grade 10)</i>	4. Recognize that ethical considerations limit what scientists can do.	U122-123, U124-130
	5. Recognize that research involving voluntary human subjects should be conducted only with the informed consent of the subjects and follow rigid guidelines and/or laws.	
	6. Recognize that animal-based research must be conducted according to currently accepted professional standards and laws.	

<u>Benchmark D: Recognize that scientific literacy is part of being a knowledgeable citizen.</u>		
<i>Science and Society(Grade 9)</i>	8. Illustrate that much can be learned about the internal workings of science and the nature of science from the study of scientists, their daily work and their efforts to advance scientific knowledge in their area of study.	F62, F124, F189, E80, E144, E189, R84, R142, R203, G58, G118, G173, U66, U120, U171
	9. Investigate how the knowledge, skills and interests learned in science classes apply to the careers students plan to pursue.	F62, F124, F189, E80, E144, E189, R84, R142, R203, G58, G118, G173, U66, U120, U171
<i>Science and Society(Grade 10)</i>	7. Investigate how the knowledge, skills and interests learned in science classes apply to the careers students plan to pursue.	F62, F124, F189, E80, E144, E189, R84, R142, R203, G58, G118, G173, U66, U120, U171