Unit 2: Bridge Engineering and Design

Content Area: **Applied Technology**
Course(s):
Time Period: **Marking Period 1**
Length: **14 Days**
Status: **Published**

Summary

Students will design and build a balsa wood bridge. They will learn about the history of bridges and the many different types of bridges. Students will use basic engineering principles and design methods in designing and constructing their bridge. Students will test and evaluate the strength of their bridge and make improvements based on performance and design constraints.

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.3	Examine challenges that may exist in the adoption of new ideas (e.g., 2.1.8.SSH, 6.1.8.CivicsPD.2).
9.4.8.CI.4	Explore the role of creativity and innovation in career pathways and industries.
5.2	Utilize positive communication and social skills to interact effectively with others
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).
8.2.8.ITH.1	Explain how the development and use of technology influences economic, political, social, and cultural issues.
8.2.8.ITH.2	Compare how technologies have influenced society over time.

Essential Questions/Enduring Understandings

Essential Questions:

How have bridges impacted the development of societies throughout history?

How do engineers design, build, and test bridges to meet specific needs?

Why are there different types of bridges, and how do their designs affect their function?

How have bridges changed the way people, goods, and ideas move across the world?

Enduring Understandings:

Bridges are essential engineering structures that connect people and places, enabling the movement of people, goods, information, and culture across distances.

Bridge design is based on engineering principles that consider purpose, materials, and forces, and different designs are used to solve different types of problems.

Objectives

Students will know a variety of different types of bridges from the past and those used today.

Students will know the history of bridge design and engineering.

Students will know the roles that tension, torsion, compression, and shear forces play in bridge engineering and design.

Students will know how and why different types of bridges work in different situations and environments.

Students will know how to design a bridge based on bridge engineering and design concepts.

Students will know the vocabulary of bridge engineering and design.

Students will be skilled at using a ruler and grid paper to create the 2D drawing of their bridge design.

Students will be skilled at accurately measuring and cutting their balsa wood sticks as they construct their bridge.

Students will be skilled at identifying a technological problem and using the design process to create an appropriate solution.

Learning Plan

Introduction to Bridges: Students will participate in an interactive lesson as they are introduced to bridges. The students will answer this question: Why are there so many different types of bridges? The activity will be the Bridges Overview slides, history of bridges, types of bridges, give students to see videos of failed bridges, let students go on virtual reality trips to the Golden Gate Bridge and to Roman aqueducts, along with a bridge and bridge stresses vocabulary matching activity.

Bridge Design: Students will explore the strongest shapes in nature through interactive demonstrations and research. Students will also review bridge designs from around the world. The remainder of this activity will involve students using rulers and grid paper to draw out a 2D representation of the side view of their bridge. Students will follow precise requirements while being mindful of height and width constraints. Finally, students will also draw their top and bottom view of their bridges. Students will keep a work portfolio of their progress through the Engineering Design Process.

Bridge Construction and Testing: To complete this unit, students will use balsawood and construction glue to build their bridges. Students will place wax paper over their grid paper drawing and build the first side of their bridge, paying attention to precise measurements and using construction specific cutting tools. Students will then remove the wax paper and repeat the process to have

two completed sides to their bridge. The top and bottom of the bridge will be constructed next. Students will connect all their pieces of their bridge together by using mini binder clips. Finally, students will test their designs using the bridge table to attach a bucket and block, and slowly add weight to see how much weight it can hold as they test for efficiency. Students will complete their work portfolio for this unit, including adding images of their designing, building, and testing stages. They will also review and analyze the data collected during building and testing.

Assessment

Formative:

Do Nows

Class Discussions

Nearpod assignment

Summative:

Bridge portfolio and reflection

Benchmark:

Google Forms

Exit tickets

Completion of 2D design for side, top and bottom drawings

Alternative:

Checklists

Verbal Discussions

Bridge design using CAD program

Materials

Chromebooks

Projector

Document camera

YouTube

Google Forms, Docs, Slides

Pencils

Grid paper

Wax paper

Ruler

Balsawood

Cardboard

Construction glue

Scissors

Masking tape

Mini binder clips

Bridge testing table (including chain, bucket, and sand bags)

Safety goggles

Paper towels

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