Problem Solving and Design

Content Area: **Industrial Arts**
Course(s):
Time Period: **Full Year**
Length: **6 Weeks**
Status: **Published**

Unit Overview

Students will learn the steps to plan, design, and write up their solutions to proposed real world problems. The first step in any project is being able to sketch a design. It does not matter if it is successful, as failure leads to a greater understanding of our problem.

Enduring Understandings

The first step in any creation project begins with the design phase. Here, students learn that failure leads to a greater understanding of the process.

Essential Questions

What scale best fits this design?
How would you redesign this project to make it more functional?
If given the opportunity to do this challenge again, what would you do differently?
What was the most challenging part of the assignment?

Learning Objectives

Use a ruler and sketchbook to design.
Students will learn the steps to plan, design, and write up their solutions to proposed real world problems.
Students will be introduced to the idea of scale and perspective drawings to create their first design portfolio entries.
Career Exploration - Explore careers in engineering and design.

Standards: Content

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.ITH.1	Explain how the development and use of technology influences economic, political, social, and cultural issues.
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.
8.2.8.ETW.4	Compare the environmental effects of two alternative technologies devised to address climate change issues and use data to justify which choice is best.
8.2.8.EC.1	Explain ethical issues that may arise from the use of new technologies.
8.2.8.EC.2	Examine the effects of ethical and unethical practices in product design and development.

Standards: Interdisciplinary

L.SS.6.1	Demonstrate command of the system and structure of the English language when writing or speaking.
L.SS.8.1	Demonstrate command of the system and structure of the English language when writing or speaking.
L.SS.7.1	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.
1.5.8.Cr1a	Conceptualize early stages of the creative process, including applying methods to overcome creative blocks or take creative risks, and document the processes in traditional or new media.
1.5.8.Cr1b	Develop criteria, identify goals and collaboratively investigate an aspect of present-day life, using contemporary practice of art or design.
1.5.8.Cr2a	Demonstrate persistence and willingness to experiment and take risks during the artistic process.
	Artists and designers develop excellence through practice and constructive critique, reflecting on, revising and refining work over time.
1.5.8.Cr3a	Use criteria to examine, reflect on and plan revisions for a work of art, and create an artistic statement.
RI.CR.7.1	Cite several pieces of textual evidence and make relevant connections to support analysis of what an informational text says explicitly as well as inferences drawn from the text.
RI.CR.6.1	Cite textual evidence and make relevant connections to support analysis of what an informational text says explicitly as well as inferences drawn from the text.
RI.CR.8.1	Cite a range of textual evidence and make clear and relevant connections (including informational text features such as charts, graphs, and diagrams) that strongly support an analysis of multiple aspects of what an informational text says explicitly, as well as inferences drawn from the text.

9.4.5.IML.1	Evaluate digital sources for accuracy, perspective, credibility and relevance (e.g., Social Studies Practice - Gathering and Evaluating Sources).
W.AW.7.1	Write arguments on discipline-specific content (e.g., social studies, science, technical subjects, English/Language Arts) to support claims with clear reasons and relevant evidence.
W.AW.8.1	Write arguments on discipline-specific content (e.g., social studies, science, technical subjects, English/Language Arts) to support claims with clear reasons and relevant evidence.
W.AW.6.1	Write arguments on discipline-specific content (e.g., social studies, science, math, technical subjects, English/Language Arts) to support claims with clear reasons and relevant evidence.
9.4.5.IML.7	Evaluate the degree to which information meets a need including social emotional learning, academic, and social (e.g., 2.2.5. PF.5).
8.2.8.ITH.1	Explain how the development and use of technology influences economic, political, social, and cultural issues.
SL.PE.7.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly.
SL.PE.8.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly.
SL.PE.6.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly.

Assessment Evidence

Formative	Collaborative Activities, Homework, Classwork, Discussion, Independent Class Assignment, Informal Observations of Students, Interactive Notebooks, Sketchbooks, Safety Assessments
Summative	Tests, Pre-Assessments, Quizzes, Written Responses, Projects, Safety Test
Alternative & Benchmark	Alternative - Read to the student and chart oral responses, graphic organizers, observations, portfolios of student work, orally administered assessments, Project based-learning, Sketchbook Benchmark – LinkIt Benchmark Assessment, Teacher generated summative assessments
Assessment Evidence Resource	

Instructional Resources

Smartboard, Computers, iPads, websites and digital interactives/models, Multi-media presentations, video streaming, Brain Pop, Microsoft 365, hand tools, wood, machines, safety glasses, pencils, folders, rulers, other appropriate tools for the shop.

Instructional Resource List

Curricular Mandates

Below are the curricular requirements as defined in NJ Administrative Code and Statute

	Amistad		Diversity, Equity, and Inclusion
	Holocaust		LGBT and Disabilities (Grades 6-12)
	Climate Change		Asian American & Pacific Islander

Social Emotional Learning (SEL) Competencies

NJ Social and Emotional Learning Competencies & Sub-Competencies

	Self-Awareness		Relationship Skills
	Responsible Decision-Making		Social Awareness
	Self-Management		

21st Century Skills & Themes

	Global and Cultural Awareness		Technology Literacy		Planning and Budgeting
X	Creativity and Innovation		Financial Institutions		Risk Management and Insurance
	Information and Media Literacy		Digital Citizenship		Economic and Government Influences
X	Critical Thinking and Problem Solving		Credit Profile	X	Career Awareness and Planning
	Civic Financial Responsibility		Financial Psychology		