Unit 5: Upcycled Engineering

Content Area: **Applied Technology**
Course(s):
Time Period: **Marking Period 1**
Length: **10 days**
Status: **Published**

Summary

In this unit, students will learn about how materials can be repurposed to meet our needs and solve problems. Students will use the Engineering Design Process and work through it as they work individually or cooperatively with classmates to complete a design challenge. Students will learn how upcycling positively affects our environmental sustainability and climate change.

Revision Date: July 2026

L.SS.8.1	Demonstrate command of the system and structure of the English language when writing or speaking.
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.
L.KL.8.2	Use knowledge of language and its conventions when writing, speaking, reading, or listening.
L.VI.8.4	Demonstrate understanding of figurative language, word relationships, and nuances in word meanings.
TECH.K-12.1.4.a	know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems.
TECH.K-12.1.4.b	select and use digital tools to plan and manage a design process that considers design constraints and calculated risks.
TECH.K-12.1.4.c	develop, test and refine prototypes as part of a cyclical design process.
TECH.K-12.1.4.d	exhibit a tolerance for ambiguity, perseverance and the capacity to work with open-ended problems.
TECH.K-12.1.6.a	choose the appropriate platforms and tools for meeting the desired objectives of their creation or communication.
TECH.K-12.1.6.b	create original works or responsibly repurpose or remix digital resources into new creations.
TECH.K-12.1.7.c	contribute constructively to project teams, assuming various roles and responsibilities to work effectively toward a common goal.
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.6	Analyze how trade-offs can impact the design of a product.
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.NT.2	Analyze an existing technological product that has been repurposed for a different function.
8.2.8.NT.3	Examine a system, consider how each part relates to other parts, and redesign it for another purpose.
8.2.8.NT.4	Explain how a product designed for a specific demand was modified to meet a new demand and led to a new product.
8.2.8.ETW.1	Illustrate how a product is upcycled into a new product and analyze the short- and long-term benefits and costs.
8.2.8.ETW.2	Analyze the impact of modifying resources in a product or system (e.g., materials, energy, information, time, tools, people, capital).
8.2.8.ETW.3	Analyze the design of a product that negatively impacts the environment or society and develop possible solutions to lessen its impact.
LA.L.8.6	Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.

Essential Questions/Enduring Understandings

Essential Questions:

How can we recycle and repurpose materials to meet our needs?

How does recycling/upcycling benefit our environment?

How is the Engineering Design Process helpful when designing and engineering?

Enduring Understandings:

Technology has both positive and negative effects on our lives and planet.

Materials can be repurposed and upcycled to meet our needs and solve problems.

Objectives

Students will know that technology is defined as the human quest for solutions.

Students will know the definitions of recycling and upcycling.

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

Students will be skilled at explaining the role of troubleshooting, research and experimentation with regards to

design.

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

Students will be skilled at explaining how repurposing materials is beneficial to the environment.

Learning Plan

Overview of Design Challenge: Students will be provided with an overview of the unit's design challenge to establish understanding of the problem, its constraints, materials, and how the Engineering Design Process will be utilized. Students will be provided with a paper or online document where the steps taken to complete the process will be documented throughout the completion of the unit.

Cardboard Design: Teacher will provide students with information about cardboard engineering and how various materials are used in design. Students will watch "Caine's Arcade" as a class, followed by a class discussion on the video and the ways in which various materials were used to solve problems and create the games.

Cardboard Arcade/Carnival Game Design: Working individually or in small groups, students will design a game to be made from repurposed materials. Students will be responsible for designing the game, explaining its purpose, its rules, and how to win.

Cardboard Monument: Students will have the opportunity to create a monument that represents something that is meaningful to them out of cardboard and other repurposed materials. The students will design the monument, explain its purpose, and why it is important to them. The students will have the opportunity to utilize the laser cutter to design and create their own manipulatives to be used for their game.

Reflection: Following the opening of the carnival/arcade, students will self-evaluate and reflect on their designs and experiences while working through this challenge and the Engineering Design Process. Students will complete the self-evaluation and reflection form.

Assessment

Formative Assessments:

Google Forms

Video reflection and discussion

Engineering Notebook

Benchmark Assessments:

Cardboard Arcade Design Challenge Documentation

Cardboard Monument Challenge Documentation

Summative Assessment:

Completed Cardboard Design Prototype and Reflection

Completed Cardboard Monument Design Prototype and Reflection

Alternate Assessment

Checklist

Questioning and Discussion

Materials

Guided note packets/Google Docs (teacher developed)

Technology (student & teacher laptops, SmartBoard, document camera)

Google Slides

Worksheets/notes

YouTube links

Safety Equipment

Cardboard

Paint

Paintbrushes

Crayons

Markers

Colored Pencils

Pencils

Duct tape

Rulers

Construction paper

Masking tape

Scissors

Clear tape

Glue

Glue Sticks

Cool melt glue guns

Laser cutter

Integrated Accommodation and Modifications

See attached document:

https://docs.google.com/spreadsheets/d/1bW0L5xhslCD9IsWWnzfbMJoRUI5vOFrgbQJ2saYTgLU/edit?usp=sharing