

SCIENCE GRADE 11

Adams County/Ohio Valley
Course of Study

Content Standard: Earth and Space Science
Grade 11-12 Benchmarks: A. Explain how technology can be used to gather evidence and increase our understanding of the universe.
Content Organizer: The Universe

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>1. Describe how the early Earth was different from the planet we live on today, and explain the formation of the sun, Earth and the rest of the solar system from a nebular cloud of dust and gas approximately 4.5 billion years ago.</p>				

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Content Standard: Earth and Space Science
Grade 11-12 Benchmarks: B. Describe how Earth is made up of a series of interconnected systems and how a change in one system affects other systems.
Content Organizer: Earth Systems

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>2. Analyze how the regular and predictable motions of Earth, sun and moon explain phenomena on Earth (e.g., seasons, tides, eclipses and phases of the Moon).</p>				

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Content Organizer: Earth Systems

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>3. Explain heat and energy transfers in and out of the atmosphere and its involvement in weather and climate (radiation, conduction, convection and advection).</p>				

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Content Standard: Earth and Space Science

Grade 11-12 Benchmarks: B. Describe how Earth is made up of a series of interconnected systems and how a change in one system affects other systems.

Content Organizer: Earth Systems

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
4. Explain the impact of oceanic and atmospheric currents on weather and climate.				

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Content Standard: Earth and Space Science
Grade 11-12 Benchmarks: B. Describe how Earth is made up of a series of interconnected systems and how a change in one system affects other systems.
Content Organizer: Earth Systems

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
5. Use appropriate data to analyze and predict upcoming trends in global weather patterns (e.g., el Niño and la Niña, melting glaciers and icecaps, changes in ocean surface temperatures).				

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Content Organizer: Earth Systems

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>6. Explain how interactions among Earth’s lithosphere, hydrosphere, atmosphere and biosphere have resulted in the ongoing changes of Earth’s system.</p>				

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Content Standard: Earth and Space Science
Grade 11-12 Benchmarks: B. Describe how Earth is made up of a series of interconnected systems and how a change in one system affects other systems.
Content Organizer: Earth Systems

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
7. Describe the effects of particulates and gases in the atmosphere including those originating from volcanic activity.				

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Grade 11-12 Benchmarks: B. Describe how Earth is made up of a series of interconnected systems and how a change in one system affects other systems.
Content Organizer: Earth Systems

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>8. Describe the normal adjustments of Earth, which may be hazardous for humans. Recognize that humans live at the interface between the atmosphere driven by solar energy and the upper mantle where convection creates changes in Earth's solid crust. Realize that as societies have grown, become stable and come to value aspects of the environment, vulnerability to natural processes of change has increased.</p>				

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Content Standard: Earth and Space Science
Grade 11-12 Benchmarks: C. Explain that humans are an integral part of the Earth's system and the choices humans make today impact natural systems in the future.

Content Organizer: Earth Systems

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
9. Explain the effects of biomass and human activity on climate (e.g., climatic change, global warming).				

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Content Standard: Earth and Space Science
Grade 11-12 Benchmarks: B. Describe how Earth is made up of a series of interconnected systems and how a change in one system affects other systems.
Content Organizer: Earth Systems

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
10. Interpret weather maps and their symbols to predict changing weather conditions worldwide (e.g., monsoons, hurricanes and cyclones).				

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Grade 11-12 Benchmarks: C. Explain that humans are an integral part of the Earth's system and the choices humans make today impact natural systems in the future.
Content Organizer: Earth Systems

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
11. Analyze how materials from human societies (e.g., radioactive waste, air pollution) affect both physical and chemical cycles of Earth.				

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Content Standard: Earth and Space Science
Grade 11-12 Benchmarks: C. Explain that humans are an integral part of the Earth's system and the choices humans make today impact natural systems in the future.

Content Organizer: Earth Systems

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>12. Explain ways in which humans have had a major effect on other species (e.g., the influence of humans on other organisms occurs through land use, which decreases space available to other species and pollution, which changes the chemical composition of air, soil and water).</p>				

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Content Standard: Earth and Space Science
Grade 11-12 Benchmarks: C. Explain that humans are an integral part of the Earth's system and the choices humans make today impact natural systems in the future.

Content Organizer: Earth Systems

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>13. Explain how human behavior affects the basic processes of natural ecosystems and the quality of the atmosphere, hydrosphere and lithosphere.</p>				

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Content Standard: Earth and Space Science
Grade 11-12 Benchmarks: C. Explain that humans are an integral part of the Earth's system and the choices humans make today impact natural systems in the future.

Content Organizer: Earth Systems

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
14. Conclude that Earth has finite resources and explain that humans deplete some resources faster than they can be renewed.				

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Content Standard: Earth and Space Science
Grade 11-12 Benchmarks: D. Summarize the historical development of scientific theories and ideas and describe emerging issues in the study of Earth and space sciences.
Content Organizer: Historical Perspectives And Scientific Revolutions

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>15. Use historical examples to show how new ideas are limited by the context in which they are conceived; are often rejected by the social establishment; sometimes spring from unexpected findings; and usually grow slowly through contributions from many different investigators (e.g., global warming, Heliocentric Theory, Theory of Continental Drift).</p>				

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Content Organizer: Historical Perspectives And Scientific Revolutions

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>16. Describe advances in Earth and space science that have important long-lasting effects on science and society (e.g., global warming, Heliocentric Theory, Plate Tectonics Theory).</p>				

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Content Standard: Life Science

Grade 11-12 Benchmarks: A. Explain how processes at the cellular level affect the functions and characteristics of an organism.

Content Organizer: Characteristics and Structure of Life

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>1. Describe how the maintenance of a relatively stable internal environment is required for the continuation of life, and explain how stability is challenged by changing physical, chemical and environmental conditions as well as the presence of pathogens.</p>				

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Adams County/Ohio Valley
Course of Study

Content Standard: Life Science
Grade 11-12 Benchmarks: A. Explain how processes at the cellular level affect the functions and characteristics of an organism.
Content Organizer: Characteristics and Structure of Life

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>2. Recognize that chemical bonds of food molecules contain energy. Energy is released when the bonds of food molecules are broken and new compounds with lower energy bonds are formed. Some of this energy is released as thermal energy.</p>				

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Adams County/Ohio Valley
Course of Study

Content Standard: Life Science
Grade 11-12 Benchmarks: B. Explain how humans are connected to and impact natural systems.
Content Organizer: Characteristics and Structure of Life

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
3. Relate how birth rates, fertility rates and death rates are affected by various environmental factors.				

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Adams County/Ohio Valley
Course of Study

Content Standard: Life Science
Grade 11-12 Benchmarks: B. Explain how humans are connected to and impact natural systems.
Content Organizer: Characteristics and Structure of Life

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>4. Examine the contributing factors of human population growth that impact natural systems such as levels of education, children in the labor force, education and employment of women, infant mortality rates, costs of raising children, birth control methods, and cultural norms.</p>				

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Adams County/Ohio Valley
Course of Study

Content Standard: Life Science
Grade 11-12 Benchmarks: B. Explain how humans are connected to and impact natural systems.
Content Organizer: Characteristics and Structure of Life

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
5. Investigate the impact on the structure and stability of ecosystems due to changes in their biotic and abiotic components as a result of human activity.				

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Content Standard: Life Science
Grade 11-12 Benchmarks: E. Explain the interconnectedness of the components of a natural system.
Content Organizer: Diversity and Interdependence of Life

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
6. Predict some possible impacts on an ecosystem with the introduction of a non-native species.				

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Course of Study

Content Standard: Life Science
Grade 11-12 Benchmarks: E. Explain the interconnectedness of the components of a natural system.
Content Organizer: Diversity and Interdependence of Life

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>7. Show how populations can increase through linear or exponential growth with corresponding effects on resource use and environmental pollution.</p>				

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Content Standard: Life Science
Grade 11-12 Benchmarks: E. Explain the interconnectedness of the components of a natural system.
Content Organizer: Diversity and Interdependence of Life

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>8. Recognize that populations can reach or temporarily exceed the carrying capacity of a given environment. Show that the limitation is not just the availability of space but the number of organisms in relation to resources and the capacity of earth systems to support life.</p>				

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Content Standard: Life Science

Grade 11-12 Benchmarks: F. Explain how human choices today will affect the quality and quantity of life on earth.

Content Organizer: Diversity and Interdependence of Life

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
9. Give examples of how human activity can accelerate rates of natural change and can have unforeseen consequences.				

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Content Standard: Life Science
Grade 11-12 Benchmarks: E. Explain the interconnectedness of the components of a natural system.
Content Organizer: Diversity and Interdependence of Life

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
10. Explain how environmental factors can influence heredity or development of organisms.				

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Course of Study

Content Standard: Life Science

Grade 11-12 Benchmarks: F. Explain how human choices today will affect the quality and quantity of life on earth.

Content Organizer: Diversity and Interdependence of Life

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>11. Investigate issues of environmental quality at local, regional, national and global levels such as population growth, resource use, population distribution, over-consumption, the capacity of technology to solve problems, poverty, the role of economics, politics and different ways humans view Earth.</p>				

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Course of Study

Content Standard: Life Science
Grade 11-12 Benchmarks: D. Relate how biotic and abiotic global changes have occurred in the past and will continue to do so in the future.
Content Organizer: Evolutionary Theory

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
12. Recognize that ecosystems change when significant climate changes occur or when one or more new species appear as a result of immigration or speciation.				

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Content Standard: Life Science
Grade 11-12 Benchmarks: D. Relate how biotic and abiotic global changes have occurred in the past and will continue to do so in the future.
Content Organizer: Evolutionary Theory

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
13. Describe how the process of evolution has changed the physical world over geologic time.				

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Content Standard: Life Science
Grade 11-12 Benchmarks: D. Relate how biotic and abiotic global changes have occurred in the past and will continue to do so in the future.
Content Organizer: Evolutionary Theory

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>14. Describe how geologic time can be estimated by observing rock sequences and using fossils to correlate the sequences at various locations. Recognize that current methods include using the known decay rates of radioactive isotopes present in rocks to measure the time since the rock was formed.</p>				

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Adams County/Ohio Valley
Course of Study

Content Standard: Physical Science
Grade 11-12 Benchmarks: A. Explain how variations in the arrangement and motion of atoms and molecules form the basis of a variety of biological, chemical and physical phenomena.
Content Organizer: Nature of Matter

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>1. Explain that elements with the same number of protons may or may not have the same mass and those with different masses (different numbers of neutrons) are called isotopes. Some of these are radioactive.</p>				

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Adams County/Ohio Valley
Course of Study

Content Standard: Physical Science
Grade 11-12 Benchmarks: E. Summarize the historical development of scientific theories and ideas within the study of physical sciences.
Content Organizer: Nature of Matter

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
2. Explain that humans have used unique bonding of carbon atoms to make a variety of molecules (e.g., plastics).				

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Course of Study

Content Standard: Physical Science
Grade 11-12 Benchmarks: C. Describe how atoms and molecules can gain or lose energy only in discrete amounts.
Content Organizer: Forces and Motion

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>3. Describe real world examples showing that all energy transformations tend toward disorganized states (e.g., fossil fuel combustion, food pyramids, electrical use).</p>				

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Adams County/Ohio Valley
Course of Study

Content Standard: Physical Science
Grade 11-12 Benchmarks: D. Apply principles of forces and motion to mathematically analyze, describe and predict the net effects on objects or systems.
Content Organizer: Forces and Motion

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>4. Explain how electric motors and generators work (e.g., relate that electricity and magnetism are two aspects of a single electromagnetic force). Investigate that electric charges in motion produce magnetic fields and a changing magnetic field creates an electric field.</p>				

SCIENCE GRADE 11

Adams County/Ohio Valley
Course of Study

Content Standard: Science and Technology
Grade 11-12 Benchmarks: A. Predict how human choices today will determine the quality and quantity of life on Earth.
Content Organizer: Understanding Technology

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
1. Identify that science and technology are essential social enterprises but alone they can only indicate what can happen, not what should happen. Realize the latter involves human decisions about the use of knowledge.				

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Adams County/Ohio Valley
Course of Study

Content Standard: Science and Technology
Grade 11-12 Benchmarks: A. Predict how human choices today will determine the quality and quantity of life on Earth.
Content Organizer: Understanding Technology

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
2. Predict how decisions regarding the implementation of technologies involve the weighing of trade-offs between predicted positive and negative effects on the environment and/or humans.				

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Adams County/Ohio Valley
Course of Study

Content Standard: Science and Technology
Grade 11-12 Benchmarks: A. Predict how human choices today will determine the quality and quantity of life on Earth.
Content Organizer: Understanding Technology

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>3. Explore and explain any given technology that may have a different value for different groups of people and at different points in time (e.g., new varieties of farm plants and animals have been engineered by manipulating their genetic instructions to reproduce new characteristics).</p>				

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Adams County/Ohio Valley
Course of Study

Content Standard: Science and Technology
Grade 11-12 Benchmarks: A. Predict how human choices today will determine the quality and quantity of life on Earth.
Content Organizer: Understanding Technology

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>4. Explain why basic concepts and principles of science and technology should be a part of active debate about the economics, policies, politics and ethics of various science-related and technology-related challenges.</p>				

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Adams County/Ohio Valley
Course of Study

Content Standard: Science and Technology
Grade 11-12 Benchmarks: A. Predict how human choices today will determine the quality and quantity of life on Earth.
Content Organizer: Understanding Technology

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>5. Investigate that all fuels (e.g., fossil, solar, nuclear) have advantages and disadvantages; therefore society must consider the trade-offs among them (e.g., economic costs and environmental impact).</p>				

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Adams County/Ohio Valley
Course of Study

Content Standard: Science and Technology
Grade 11-12 Benchmarks: A. Predict how human choices today will determine the quality and quantity of life on Earth.
Content Organizer: Understanding Technology

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>6. Research sources of energy beyond traditional fuels and the advantages, disadvantages and trade-offs society must consider when using alternative sources (e.g., biomass, solar, hybrid engines, wind, fuel cells).</p>				

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Content Standard: Scientific Inquiry
Grade 11-12 Benchmarks: A. Make appropriate choices when designing and participating in scientific investigations by using cognitive and manipulative skills when collecting data and formulating conclusions from the data.
Content Organizer: Doing Scientific Inquiry

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
1. Formulate testable hypotheses. Develop and explain the appropriate procedures, controls and variables (dependent and independent) in scientific experimentation.				

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Content Standard: Scientific Inquiry
Grade 11-12 Benchmarks: A. Make appropriate choices when designing and participating in scientific investigations by using cognitive and manipulative skills when collecting data and formulating conclusions from the data.
Content Organizer: Doing Scientific Inquiry

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
2. Evaluate assumptions that have been used in reaching scientific conclusions.				

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Adams County/Ohio Valley
Course of Study

Content Standard: Scientific Inquiry
Grade 11-12 Benchmarks: A. Make appropriate choices when designing and participating in scientific investigations by using cognitive and manipulative skills when collecting data and formulating conclusions from the data.
Content Organizer: Doing Scientific Inquiry

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
3. Design and carry out scientific inquiry (investigation), communicate and critique results through peer review.				

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Adams County/Ohio Valley
Course of Study

Content Standard: Scientific Inquiry
Grade 11-12 Benchmarks: A. Make appropriate choices when designing and participating in scientific investigations by using cognitive and manipulative skills when collecting data and formulating conclusions from the data.
Content Organizer: Doing Scientific Inquiry

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
4. Explain why the methods of an investigation are based on the questions being asked.				

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Content Standard: Scientific Inquiry
Grade 11-12 Benchmarks: A. Make appropriate choices when designing and participating in scientific investigations by using cognitive and manipulative skills when collecting data and formulating conclusions from the data.
Content Organizer: Doing Scientific Inquiry

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
5. Summarize data and construct a reasonable argument based on those data and other known information.				

SCIENCE GRADE 11

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Course of Study

Content Standard: Scientific Ways of Knowing
Grade 11-12 Benchmarks: A. Explain how scientific evidence is used to develop and revise scientific predictions, ideas or theories.
Content Organizer: Nature of Science

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
1. Analyze a set of data to derive a hypothesis and apply that hypothesis to a similar phenomenon (e.g., biome data).				

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Content Standard: Scientific Ways of Knowing
Grade 11-12 Benchmarks: A. Explain how scientific evidence is used to develop and revise scientific predictions, ideas or theories.
Content Organizer: Nature of Science

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
2. Apply scientific inquiry to evaluate results of scientific investigations, observations, theoretical models and the explanations proposed by other scientists.				

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Course of Study

Content Standard: Scientific Ways of Knowing
Grade 11-12 Benchmarks: A. Explain how scientific evidence is used to develop and revise scientific predictions, ideas or theories.
Content Organizer: Nature of Science

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>3. Demonstrate that scientific explanations adhere to established criteria, for example a proposed explanation must be logically consistent, it must abide by the rules of evidence and it must be open to questions and modifications.</p>				

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Content Standard: Scientific Ways of Knowing
Grade 11-12 Benchmarks: A. Explain how scientific evidence is used to develop and revise scientific predictions, ideas or theories.
Content Organizer: Nature of Science

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
4. Explain why scientists can assume that the universe is a vast single system in which the basic rules are the same everywhere.				

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Content Standard: Scientific Ways of Knowing
Grade 11-12 Benchmarks: B. Explain how ethical considerations shape scientific endeavors.
Content Organizer: Ethical Practices

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>5. Recognize that bias affects outcomes. People tend to ignore evidence that challenges their beliefs but accept evidence that supports their beliefs. Scientists attempt to avoid bias in their work.</p>				

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Adams County/Ohio Valley
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Content Standard: Scientific Ways of Knowing
Grade 11-12 Benchmarks: B. Explain how ethical considerations shape scientific endeavors.
Content Organizer: Nature of Science

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
6. Describe the strongly held traditions of science that serve to keep scientists within the bounds of ethical professional behavior.				

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Adams County/Ohio Valley
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Content Standard: Scientific Ways of Knowing
Grade 11-12 Benchmarks: A. Explain how scientific evidence is used to develop and revise scientific predictions, ideas or theories.
Content Organizer: Scientific Theories

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>7. Explain how theories are judged by how well they fit with other theories, the range of included observations, how well they explain observations and how effective they are in predicting new findings.</p>				

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Content Standard: Scientific Ways of Knowing
Grade 11-12 Benchmarks: C. Explain how societal issues and considerations affect the progress of science and technology.
Content Organizer: Science and Society

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
8. Explain that the decision to develop a new technology is influenced by societal opinions and demands and by cost benefit considerations.				

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Content Standard: Scientific Ways of Knowing
Grade 11-12 Benchmarks: C. Explain how societal issues and considerations affect the progress of science and technology.
Content Organizer: Science and Society

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>9. Explain how natural and human-induced hazards present the need for humans to assess potential danger and risk. Many changes in the environment designed by humans bring benefits to society as well as cause risks.</p>				

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Content Standard: Scientific Ways of Knowing
Grade 11-12 Benchmarks: C. Explain how societal issues and considerations affect the progress of science and technology.
Content Organizer: Science and Society

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>10. Describe costs and trade-offs of various hazards - ranging from those with minor risk to a few people, to major catastrophes with major risk to many people. The scale of events and the accuracy with which scientists and engineers can (and cannot) predict events are important considerations.</p>				

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Adams County/Ohio Valley
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Content Standard: Scientific Ways of Knowing
Grade 11-12 Benchmarks: C. Explain how societal issues and considerations affect the progress of science and technology.
Content Organizer: Science and Society

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
11. Research the role of science and technology in careers that students plan to pursue.				