

Principles of Technology Curriculum Guide

Ohio Valley Career & Technical Center

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. **(Embedded across cc)**

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. **(Embedded across cc)**

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. **(Embedded across cc)**

Science Research Units Included:

Quarter 1 –Weeks 1-9--- Developing Scientific Literacy and Reasoning

Quarter 2 –Weeks 10-18--- Developing Scientific Understanding

Quarter 3 –Weeks 19-27--- Developing Scientific Problem Solving and Research Skills

Quarter 4 –Weeks 28-36--- Understanding Scientific Developments and Current Changes

Academic Content Standards (11 &12)-Abbreviations Utilized

Earth and Space Sciences (ESS)

Life Sciences (LS)

Physical Sciences (PS)

Science and Technology (ST)

Scientific Way of Knowing (SWK)

CURRICULUM MAP
Principles of Technology-Ohio Valley Career & Technical Center

Quarter 1: Developing Scientific Literacy and Reasoning Weeks 1-9	Quarter 2: Developing Scientific Understanding Weeks 10-18
<p>ESS-15 (11). 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 and Theory of Continental Drift).</p> <p>ESS-16 (11). Describe advances in Earth and space science that have important long-lasting effects on science and society (e.g., global warming, Heliocentric Theory and Plate Tectonics Theory).</p> <p>LS-12 (12). Describe advances in life sciences that have important, long-lasting effects on science and society (e.g., biotechnology).</p> <p>ST-5 (11). Investigate that all fuels (e.g., fossil, solar and nuclear) have advantages and disadvantages; therefore society must consider the trade-offs among them (e.g., economic costs and environmental impact).</p> <p>SWK-4 (11). Explain why scientists can assume that the universe is a vast single system in which the basic rules are the same everywhere.</p> <p>SWK-1 (12). Give examples that show how science is a social endeavor in which scientists share their knowledge with the expectation that it will be challenged continuously by the scientific community and others.</p> <p>SWK-5 (12). Describe how individuals and teams contribute to science and engineering at different levels of complexity (e.g., an individual may conduct basic field studies, hundreds of people may work together on major scientific questions or technical problem).</p> <p>SWK-7 (12). Describe the current and historical contributions of diverse peoples and cultures to science and technology and the scarcity and inaccessibility of information on some of these contributions.</p> <p>PS-14 (12). 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., nuclear energy, quantum theory and theory of relativity).</p> <p>ST-1 (11). 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.</p> <p>ST-3 (12). Research how scientific inquiry is driven by the desire to understand the natural world and how technological design is driven by the need to meet human needs and solve human problems.</p> <p>SI-1 (11). Formulate testable hypotheses. Develop and explain the appropriate procedures, controls and variables (dependent and independent) in scientific experimentation.</p> <p>SI-4 (12). Create and clarify the method, procedures, controls and variables in complex scientific investigations.</p> <p>SWK-3 (11). 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> <p>SWK-6 (11). Describe the strongly held traditions of science that serve to keep scientists within the bounds of ethical professional behavior.</p> <p>SWK-8 (11). Explain that the decision to develop a new technology is influenced by societal opinions and demands and by cost benefit considerations.</p>	<p>PS-15 (12). Describe concepts/ideas in physical sciences that have important, long-lasting effects on science and society (e.g., quantum theory, theory of relativity, age of the universe).</p> <p>ST-1 (12). Explain how science often advances with the introduction of new technologies and how solving technological problems often results in new scientific knowledge.</p> <p>SI-3 (11). Design and carry out scientific inquiry (investigation), communicate and critique results through peer review.</p> <p>SWK-2 (11). Apply scientific inquiry to evaluate results of scientific investigations, observations, theoretical models and the explanations proposed by other scientists</p> <p>SWK-10 (11). 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> <p>SWK-8 (12). Recognize that individuals and society must decide on proposals involving new research and the introduction of new technologies into society. Decisions involve assessment of alternatives, risks, costs and benefits and consideration of who benefits and who suffers, who pays and gains, and what the risks are and who bears them.</p>

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Quarter 3: Developing Scientific Problem Solving and Research Skills Weeks 19-27	Quarter 4: Developments and Current Changes Weeks 27-36
<p>ST-2 (11). 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.</p> <p>ST-2 (12). Describe how new technologies often extend the current levels of scientific understanding and introduce new areas of research.</p> <p>SI-2 (11). Evaluate assumptions that have been used in reaching scientific conclusions.</p> <p>SI-2 (12). Derive simple mathematical relationships that have predictive power from experimental data (e.g., derive an equation from a graph and vice versa, determine whether a linear or exponential relationship exists among the data in a table).</p> <p>SWK-4 (12). Analyze a set of data to derive a principle and then apply that principle to a similar phenomenon (e.g., predator-prey relationships and properties of semiconductors).</p> <p>SWK-9 (11). 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> <p>SWK-6 (12). Explain that scientists may develop and apply ethical tests to evaluate the consequences of their research when appropriate.</p> <p>ST-3 (11). 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> <p>ST-4 (11 & 12). 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> <p>SI-4 (11). Explain why the methods of an investigation are based on the questions being asked.</p> <p>SI-5 (11). Summarize data and construct a reasonable argument based on those data and other known information.</p> <p>SWK-5 (11). Use appropriate summary statistics to analyze and describe data.</p> <p>SWK-1 (12). Analyze a set of data to derive a hypothesis and apply that hypothesis to a similar phenomenon (e.g., biome data).</p> <p>SWK-2 (12). Evaluate scientific investigations by reviewing current scientific knowledge and the experimental procedures used, examining the evidence, identifying faulty reasoning, pointing out statements that go beyond the evidence and suggesting alternative explanations for the same observations</p> <p>SWK-11 (11). Research the role of science and technology in careers that students plan to pursue.</p> <p>SWK-9 (12). Recognize the appropriateness and value of basic questions “What can happen?” “What are the odds?” and “How do scientists and engineers know what will happen?”</p>	<p>LS-11 (12). Trace the historical development of a biological theory or idea (e.g., genetics, cytology and germ theory).</p> <p>PS-2 (11). Explain that humans have used unique bonding of carbon atoms to make a variety of molecules (e.g., plastics).</p> <p>ST-6 (11). 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 and fuel cells).</p> <p>ST-4 (12). 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> <p>SI-3 (12). Research and apply appropriate safety precautions when designing and/or conducting scientific investigations (e.g., OSHA, MSDS, eyewash, goggles and ventilation).</p> <p>SWK-7 (11). 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> <p>SWK-3 (12). Select a scientific model, concept or theory and explain how it has been revised over time based on new knowledge, perceptions or technology.</p> <p>SWK-5 (11). Recognize that bias affects outcomes. People tend to ignore evidence that challenges their beliefs but accept evidence that supports their beliefs. Scientist attempt to avoid bias in their work.</p> <p>SWK-10 (12). Recognize that social issues and challenges can affect progress in science and technology. (e.g., Funding priorities for specific health problems serve as examples of ways that social issues influence science and technology.)</p> <p>SWK-11 (12). Research how advances in scientific knowledge have impacted society on a local, national or global level.</p>