Unit 3: Design Thinking

Content Area: **CTE**
Course(s): **Technology 8**
Time Period: **December**
Length:
Status: **Published**

Essential Questions:

- How can a team be successful?
- What are constraints and trade-offs of a project?
- What is the engineering design process?
- What is your role within a collaborative work environment?

Enduring Understandings:

- 3D design
- Collaborating effectively
- Creative Problem Solving
- Engineering Design Process
- global impact of solutions
- identify trade-offs and constraints
- Visual Communication

Lesson Titles:

-Egg Drop

-Real Estate Challenge

-Hydraulic/Pneumatic Machines

- Paper Circuits

-Pollinator garden design (applied digital skills)

Career Readiness, Life Literacies, and Key Skills:

CRP.K-12.CRP4.1	Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are

	excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.
CRP.K-12.CRP5.1	Career-ready individuals understand the interrelated nature of their actions and regularly make decisions that positively impact and/or mitigate negative impact on other people, organization, and the environment. They are aware of and utilize new technologies, understandings, procedures, materials, and regulations affecting the nature of their work as it relates to the impact on the social condition, the environment and the profitability of the organization.
CRP.K-12.CRP6.1	Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.
CRP.K-12.CRP8.1	Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.
CRP.K-12.CRP12.1	Career-ready individuals positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.
WRK.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.
WRK.9.2.8.CAP.11	Analyze potential career opportunities by considering different types of resources, including occupation databases, and state and national labor market statistics.
WRK.9.2.8.CAP.15	Present how the demand for certain skills, the job market, and credentials can determine an individual's earning power.
WRK.9.2.8.CAP.16	Research different ways workers/employees improve their earning power through education and the acquisition of new knowledge and skills.
WRK.9.2.8.CAP.20	Identify the items to consider when estimating the cost of funding a business.
TECH.8.2.8.C.CS2	The application of engineering design.
TECH.8.2.8.D.2	Identify the design constraints and trade-offs involved in designing a prototype (e.g., how the prototype might fail and how it might be improved) by completing a design problem and reporting results in a multimedia presentation, design portfolio or engineering notebook.
TECH.8.2.8.D.3	Build a prototype that meets a STEM-based design challenge using science, engineering, and math principles that validate a solution.
TECH.9.4.8.TL.3	Select appropriate tools to organize and present information digitally.
TECH.9.4.8.GCA	Global and Cultural Awareness
TECH.9.4.8.GCA.2	Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal.

TECH.9.4.8.IML.1	Critically curate multiple resources to assess the credibility of sources when searching for information.
TECH.9.4.8.IML.3	Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping (e.g., 6.SP.B.4, 7.SP.B.8b).
	Awareness of and appreciation for cultural differences is critical to avoid barriers to productive and positive interaction.
	Communication skills and responsible behavior in addition to education, experience, certifications, and skills are all factors that affect employment and income.
	There are variety of resources available to help navigate the career planning process.
	Engineering design requirements and specifications involve making trade-offs between competing requirements and desired design features.
	Some digital tools are appropriate for gathering, organizing, analyzing, and presenting information, while other types of digital tools are appropriate for creating text, visualizations, models, and communicating with others.
	An individual's strengths, lifestyle goals, choices, and interests affect employment and income.
	Sources of information are evaluated for accuracy and relevance when considering the use of information.
	Digital tools make it possible to analyze and interpret data, including text, images, and sound. These tools allow for broad concepts and data to be more effectively communicated.
	Engineering design is a systematic, creative, and iterative process used to address local and global problems. The process includes generating ideas, choosing the best solution, and making, testing, and redesigning models or prototypes.

Inter-Disciplinary Connections:

MA.6-8.1.2.8.Cr1a	Generate a variety of ideas, goals and solutions for media artworks using creative processes such as sketching, brainstorming, improvising, and prototyping with increased proficiency, divergent thinking, and opportunity for student choice.
LA.RH.6-8.7	Integrate visual information (e.g., in charts, graphs, photographs, videos, or maps) with other information in print and digital texts.
MA.6-8.1.2.8.Pr5b	Develop and demonstrate creativity and adaptability, through processes such as testing constraints and divergent solutions, within and through media arts productions.
MA.7.EE.B.3	Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.
MA.7.G.A.1	Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.
MA.7.G.A.2	Draw (with technology, with ruler and protractor, as well as freehand) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.
6-8.MS-ETS1-1	Define the criteria and constraints of a design problem with sufficient precision to ensure

	a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
6-8.MS-ETS1-1.1.1	Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions.
6-8.MS-ETS1-4.ETS1.B.1	A solution needs to be tested, and then modified on the basis of the test results, in order to improve it.
6-8.MS-ETS1-3.ETS1.C.1	Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of those characteristics may be incorporated into the new design.

Equity Considerations

LGBTQ & Disabilities Mandate

Asian American Pacific Islander Mandate

Holocaust Mandate

Amistad Mandate

Instructional Strategies, Learning Activities, and Levels of Blooms/DOK:

- Brain teaser
- collaboration
- cueing and questioning
- digital tool skills
- Intentional grouping
- Let me learn scores
- peer-evaluation

- presentation skills
- Project rubrics
- researching skills
- self-reflection
- student-centered instruction
- TinkerCAD

Modifications

Modifications are based on individual education plans. Specific modifications and accommodations are provided.

Formative Assessment:

- Journals
- Presentations
- Projects
- Warm-Up

Summative Assessment:

- EOU Presentations
- EOU Project

Alternative Assessments

Performance tasks

Project-based assignments

Problem-based assignments

Presentations

Reflective pieces

Concept maps

Case-based scenarios

Portfolios

Benchmark Assessments

Skills-based assessment

Reading response

Writing prompt

Lab practical

Resources & Materials:

- Google Calendar
- Google Draw
- Google Sites
- Google Slides
- Journals
- TinkerCAD