



SOUTHERN LEHIGH SCHOOL DISTRICT
 5775 Main Street
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Scope and Sequence for **Foundations of Technology**

The Nature of Technology

National Standards for Technological Literacy	PA Standards for Science and Technology and Engineering Education
<p>1. The characteristics and scope of technology. 9-12.J The nature and development of technological knowledge and processes are functions of the setting. 9-12.L Inventions and innovations are the results of specific, goal-directed research.</p>	<p>1. Characteristics of Technology 3.4.12.A1 Compare and contrast the rate of technological development over time.</p>
<p>2. The core concepts of technology. 9-12.W Systems thinking applies logic and creativity with appropriate compromises in complex real-life problems. 9-12.X Systems, which are the building blocks of technology, are embedded within larger technological, social, and environmental systems. 9-12.Y The stability of a technological system is influenced by all of the components in the system, especially those in the feedback loop. 9-12.CC New technologies create new processes. 9-12.DD Quality control is a planned process to ensure that a product, service, or system meets established criteria. 9-12.FF Complex systems have many layers of controls and feedback loops to provide information.</p>	<p>2. Core Concepts of Technology 3.4.10.A2 Interpret how systems thinking applies logic and creativity with appropriate compromises in complex real-life problems. 3.4.12.A2 Describe how management is the process of planning, organizing, and controlling.</p>
<p>3. The relationships among technologies and the connections between technology and other fields. 9-12.H Technological innovation often results when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields. 9-12.I Technological ideas are sometimes protected through the process of patenting. 9-12.J Technological progress promotes the advancement of science and mathematics.</p>	<p>3. Technology Connections 3.4.12.A3 Demonstrate how technological progress promotes the advancement of science, technology, engineering and mathematics (STEM).</p>

Technology and Society

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<p>4. The cultural, social, economic, and political effects of technology. 9-12.I Making decisions about the use of technology involves weighing the trade-offs between the positive and negative effects. 9-12.J Ethical considerations are important in the development, selection, and use of technologies.</p>	<p>1. Effects of Technology 3.4.10.B1 Compare and contrast how the use of technology involves weighing the trade-offs between the positive and negative effects.</p>
<p>5. The effects of technology on the environment. 9-12.H When new technologies are developed to reduce the use of resources, considerations of trade-offs are important. 9-12.K Humans devise technologies to reduce the negative consequences of other technologies. 9-12.L Decisions regarding the implementation of technologies involve the weighing of trade-offs between predicted positive and negative effects on the environment.</p>	<p>2. Technology and Environment 3.4.10.B2 Demonstrate how humans devise technologies to reduce the negative consequences of other technologies.</p>
<p>6. The role of society in the development and use of technology. 9-12.I The decision whether to develop a technology is influenced by societal opinions and demands, in addition to corporate cultures. 9-12.J A number of different factors, such as advertising, the strength of the economy, the goals of a company, and the latest fads contribute to shaping the design of and demand for various technologies.</p>	<p>3. Society and Development of Technology 3.4.10.B3 Compare and contrast how a number of different factors, such as advertising, the strength of the economy, the goals of a company, and the latest fads, contribute to shaping the design of and demand for various technologies</p>
<p>7. The influence of technology on history. 9-12.G Most technological development has been evolutionary, the result of a series of refinements to a basic invention. 9-12.H The evolution of civilization has been directly affected by, and has in turn affected, the development and use of tools and materials. 9-12.J Early in the history of technology, the development of many tools and machines was based not on scientific knowledge but on technological know-how. 9-12.N The Industrial Revolution saw the development of continuous manufacturing, sophisticated transportation and communication systems, advanced construction practices, and improved education and leisure time. 9-12.O The Information Age places emphasis on the processing and exchange of information.</p>	<p>4. Technology and History 3.4.10.B4 Recognize that technology development has been evolutionary, the result of a series of refinements to a basic invention.</p>

Design

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<p>8. The attributes of design. 9-12.H The design process includes defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results. 9-12.J The design needs to be continually checked and critiqued, and the ideas of the design must be redefined and improved.</p>	<p>1. Design Attributes 3.4.10.C1 Apply the components of the technological design process.</p>
<p>9. Engineering design. 9-12.I Established design principles are used to evaluate existing designs, to collect data, and to guide the design process. 9-12.J Engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly. 9-12.K A prototype is a working model used to test a design concept by making actual observations and necessary adjustments. 9-12.L The process of engineering design takes into account a number of factors.</p>	<p>2. Engineering Design 3.4.10.C2 Analyze a prototype and/or create a working model to test a design concept by making actual observations and necessary adjustments.</p>
<p>10. The role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. 9-12.I Research and development is a specific problem-solving approach that is used intensively in business and industry to prepare devices and systems for the marketplace. 9-12.J Technological problems must be researched before they can be solved.</p>	<p>3. Research & Development, Invention & Innovation, Experimentation/Problem Solving and Troubleshooting 3.4.10.C3 Illustrate the concept that not all problems are technological and not every problem can be solved using technology.</p>

Abilities for a Technological World

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<p>11. Apply the design process. 9-12.N Identify criteria and constraints and determine how these will affect the design process. 9-12.O Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product. 9-12.Q Develop and produce a product or system using a design process. 9-12.R Evaluate final solutions and communicate observation, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual, and written means, in addition to three-dimensional models.</p>	<p>1. Applying the Design Process 3.4.10.D1 Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of a final product.</p>
<p>12. Use and maintain technological products and systems. 9-12.L Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques. 9-12.O Operate systems so that they function in the way they were designed. 9-12.P Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate.</p>	<p>2. Using and Maintaining Technological Systems 3.4.12.D2 Verify that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.</p>
<p>13. Assess the impact of products and systems. 9-12.J Collect information and evaluate its quality 9-12.L Use assessment techniques, such as trend analysis and experimentation, to make decisions about the future development of technology.</p>	<p>3. Assessing Impact of Products and Systems 3.4.10.D3 Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual society, and the environment.</p>

The Designed World

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<p>17. Information and communication technologies.</p> <p>9-12.L Information and communication technologies include the inputs, processes, and outputs associated with sending and receiving information.</p> <p>9-12.N Information and communication systems can be used to inform, persuade, entertain, control, manage, and educate.</p> <p>9-12.O Communication systems are made up of source, encoder, transmitter, receiver, decoder, storage, retrieval, and destination.</p> <p>9-12.P There are many ways to communicate information, such as graphic and electronic means.</p> <p>9-12.Q Technological knowledge and processes are communicated using symbols, measurement, conventions, icons, graphic images, and languages that incorporate a variety of visual, auditory, and tactile stimuli.</p>	<p>4. Information and Communication Technologies</p> <p>3.4.10.E4 Evaluate the purpose and effectiveness of information and communication systems.</p> <p>3.4.12.E4 Synthesize the effects of information and communication systems and subsystems as an integral part of the development of the Information Age.</p>
<p>19. Manufacturing technologies.</p> <p>9-12.L Servicing keeps products in good operating condition.</p> <p>9-12.M Materials have different qualities and may be classified as natural, synthetic, or mixed.</p> <p>9-12.O Manufacturing systems may be classified into types, such as customized production, batch production, and continuous production.</p> <p>9-12.P The interchangeability of parts increases the effectiveness of manufacturing processes.</p>	<p>6. Manufacturing Technologies</p> <p>3.4.10.E6 Illustrate how manufacturing systems may be classified into types such as customized production, batch production, and continuous production.</p> <p>3.4.12.E6 Compare and contrast the importance of science, technology, engineering and math (STEM) as it pertains to the manufactured world.</p>

Pennsylvania Core Standards for Reading in Science and Technical Subjects

Key Ideas and Details

CC.3.5.9-10.A. Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

CC.3.5.9-10.C. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.

Craft and Structure

CC.3.5.9-10.D. 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 9–10 texts and topics.

CC.3.5.9-10.F. Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.

Integration of Knowledge and Ideas

CC.3.5.9-10.H. Assess the extent to which the reasoning and evidence in a text support the author’s claim or a recommendation for solving a scientific or technical problem.

CC.3.5.9-10.I. Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

Range and Level of Complex Texts

CC.3.5.9-10.J. By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

Pennsylvania Core Standards for Writing in Science and Technical Subjects

Text Types and Purposes

CC.3.6.9-10.A. Write arguments focused on *discipline-specific content*.

- Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.
- Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns.
- Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- Provide a concluding statement or section that follows from or supports the argument presented.

CC.3.6.9-10.B. *

Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

- Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
- Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
- Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.
- Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

Production and Distribution of Writing

CC.3.6.9-10.C. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

CC.3.6.9-10.D. 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.

CC.3.6.9-10.E. Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

Range of Writing

CC.3.6.9-10.I. 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.