Grades 9–12

3.5.9-12.DD Technology and Engineering: Integration of Knowledge, Technologies, and Practices

Students who demonstrate understanding can *develop a plan that incorporates knowledge from science, mathematics, and other disciplines to design or improve a technological product or system.*

Clarifying Statement: Designing, maintaining, and improving products or systems often require unique knowledge and skills. Technologically and engineering literate citizens are capable of synthesizing knowledge from science, mathematics, and other disciplines to design, construct, and execute a plan to solve a system's design problem.

Assessment Boundary: N/A

Science and Engineering Practices (SEP)	Disciplinary Core Ideas (DCI)	Technology and Engineering Practices (TEP)
Asking Questions and Defining Problems Asking questions and defining problems in 9–12 builds on K–8 experiences and progresses to formulating, refining, and evaluating empirically testable questions and design problems using models and simulations. • Define a design problem that involves the development of a process or system with interacting components and criteria and constraints that may include social, technical, and/or environmental considerations.	**Nature of Technology** • Engineers use science, mathematics, and other disciplines to improve technology, while scientists use tools devised by engineers to advance knowledge in their disciplines. This interaction has deepened over the past century.	**Making and Doing** • Demonstrates the ability to regulate and improve making and doing skills. **Systems Thinking** • Designs and troubleshoots technological systems in ways that consider the multiple components of the system.

Pennsylvania Context: N/A

Pennsylvania Career Ready Skills: Establish and pursue goals or post-secondary education, employment, and living within the community.

Connections to Other Standards Content and Practices

Standard Source	Possible Connections to Other Standard(s) or Practice(s)
PA Core Standards: Reading and Writing in Science and Technical Areas	CC.1.2.3.G: Use information gained from text features to demonstrate understanding of a text. CC.1.2.4.G: Interpret various presentations of information within a text or digital source and explain how the information contributes to an understanding of text in which it appears. CC.1.2.5.G: Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. CC.1.4.3.V: Conduct short research projects that build knowledge about a topic. CC.1.4.4.V: Conduct short research projects that build knowledge through investigation of different aspects of a topic. CC.1.4.5.V: Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. CC.1.4.3.W: Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories. CC.1.4.4.W: Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.
PA Core Standards: Reading and Writing in Science and Technical Areas (continued)	CC.1.4.5.W: Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources.
PA Core Standards and Practices: Math	MP.1: Make sense of problems and persevere in solving them.
Integrated Standards for Science, Environment & Ecology, and Technology & Engineering Standards Grades K–12	N/A