Grades 9–12

3.5.9-12.K (ETS) Technology and Engineering: Applying, Maintaining, and Assessing Technological Products and Systems

Students who demonstrate understanding can *use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.*

Clarifying Statement: Both physical models and computers can be used in various ways to aid in the engineering design process.

Assessment Boundary: N/A

Science and Engineering Practices (SEP)	Disciplinary Core Ideas (DCI)	Technology and Engineering Practices (TEP)
Using Mathematics and Computational Thinking Mathematical and computational thinking in 9–12 builds on K–8 experiences and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions. • Use mathematical models and/or computer simulations to predict the effects of a design solution on systems and/or the interactions between systems.	**Developing Possible Solutions** • Both physical models and computers can be used in various ways to aid in the engineering design process. • Computers are useful for a variety of purposes, such as running simulations to test different ways of solving a problem or to see which one is most efficient or economical; and in making a persuasive presentation to a client about how a given design will meet his or her needs.	**Critical Thinking** • Uses evidence to better understand and solve problems in technology and engineering, including applying computational thinking.

Pennsylvania Context: N/A

Pennsylvania Career Ready Skills: Evaluate consequences from a personal, and civic perspective to inform decision making.

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	N/A
PA Core Standards and Practices: Math	MP.2: Reason abstractly and quantitatively. MP.4: Model with mathematics.

Standard Source	Possible Connections to Other Standard(s) or Practice(s)
Integrated Standards for Science, Environment & Ecology, and Technology & Engineering Standards Grades K–12	N/A