Pennsylvania Technology and Engineering Standards (6-12)

# Grades 6, 7, 8

Adopted 2022

## Nature and Characteristics of Technology and Engineering

1. Consider historical factors that have contributed to the development of technologies and human progress. 1.68.1
2. Engage in a research and development process to simulate how inventions and innovations have evolved through systematic tests and refinements. 1.68.2
3. Differentiate between inputs, processes, outputs, and feedback in technological systems. 1.68.3
4. Demonstrate how systems thinking involves considering relationships between every part, as well as how the systems interact with the environment in which it is used. 1.68.4
5. Create an open-loop system that has no feedback path and requires human intervention. 1.68.5
6. Create a closed-loop system that has a feedback path and requires no human intervention. 1.68.6
7. Predict outcomes of a future product or system at the beginning of the design process. 1.68.7
8. Apply informed problem-solving strategies to the improvement of existing devices or processes or the development of new approaches. 1.68.8
9. Explain how technology and engineering are closely linked to creativity, which can result in both intended and unintended innovations. 1.68.9
10. Compare how different technologies involve different sets of processes. 1.68.10

## Integration of Knowledge, Technologies, and Practices

1. Compare, contrast, and identify overlap between the contributions of science, technology, engineering, and mathematics in the development of technological systems. 2.68.1
2. Analyze how different technological systems often interact with economic, environmental, and social systems. 2.68.2
3. Adapt and apply an existing product, system, or process to solve a problem in a different setting. 2.68.3

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| | 4. Demonstrate how knowledge gained from other content areas affects the development of technological products and systems. 2.68.4 |
| **Applying, Maintaining, Assessing and Evaluating Technological Products and Systems** | 1. Examine the ways that technology can have both positive and negative effects at the same time. 3.68.1 |
| | 2. Analyze how the creation and use of technologies consumes renewable, non-renewable, and inexhaustible resources; creates waste; and may contribute to environmental challenges. 3.68.2 |
| | 3. Consider the impacts of a proposed or existing technology and devise strategies for reducing, reusing, and recycling waste caused by its creation. 3.68.3 |
| | 4. Analyze examples of technologies that have changed the way people think, interact, live, and communicate. 3.68.4 |
| | 5. Hypothesize what alternative outcomes (individual, cultural, and/or environmental) might have resulted had a different technological solution been selected. 3.68.5 |
| | 6. Analyze how an invention or innovation was influenced by the context and circumstances in which it is developed. 3.68.6 |
| | 7. Evaluate trade-offs based on various perspectives as part of a decision process that recognizes the need for careful compromises among competing factors. 3.68.7 |
| | 8. Research information from various sources to use and maintain technological products or systems. 3.68.8 |
| | 9. Use tools, materials, and machines to safely diagnose, adjust, and repair systems. 3.68.9 |
| | 10. Use devices to control technological systems. 3.68.10 |
| | 11. Design methods to gather data about technological systems. 3.68.11 |
| | 12. Interpret the accuracy of information collected. 3.68.12 |
| | 13. Use instruments to gather data on the performance of everyday products. 3.68.13 |
| **Design Thinking in Technology and Engineering Education** | 1. Apply a technology and engineering design thinking process. 4.68.1 |
| | 2. Develop innovative products and systems that solve problems and extend capabilities based on individual or collective needs and wants. 4.68.2 |
| | 3. Illustrate the benefits and opportunities associated with different approaches to design. 4.68.3 |

4. **Create solutions to problems by identifying and applying human factors in design.** 4.68.4

5. **Evaluate and assess the strengths and weaknesses of various design solutions given established principles and elements of design.** 4.68.5

6. **Refine design solutions to address criteria and constraints.** 4.68.6

7. **Defend decisions related to a design problem.** 4.68.7