

Unit 3 - The Engineering Process

Content Area: **Unified Arts**
Course(s): **Tech Apps 7**
Time Period: **September**
Length: **1 week**
Status: **Published**

Unit Summary

Throughout this unit, students will have the opportunity to learn that the engineering process includes brainstorming (Idea Generating) methodologies, idea refinement methodologies, research on both skills and content, testing and evaluation, redesign, self evaluation, and peer evaluation.

Standards

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| SCI.MS-ETS1-3 | Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success. |
| SCI.MS-ETS1-4 | Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved. |
| SCI.MS-ETS1-2 | Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. |
| SCI.MS-ETS1-1 | Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. |
| CAEP.9.2.8.B.3 | Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career. |
| TECH.8.1.8.A.CS1 | Understand and use technology systems. |
| TECH.8.1.8.B.1 | Synthesize and publish information about a local or global issue or event (ex. telecollaborative project, blog, school web). |
| TECH.8.1.8.B.CS1 | Apply existing knowledge to generate new ideas, products, or processes. |
| TECH.8.1.8.B.CS2 | Create original works as a means of personal or group expression. |
| TECH.8.1.8.C.CS4 | Contribute to project teams to produce original works or solve problems. |
| TECH.8.1.8.D.CS1 | Advocate and practice safe, legal, and responsible use of information and technology. |
| TECH.8.1.8.E | Research and Information Fluency: Students apply digital tools to gather, evaluate, and use information. |
| TECH.8.1.8.F.1 | Explore a local issue, by using digital tools to collect and analyze data to identify a solution and make an informed decision. |
| TECH.8.1.8.F.CS1 | Identify and define authentic problems and significant questions for investigation. |
| TECH.8.1.8.F.CS2 | Plan and manage activities to develop a solution or complete a project. |
| TECH.8.1.8.F.CS3 | Collect and analyze data to identify solutions and/or make informed decisions. |
| TECH.8.1.8.F.CS4 | Use multiple processes and diverse perspectives to explore alternative. |
| TECH.8.2.8.C.1 | Explain how different teams/groups can contribute to the overall design of a product. |
| TECH.8.2.8.C.2 | Explain the need for optimization in a design process. |
| TECH.8.2.8.C.3 | Evaluate the function, value, and aesthetics of a technological product or system, from the |

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| | perspective of the user and the producer. |
| TECH.8.2.8.C.4 | Identify the steps in the design process that would be used to solve a designated problem. |
| TECH.8.2.8.C.6 | Collaborate to examine a malfunctioning system and identify the step-by-step process used to troubleshoot, evaluate and test options to repair the product, presenting the better solution. |
| TECH.8.2.8.C.7 | Collaborate with peers and experts in the field to research and develop a product using the design process, data analysis and trends, and maintain a design log with annotated sketches to record the developmental cycle. |
| TECH.8.2.8.C.8 | Develop a proposal for a chosen solution that include models (physical, graphical or mathematical) to communicate the solution to peers. |
| TECH.8.2.8.C.5a | Explain the interdependence of a subsystem that operates as part of a system. |
| TECH.8.2.8.C.5b | Create a technical sketch of a product with materials and measurements labeled. |
| TECH.8.2.8.C.CS3 | The role of troubleshooting, research and development, invention and innovation and experimentation in problem solving. |
| TECH.8.2.8.D.1 | Design and create a product that addresses a real world problem using a design process under specific constraints. |
| TECH.8.2.8.D.2 | Identify the design constraints and trade-offs involved in designing a prototype (e.g., how the prototype might fail and how it might be improved) by completing a design problem and reporting results in a multimedia presentation, design portfolio or engineering notebook. |
| TECH.8.2.8.D.3 | Build a prototype that meets a STEM-based design challenge using science, engineering, and math principles that validate a solution. |
| TECH.8.2.8.D.4 | Research and publish the steps for using and maintaining a product or system and incorporate diagrams or images throughout to enhance user comprehension. |

Student Learning Objectives

- Students will learn how to apply the engineering design process to solve a technical challenge.
- Students will learn how to use morph charts and other tools for generating ideas.
- Students will learn how to test a design and apply findings to improve a solution.

Essential Questions

- What does it mean to innovate? How does innovation take place?
- Why is it important to reflect on what we have done and revise our innovations?

Enduring Understandings

- Students will understand that the design process is an intuitive process that can be applied to effectively create and innovate products.
- Students will understand that reflection and revision are key parts of intuitive process.

Application

- Students will be able to independently use their learning to create a solar car or an exercise in human centered design.

Skills

Students will be skilled at:

- Applying the design process to solve problems, iterating through the test, analyze, and redesign stages as necessary.
- Creating a product based on exact specifications.
- Documenting the design process.