

SCIENCE GRADE 10

Adams County/Ohio Valley
Course of Study

<p>Content Standard: Earth and Space Science Grade 9-10 Benchmarks: B. Explain that many processes occur in patterns within the Earth's systems. Content Organizer: Earth Systems</p>				
Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>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.)</p>		<p>Biology (Student textbook) Prentice Hall:Miller/Levine 2004 (pp. 64, 98-105) TE: Section Review: 4-3 Technology resource- text: 4-3, Presentation Assistant Plus (PAP) 4-3</p> <p>Word Wall – Teacher-created species populations communities ecosystem biome biosphere tolerance terrestrial adaptation microclimate abiotic coniferous deciduous humus taiga permafrost</p>		<p>Biology p. 105 4-3 Section Assessment Question #6 – Select an appropriate graphic organizer to use in answering this question. After you have completed the organizer, use the information to write a journal entry (no longer than one page) explaining your understanding.</p> <p>Alternative Assessment (p. 105) Select two biomes very different from each other. Divide a standard letter size paper into two parts. Create a visual representation of the biomes. (Students should not merely copy the pages in the textbook. The objective is to provide information in visual form, not draw a nice picture.</p>

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Content Standard: Earth and Space Science
Grade 9-10 Benchmarks: B. Explain that many processes occur in patterns within the Earth's systems.
Content Organizer: Earth Systems

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2. Explain climate and weather patterns associated with certain geographic locations and features (e.g., tornado alley, tropical hurricanes and lake effect snow).				

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Content Standard: Earth and Space Science
Grade 9-10 Benchmarks: 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.
Content Organizer: Earth Systems

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
3. Explain how geologic time can be estimated by multiple methods (e.g., rock sequences, fossil correlation, radiometric dating).				

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Content Organizer: Earth Systems

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
4. Describe how organisms on Earth contributed to the dramatic change in oxygen content of Earth's early atmosphere.				

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Content Standard: Earth and Space Science
Grade 9-10 Benchmarks: D. Describe the finite nature of Earth's resources and those human activities that can conserve or deplete Earth's resources.
Content Organizer: Earth Systems

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
5. Explain how the acquisition and use of resources, urban growth and waste disposal can accelerate natural change and impact the quality of life.				

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Grade 9-10 Benchmarks: D. Describe the finite nature of Earth's resources and those human activities that can conserve or deplete Earth's resources.
Content Organizer: Earth Systems

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>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).</p>				

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Content Standard: Earth and Space Science
Grade 9-10 Benchmarks: F. 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>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, exponential population growth).</p>				

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Content Standard: Life Science
Grade 9-10 Benchmarks: A. Explain that cells are the basic unit of structure and function of living organisms, that once life originated all cells come from pre-existing cells, and that there are a variety of cell types.
Content Organizer: Characteristics and Structure of Life

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
1. Explain that living cells <ul style="list-style-type: none"> a. are composed of a small number of key chemical elements (carbon, hydrogen, oxygen, nitrogen, phosphorus and sulfur) b. are the basic unit of structure and function of all living things c. come from pre-existing cells after life originated, and d. are different from viruses 				

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Content Organizer: Characteristics and Structure of Life

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
2. Compare the structure, function and interrelatedness of cell organelles in eukaryotic cells (e.g., nucleus, chromosome, mitochondria, cell membrane, cell wall, chloroplast, cilia, flagella) and prokaryotic cells.				

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Content Standard: Life Science
Grade 9-10 Benchmarks: B. Explain the characteristics of life as indicated by cellular processes and describe the process of cell division and development.
Content Organizer: Characteristics and Structure of Life

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>3. Explain the characteristics of life as indicated by cellular processes including</p> <ul style="list-style-type: none"> a. homeostasis b. energy transfers and transformation c. transportation of molecules d. disposal of wastes e. synthesis of new molecules 				

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Content Organizer: Characteristics and Structure of Life

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>4. Summarize the general processes of cell division and differentiation, and explain why specialized cells are useful to organisms and explain that complex multicellular organisms are formed as highly organized arrangements of differentiated cells.</p>				

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Content Standard: Life Science
Grade 9-10 Benchmarks: C. Explain the genetic mechanisms and molecular basis of inheritance.
Content Organizer: Heredity

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
5. Illustrate the relationship of the structure and function of DNA to protein synthesis and the characteristics of an organism.				

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Content Organizer: Heredity

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>6. Explain that a unit of hereditary information is called a gene, and genes may occur in different forms called alleles (e.g., gene for pea plant height has two alleles, tall and short).</p>				

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Content Organizer: Heredity

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>7. Describe that spontaneous changes in DNA are mutations, which are a source of genetic variation. When mutations occur in sex cells, they may be passed on to future generations; mutations that occur in body cells may affect the functioning of that cell or the organism in which that cell is found.</p>				

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Content Standard: Life Science
Grade 9-10 Benchmarks: C. Explain the genetic mechanisms and molecular basis of inheritance.
Content Organizer: Heredity

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>8. Use the concepts of Mendelian and non-Mendelian genetics (e.g., segregation, independent assortment, dominant and recessive traits, sex-linked traits, jumping genes) to explain inheritance.</p>				

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Content Standard: Life Science
Grade 9-10 Benchmarks: D. Explain the flow of energy and the cycling of matter through biological and ecological systems (cellular, organismal and ecological).
Content Organizer: Diversity and Interdependence of Life

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>9. Describe how matter cycles and energy flows through different levels of organization in living systems and between living systems and the physical environment. Explain how some energy is stored and much is dissipated into the environment as thermal energy (e.g., food webs and energy pyramids).</p>				

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Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
10. Describe how cells and organisms acquire and release energy (photosynthesis, chemosynthesis, cellular respiration and fermentation).				

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Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>11. Explain that living organisms use matter and energy to synthesize a variety of organic molecules (e.g., proteins, carbohydrates, lipids and nucleic acids) and to drive life processes (e.g., growth, reacting to the environment, reproduction and movement).</p>				

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Content Standard: Life Science
Grade 9-10 Benchmarks: E. Explain how evolutionary relationships contribute to an understanding of the unity and diversity of life.
Content Organizer: Diversity and Interdependence of Life

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>12. Describe that biological classification represents how organisms are related with species being the most fundamental unit of the classification system. Relate how biologists arrange organisms into a hierarchy of groups and subgroups based on similarities and differences that reflect their evolutionary relationships.</p>				

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Grade 9-10 Benchmarks: E. Explain how evolutionary relationships contribute to an understanding of the unity and diversity of life.
Content Organizer: Diversity and Interdependence of Life

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>13. Explain that the variation of organisms within a species increases the likelihood that at least some members of a species will survive under gradually changing environmental conditions.</p>				

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Content Standard: Life Science

Grade 9-10 Benchmarks: E. Explain how evolutionary relationships contribute to an understanding of the unity and diversity of life.

Content Organizer: Diversity and Interdependence of Life

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
14. Relate diversity and adaptation to structures and their functions in living organisms (e.g., adaptive radiation).				

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Content Standard: Life Science
Grade 9-10 Benchmarks: F. Explain the structure and function of ecosystems and relate how ecosystems change over time.
Content Organizer: Diversity and Interdependence of Life

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
15. Explain how living things interact with biotic and abiotic components of the environment (e.g., predation, competition, natural disasters and weather).				

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Content Organizer: Diversity and Interdependence of Life

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>16. Relate how distribution and abundance of organisms and populations in ecosystems are limited by the ability of the ecosystem to recycle materials and the availability of matter, space and energy.</p>				

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Grade 9-10 Benchmarks: F. Explain the structure and function of ecosystems and relate how ecosystems change over time.
Content Organizer: Diversity and Interdependence of Life

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>17. Conclude that ecosystems tend to have cyclic fluctuations around a state of approximate equilibrium that can change when climate changes, when one or more new species appear as a result of immigration or when one or more species disappear.</p>				

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Content Standard: Life Science
Grade 9-10 Benchmarks: G. Describe how human activities can impact the status of natural systems.
Content Organizer: Diversity and Interdependence of Life

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>18. Describe ways that human activities can deliberately or inadvertently alter the equilibrium in ecosystems. Explain how changes in technology /biotechnology can cause significant changes, either positive or negative, in environmental quality and carrying capacity.</p>				

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Content Standard: Life Science
Grade 9-10 Benchmarks: G. Describe how human activities can impact the status of natural systems.
Content Organizer: Diversity and Interdependence of Life

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
19. Illustrate how uses of resources at local, state, regional, national, and global levels have affected the quality of life (e.g., energy production, sustainable vs. nonsustainable agriculture).				

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Content Standard: Life Science
Grade 9-10 Benchmarks: H. Describe a foundation of biological evolution as the change in gene frequency of a population over time. Explain the historical and current scientific developments, mechanisms and processes of biological evolution. Describe how scientists continue to investigate and critically analyze aspects of evolutionary theory. (The intent of this benchmark does not mandate the teaching or testing of intelligent design.)
Content Organizer: Evolutionary Theory

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>20. Recognize that a change in gene frequency (genetic composition) in a population over time is a foundation of biological evolution.</p>				

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Content Organizer: Evolutionary Theory

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>21. Explain that natural selection provides the following mechanism for evolution; undirected variation in inherited characteristics exist within every species. These characteristics may give individuals an advantage or disadvantage compared to others in surviving and reproducing. The advantaged offspring are more likely to survive and reproduce. Therefore, the proportion of individuals that have advantageous characteristics will increase. When an environment changes, the survival value of some inherited characteristics may change.</p>				

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Content Organizer: Evolutionary Theory

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
22. Describe historical scientific developments that occurred in evolutionary thought (e.g., Lamarck and Darwin, Mendelian Genetics and modern synthesis).				

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Content Organizer: Evolutionary Theory

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
23. Describe how scientists continue to investigate and critically analyze aspects of evolutionary theory. (The intent of this indicator does not mandate the teaching or testing of “intelligent design”.)				

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Content Standard: Life Science
Grade 9-10 Benchmarks: I. Explain how natural selection and other evolutionary mechanisms account for the unity and diversity of past and present life forms.
Content Organizer: Evolutionary Theory

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>24. Analyze how natural selection and other evolutionary mechanisms (e.g. genetic drift, immigration, emigration, mutation) and their consequences provide a scientific explanation for the diversity and unity of past life forms, as depicted in the fossil record, and present life forms.</p>				

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Content Standard: Life Science
Grade 9-10 Benchmarks: I. Explain how natural selection and other evolutionary mechanisms account for the unity and diversity of past and present life forms.
Content Organizer: Evolutionary Theory

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>25. Explain that life on Earth is thought to have begun as simple, one celled organisms approximately 4 billion years ago. During most of the history of Earth only single celled microorganisms existed, but once cells with nuclei developed about a billion years ago, increasingly complex multicellular organisms evolved.</p>				

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Content Standard: Life Science
Grade 9-10 Benchmarks: J. Summarize the historical development of scientific theories and ideas, and describe emerging issues in the study of life sciences.
Content Organizer: Historical Perspectives and Scientific Revolutions

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>26. Use historical examples to explain how new ideas are limited by the context in which they are conceived. These ideas are often rejected by the scientific establishment; sometimes spring from unexpected findings; and usually grow slowly through contributions from many different investigators (e.g., biological evolution, germ theory, biotechnology, discovering germs).</p>				

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Grade 9-10 Benchmarks: J. Summarize the historical development of scientific theories and ideas, and describe emerging issues in the study of life sciences.
Content Organizer: Historical Perspectives and Scientific Revolutions

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
27. Describe advances in life sciences that have important long-lasting effects on science and society (e.g., biological evolution, germ theory, biotechnology, discovering germs).				

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Content Standard: Life Science
Grade 9-10 Benchmarks: J. Summarize the historical development of scientific theories and ideas, and describe emerging issues in the study of life sciences.
Content Organizer: Historical Perspectives and Scientific Revolutions

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
28. Analyze and investigate emerging scientific issues (e.g., genetically modified food, stem cell research, genetic research, cloning).				

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Content Standard: Science and Technology
Grade 9-10 Benchmarks: B. Explain that science and technology are interdependent; each drives the other.
Content Organizer: Understanding Technology

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>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.</p>				

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Course of Study

Content Standard: Science and Technology
Grade 9-10 Benchmarks: B. Explain that science and technology are interdependent; each drives the other.
Content Organizer: Understanding Technology

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
2. Describe examples of scientific advances and emerging technologies and how they may impact society.				

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Content Standard: Science and Technology
Grade 9-10 Benchmarks: A. Explain the ways in which the processes of technological design respond to the needs of society.
Content Organizer: Abilities To Do Technological Design

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>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.</p>				

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Content Standard: Scientific Inquiry
Grade 9-10 Benchmarks: 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.
Content Organizer: Doing Scientific Inquiry

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>1. Research and apply appropriate safety precautions when designing and conducting scientific investigations (e.g. OSHA, MSDS, eyewash, goggles, ventilation).</p>				

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Content Standard: Scientific Inquiry
Grade 9-10 Benchmarks: 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.
Content Organizer: Doing Scientific Inquiry

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
2. Present scientific findings using clear language, accurate data, appropriate graphs, tables, maps and available technology.				

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Content Standard: Scientific Inquiry
Grade 9-10 Benchmarks: 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.
Content Organizer: Doing Scientific Inquiry

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
3. Use mathematical models to predict and analyze natural phenomena.				

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Content Standard: Scientific Inquiry
Grade 9-10 Benchmarks: 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.
Content Organizer: Doing Scientific Inquiry

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
4. Draw conclusions from inquiries based on scientific knowledge and principles, the use of logic and evidence (data) from investigations.				

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Content Standard: Scientific Inquiry
Grade 9-10 Benchmarks: 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.
Content Organizer: Doing Scientific Inquiry

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
5. Explain how new scientific data can cause any existing scientific explanation to be supported, revised or rejected.				

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Content Standard: Scientific Ways of Knowing
Grade 9-10 Benchmarks: A. Explain that scientific knowledge must be based on evidence, be predictive, logical, subject to modification and limited to the natural world.
Content Organizer: Nature of Science

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
1. Discuss science as a dynamic body of knowledge that can lead to the development of entirely new disciplines.				

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Content Standard: Scientific Ways of Knowing
Grade 9-10 Benchmarks: A. Explain that scientific knowledge must be based on evidence, be predictive, logical, subject to modification and limited to the natural world.
Content Organizer: Nature of Science

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>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.</p>				

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Content Standard: Scientific Ways of Knowing
Grade 9-10 Benchmarks: A. Explain that scientific knowledge must be based on evidence, be predictive, logical, subject to modification and limited to the natural world.
Content Organizer: Nature of Science

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>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.</p>				

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Content Standard: Scientific Ways of Knowing
Grade 9-10 Benchmarks: C. Describe the ethical practices and guidelines in which science operates.
Content Organizer: Ethical Practices

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
4. Recognize that ethical considerations limit what scientists can do.				

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Content Standard: Scientific Ways of Knowing
Grade 9-10 Benchmarks: C. Describe the ethical practices and guidelines in which science operates.
Content Organizer: Ethical Practices

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
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.				

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Content Standard: Scientific Ways of Knowing
Grade 9-10 Benchmarks: C. Describe the ethical practices and guidelines in which science operates.
Content Organizer: Ethical Practices

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
6. Recognize that animal-based research must be conducted according to currently accepted professional standards and laws.				

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Content Standard: Scientific Ways of Knowing
Grade 9-10 Benchmarks: D. Recognize that scientific literacy is part of being a knowledgeable citizen.
Content Organizer: Science and Society

Grade level Indicator	OGT Competency Focus	Resources	Instructional Activities/Strategies	Assessment
<p>7. Investigate how the knowledge, skills and interests learned in science classes apply to the careers students plan to pursue.</p>				