

Oakwood City School District Environmental Science

Environmental Science

Environmental Science incorporates concepts from biology, chemistry, physics, and physical geology to introduce students to issues and concerns facing our world. Inquiry investigations and fieldwork will be utilized to help students gain an understanding about how humans are impacting our planet and to design scenarios that incorporate scientific reasoning, analysis, communication skills and real-world applications. This is a semester course.

This course meets the Graduation Requirements of an Advanced Science.

Science Inquiry and Application Standards

During the years of grades 9 through 12 all students must use the following scientific processes with appropriate laboratory safety techniques to construct their knowledge and understanding in all science content areas. These are ongoing skills that will be developed and intertwined within the content of the course.

- Identify questions and concepts that guide scientific investigations
- Design and conduct scientific investigations
- Use technology and mathematics to improve investigations and communications
- Formulate and revise explanations and models using logic and evidence (critical thinking)
- Recognize and analyze explanations and models
- Communicate and support a scientific argument

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English Language Arts Standards for Science & Technical Subjects

I. Key Ideas and Details

- A. Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
- B. Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
- C. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

II. Craft and Structure

- A. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
- B. Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
- C. Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

III. Integration of Knowledge and Ideas

- A. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
- B. Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
- C. Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

IV. Range of Reading and Level of Text Complexity

- A. By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently.

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Writing Standards for Science & Technical Subjects

I. Text Types and Purposes Standard 1

- A. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.
- B. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases.
- C. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
- D. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- E. Provide a concluding statement or section that follows from or supports the argument presented.

II. Text Types and Purposes Standard 2

- A. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
- B. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
- C. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
- D. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.
- E. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).

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III. Production and Distribution of Writing

- A. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- B. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
- C. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

IV. Research to Build and Present Knowledge

- A. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
- B. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
- C. Draw evidence from informational texts to support analysis, reflection, and research.

V. Range of Writing

- A. Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

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Content Standards

I Earth Systems: Interconnected Spheres of Earth

A Biosphere

- 1 Explain the difference between biotic and abiotic factors.
- 2 Discuss how an organism's habitat relates to its survival.
- 3 Explain what age structure diagrams tell you about a population.
- 4 Describe the factors that influence a population's growth rate.
- 5 Explain exponential growth and logistic growth.
- 6 Explain how limiting factors and biotic potential affect population growth.

B Atmosphere

- 1 Describe the properties of the atmosphere including composition, relative humidity, temperature and air pressure.
- 2 Identify the four main layers of the atmosphere.
- 3 Explain heat transfer and the interaction of air masses in the troposphere.
- 4 Examine temperature inversions and the role they play with smog formation.

C Lithosphere

- 1 Examine the structure of Earth's lithosphere.
- 2 Demonstrate the actions and forces involved at plate boundaries.
- 3 Investigate processes in which the lithosphere can be altered both naturally and as a result of human actions.
- 4 Investigate the processes by which soil is formed.
- 5 Investigate soil horizons and the impact on life.
- 6 Examine the classification schemes for soils.

D Hydrosphere

- 1 Examine the movement of water at the surface, in the atmosphere, and beneath the surface.
- 2 Discuss how fresh water can be both renewable and limited.
- 3 Investigate how both groundwater and surface water can be a mode of transmission of contamination and are dependent on water velocities, patterns and lithosphere in the area.
- 4 Examine oceanic currents both deep water and shallow and investigate how changes in those currents impact life and climate.
- 5 Examine geomorphology and topography of a region to identify flow patterns and pathways for contamination.

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- 6 Investigate the cryosphere and determine the impact of human activity on this region.
- E Movement of matter and energy through the hydrosphere, lithosphere, atmosphere and biosphere.
- 1 Investigate the causes and effects of climate on Earth systems.
 - 2 Examine global climate trends including el Nino and la Nina patterns.
 - 3 Examine changes in climate through Earth's history and relate how those changes impact Earth's spheres, biogeochemical cycles and patterns, and the impact on both abiotic and biotic factors within the ecosystem.
 - 4 Research an actual environmental/geologic event (e.g. specific release of toxins/contaminates, hurricane, earthquake, flood, fire or landslide) and determine how each of the spheres was impacted both short-term and long-term.

II Earth's Resources

- A Energy Resources
- 1 Identify renewable and nonrenewable energy sources.
 - 2 Investigate the effectiveness, risk and efficiency for differing types of energy resources at a local, state, national and global level.
 - 3 Examine the feasibility, availability, remediation and environmental cost associated with the extraction, storage, use and disposal of energy sources.
 - 4 Analyze which energy source(s) would be the best for a given location based on a set of specific parameters.
 - 5 Examine personal energy consumption and ways in which to reduce consumption in daily life.
- B Air and Air Pollution
- 1 Differentiate between air pollution that is caused by natural processes and that caused by human activity.
 - 2 Examine sources of pollution and types of pollution.
 - 3 Investigate how acid deposition is formed and impacts the atmosphere.
 - 4 Examine how legislation on the international level has impacted the ozone layer.
 - 5 Examine local, state, national and international laws in place to protect our air and determine their effectiveness.

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- C Water and Water Pollution
 - 1 Differentiate between point source and non-point source water contamination.
 - 2 Test for water quality of a variety of water samples.
 - 3 Examine the need for potable water on a global scale.
 - 4 Construct and test methods to make potable water.
 - 5 Examine the path that water goes through on a local level from ground to tap.
 - 6 Identify water pollution concerns in the local community and create a proposal on how to lessen the pollution concern.
 - 7 Research an actual contamination event using quantitative data to develop and evaluate solutions for the clean-up, containment or reduction of the contamination.
 - 8 Investigate the process of wastewater treatment and why it is a necessity.
 - 9 Plan and implement an investigation to determine the water quality of a section of a local stream.

- D Soil and Land
 - 1 Describe some practices that can lead to soil erosion and some that can prevent it.
 - 2 Identify causes and effects of desertification.
 - 3 Identify causes and effects of mass wasting.
 - 4 Research and collect specific data for a mass wasting or desertification event including factors that led to the event, result of the event, laws that are in place to prevent the event, and possible ways to prevent the event in the future.
 - 5 Explain how irrigation and pesticide use can cause soil pollution.
 - 6 Examine land use plans and regulations for the region.

III Global Environmental Problems and Issues

- A Human Population
 - 1 Research and analyze quantifiable scientific data pertaining to food availability, reproductive requirements, adaptations or population changes to draw conclusions on a specific species.
 - 2 Investigate and research global human population patterns and changes over time.

- B Climate Change
 - 1 Identify evidence for global climate change.
 - 2 Explain methods used by scientists to study global climate change.
 - 3 State the probable causes of global climate change.

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- 4 Examine how scientists use modeling to explain and predict our changing climate.
 - 5 Investigate the consequences of a warming Earth on life as we know it.
 - 6 List ways to reduce greenhouse gases related to the use and generation of electricity and transportation.
 - 7 Examine how Ohio is working to reduce greenhouse gas emissions.
 - 8 Explain and give examples of how nations are working together to try to address global climate change.
- C Waste Management
- 1 Identify the three categories of waste.
 - 2 Describe conventional waste and disposal methods.
 - 3 Describe how composting and recycling help reduce the total amount of waste.
 - 4 Examine your personal waste and develop alternative packaging to reduce the total amount of waste generated.
 - 5 Describe sources of hazardous waste and current disposal methods.
 - 6 Develop a position statement on the state of our waste in Ohio.