Unit 1: The History of Engineering and the Design Process

Content Area: **Applied Technology**
Course(s):
Time Period: **Marking Period 1**
Length: **8 Days**
Status: **Published**

Summary

In this unit, students will explore how the concept of engineering has existed since ancient times and is still transforming the way people live and interact with their world today, as they explore basic principles of engineering to develop useful tools and objects. As they examine the Engineering Design Process, students will learn about its steps, the similarities to and differences from the Scientific Method, and how this process is used in the field of engineering. The concepts of following a procedure and iteration will be discussed and students will finish the unit with the completion of a design challenge that will provide them with the opportunity to work through the process in its entirety.

Revision date: June 2026

9.2.8.CAP.1	Identify offerings such as high school and county career and technical school courses, apprenticeships, military programs, and dual enrollment courses that support career or occupational areas of interest.
9.4.8.CI.2	Repurpose an existing resource in an innovative way (e.g., 8.2.8.NT.3).
5.2	Utilize positive communication and social skills to interact effectively with others
TECH.K-12.1.4.c	develop, test and refine prototypes as part of a cyclical design process.
TECH.K-12.1.7.d	explore local and global issues and use collaborative technologies to work with others to investigate solutions.
8.2.8.ED.1	Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and the producer.
8.2.8.ED.2	Identify the steps in the design process that could be used to solve a problem.
8.2.8.ED.3	Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch).
8.2.8.ED.5	Explain the need for optimization in a design process.
8.2.8.ED.7	Design a product to address a real-world problem and document the iterative design process, including decisions made as a result of specific constraints and trade-offs (e.g., annotated sketches).

Essential Questions/Enduring Understandings

Essential Questions:

How has engineering shaped human civilization throughout history?

How have engineers overcome challenges to meet the needs and wants of society?

How have geography, culture, and available resources influenced engineering innovations across different civilizations?

Who were some of the early innovators in engineering?

Why is it important to have a plan when undertaking a problem?

Enduring Understandings:

Learning about the history of engineering helps us understand how technological advancements have shaped society and can inform future innovations.

Engineering innovations are developed to solve problems and meet human needs, often transforming societies and the way people live.

The process of design in engineering is one that does not end.

Objectives

Students will know that the earliest forms of engineering were developed to help people survive and improve their quality of life.

Students will know the major fields of engineering and the types of problems each field addresses.

Students will know examples of significant engineering achievements throughout history, including but not limited to pyramids, obelisks, irrigation systems, temples, siege weapons, bridges, ships, and early forms of flight.

Students will know how to identify constraints in a problem.

Students will know that the engineering design process is cyclical in nature.

Students will know vocabulary as it applies to the design process.

Students will be skilled at using research skills to compare and contrast ancient and modern engineering achievements.

Students will be skilled at applying the Engineering Design Process to design, build, test, and improve an irrigation system.

Students will be skilled at demonstrating safe work habits when using tools, equipment, and technical processes.

Students will be skilled at explaining the reasoning behind their designs.

Learning Plan

Overview of the Engineering Design Process: The teacher will present information including the definition of technology, engineering, the scientific method, and the 8 steps of the engineering design process. Students should complete guided notes and/or complete a Google Slide/worksheet highlighting the steps of the process. The teacher will lead discussion on how this process is used in engineering. Concepts may be supported through showing videos that explain the process and how it has been used by engineering throughout history.

Pioneers in Engineering: Students will research a pioneer in engineering and create a Google Slides presentation highlighting the

individual's contributions. Engineers may be selected from any period in history, from ancient civilizations to the present day. Students will identify obstacles the engineer faced, describe their innovations and accomplishments, explain the field of engineering in which they worked, and analyze the impact of their work on society. Students will present their findings to the class.

Engineering Timeline: Working with a partner, students will develop an engineering timeline that includes one ancient, one modern, and one New Jersey-based engineering achievement. Students will research each accomplishment, identify the challenges faced during its development, explain why it is considered a significant engineering achievement, and analyze its impact on society and the world. Students will present their timelines and findings to the class.

Irrigation System: Students will examine how engineers and inventors have developed irrigation systems throughout history to solve the problem of transporting water efficiently. After exploring examples from ancient and modern civilizations, students will work in small groups to apply the Engineering Design Process to design, build, and test an irrigation system using either a lever or pulley mechanism. Students' goal will be to move water from one container to another using their irrigation system. Students will complete a reflection on their design process and the effectiveness of their final design.

Aqueduct Engineering Challenge: Students will explore how aqueducts were engineered in ancient civilizations to transport water over long distances and support growing populations. Students will analyze historical examples of aqueduct systems and their impact on society before applying the Engineering Design Process to design and construct their own model aqueduct using provided materials. Students will test their designs by transporting water across a distance while overcoming structural and flow-related challenges. Students will complete a reflection analyzing the effectiveness of their design and identifying areas for improvement.

Assessment

Formative:

Do Nows

Exit tickets

Class discussions

Worksheets

Summative:

Irrigation system project and reflection

Aqueduct engineering challenge and reflection

Benchmark:

Pioneers in Engineering project

Engineering Timeline project

Alternative:

Checklists

Verbal discussions

Materials

Google Slides

Google Docs

YouTube

Gizmos

Chromebooks

Projector

Mini cups

Popsicle sticks

Rubber bands

Glue

Two bins to hold water

Bottle caps

Straws

String

Toothpicks

Water pitcher

Timer

Cardboard

Integrated Accommodation and Modifications, Special Ed, ELLs, At-Risk, G & T, Career Education, 504s

See attached document:

https://docs.google.com/spreadsheets/d/1elkfGwG4CoxIRxyxZ6eem_INsnuGIXXiG4CkOug9_wg/edit?usp=sharing