Problem Solving & 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 - Examine careers in engineering.

Standards: Content

VA.3-5.1.5.5.Cr1a	Brainstorm and curate ideas to innovatively problem solve during artmaking and design projects.
VA.3-5.1.5.5.Cr1b	Individually and collaboratively set goals, investigate, choose, and demonstrate diverse approaches to art-making that is meaningful to the makers.

VA.3-5.1.5.5.Cr2a	Experiment and develop skills in multiple art-making techniques and approaches, through invention and practice.
VA.3-5.1.5.5.Cr2b	Demonstrate craftsmanship through the safe and respectful use of materials, tools and equipment.
VA.3-5.1.5.5.Cr2c	Individually or collaboratively represent environments or objects of personal significance that includes a process of peer discussion, revision and refinement.
CS.3-5.8.2.5.ED.1	Explain the functions of a system and its subsystems.
CS.3-5.8.2.5.ED.2	Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models.
CS.3-5.8.2.5.ED.3	Follow step by step directions to assemble a product or solve a problem, using appropriate tools to accomplish the task.
CS.3-5.8.2.5.ED.4	Explain factors that influence the development and function of products and systems (e.g., resources, criteria, desired features, constraints).
CS.3-5.8.2.5.ED.5	Describe how specifications and limitations impact the engineering design process.
CS.3-5.8.2.5.ED.6	Evaluate and test alternative solutions to a problem using the constraints and trade-offs identified in the design process.
TECH.9.4.5.CI.3	Participate in a brainstorming session with individuals with diverse perspectives to expand one's thinking about a topic of curiosity (e.g., 8.2.5.ED.2, 1.5.5.CR1a).
TECH.9.4.5.CT.4	Apply critical thinking and problem-solving strategies to different types of problems such as personal, academic, community and global (e.g., 6.1.5.CivicsCM.3).

Standards: Interdisciplinary

ELA.L.KL.5.1	Use knowledge of language and its conventions when writing, speaking, reading, or listening.
ELA.L.VL.5.2	Determine or clarify the meaning of unknown and multiple-meaning academic and domain-specific words and phrases based on grade 5 reading and content, choosing flexibly from a range of strategies.
ELA.L.WF.3.3	Demonstrate command of the conventions of writing including those listed under grade two foundational skills.
ELA.L.VL.4.2	Determine or clarify the meaning of unknown and multiple-meaning academic and domain-specific words and phrases based on grade 4 reading and content, choosing flexibly from a range of strategies.
ELA.RI.CR.5.1	Quote accurately from an informational text when explaining what the text says explicitly and make relevant connections when drawing inferences from the text.
ELA.L.KL.3.1	Use knowledge of language and its conventions when writing, speaking, reading, or listening.
ELA.L.VL.3.2	Determine or clarify the meaning of unknown and multiple-meaning academic and domain-specific words and phrases based on grade 3 reading and content, choosing flexibly from a range of strategies.
ELA.RI.CR.4.1	Refer to details and examples as textual evidence when explaining what an informational text says explicitly and make relevant connections when drawing inferences from the text.
ELA.RI.CR.3.1	Ask and answer questions and make relevant connections to demonstrate understanding of an informational text, referring explicitly to textual evidence as the basis for the answers.
ELA.W.WR.4.5	Conduct short research projects that use multiple reference sources (print and non-print) and build knowledge through investigation of different aspects of a topic.

ELA.W.RW.4.7	Write routinely over extended time frames (with time for research and revision) and shorter time frames (a single sitting) for a range of tasks, purposes, and audiences.
ELA.SL.PE.4.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 4 topics and texts, building on others' ideas and expressing their own clearly.
ELA.SL.PE.4.1.D	Review the key ideas expressed and explain their own ideas and understanding in light of the discussion.
ELA.W.RW.3.7	Engage in independent and task-based writing for both short and extended periods of time, producing written work routinely.
ELA.SL.AS.4.6	Differentiate between contexts that call for formal English (e.g., presenting ideas) and situations where informal discourse is appropriate (e.g., small-group discussion); use formal English when appropriate to task and situation.
ELA.SL.UM.3.5	Use multimedia to demonstrate fluid reading at an understandable pace; add visual displays when appropriate to emphasize or enhance certain facts or details.
ELA.SL.AS.3.6	Speak in complete sentences when appropriate to task and situation in order to provide requested detail or clarification.

Assessment Evidence

Formative	Collaborative Activities, Homework, Classwork, Discussion, Independent Class Assignment, Informal Observations of Students, Interactive Notebooks, Sketchbooks, Safety test
Summative	Tests, Pre-Assessments, Quizzes, Written Responses, Projects
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	X	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		Career Awareness and Planning
	Civic Financial Responsibility		Financial Psychology		