



Grades 9–12

3.5.9-12.T (ETS) Technology and Engineering: Design Thinking in Technology & Engineering Education

Students who demonstrate understanding can *analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.*

Clarifying Statement: Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities.

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. <ul style="list-style-type: none"> Analyze complex real-world problems by specifying criteria and constraints for successful solutions. 	Defining and Delimiting Engineering Problems <ul style="list-style-type: none"> Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities. 	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	<p>CC.3.5.9-10.G: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.</p> <p>CC.3.5.11-12.G: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.</p> <p>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.</p> <p>CC.3.5.11-12.H: Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.</p> <p>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.</p> <p>CC.3.5.11-12.I: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p>
PA Core Standards and Practices: Math	<p>MP.2: Reason abstractly and quantitatively.</p> <p>MP.4: Model with mathematics.</p>
Integrated Standards for Science, Environment & Ecology, and Technology & Engineering Standards Grades K–12	<p>N/A</p>