## Grades 9–12

**3.5.9-12.M Technology and Engineering:** Applying, Maintaining, Assessing, and Evaluating Technological Products and Systems

**Students who demonstrate understanding can** *develop a device or system for the marketplace.*

**Clarifying Statement:** Research on specific topics of interest to the government or business and industry can provide more information on a subject, and, in many cases, can provide information needed to create an invention or innovation. R&D helps to prepare a product or system for final production. Product development of this type frequently requires sustained effort from teams of people having diverse backgrounds.

**Assessment Boundary:** N/A

| Science and Engineering Practices (SEP) | Disciplinary Core Ideas (DCI) | Technology and Engineering Practices (TEP) |
|---|---|---|
| **Constructing Explanations and Designing Solutions**<br>Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.<br>• Design, evaluate, and refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations. | **Engineering Design**<br>• Engineering design is a complicated process in which creative steps are embedded in content knowledge and research on the challenge. Decisions on trade-offs involve systematic comparisons of all costs and benefits, and final steps may involve redesigning for optimization. | **Making and Doing**<br>• Demonstrates the ability to regulate and improve making and doing skills. |

**Pennsylvania Context:** Examples of Pennsylvania context include but are not limited to Pennsylvania's inventors and inventions.

**Pennsylvania Career Ready Skills:** Advocate for oneself in education, employment, and 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.<br>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.<br>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.<br>CC.1.4.3.V: Conduct short research projects that build knowledge about a topic.<br>CC.1.4.4.V: Conduct short research projects that build knowledge through investigation of different aspects of a topic.<br>CC.1.4.5.V: Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic.<br>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.<br>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.<br>MP.5: Use appropriate tools strategically. |
| **Integrated Standards for Science, Environment & Ecology, and Technology & Engineering Standards Grades K–12** | N/A |