Unit 3: The Universal Design Process & Problem Solving

Content Area: **Technology**
Course(s):
Time Period: **September**
Length: **3 weeks**
Status: **Published**

Enduring Understandings

- The universal design process (also known as the design loop) is a series of steps that designers follow to come up with a solution to a problem.
- The design process is a cyclical process as opposed to a linear process.
- Designers often cycle through the steps or go back and forth between steps in developing an ideal solution to a problem.
- Design is an integrative, repeating decision-making process that results in plan to produce a new product, environment or system.
- The design process may be applied to any task.

Essential Questions

- What is design?
- How are products developed?
- What defines invention versus innovation?
- What is the difference between design criteria and constraints?
- How do the constraints of a design challenge ultimately impact the final product?

Content

Skills

- Students will be able to explain the steps within the universal design process.
- Students will be able to create a product and document the engineering design process.

Suggested Activities:

- Class design STEM challenges (Zip-Line Challenge, Marble Run, Sinking Boat).
- Invention convention.

Resources

1. PC or Laptops with internet access, able to run Adobe Illustrator (or similar program) and the various 3D printer software platforms.

2. Laser Printer allows for printing capabilities from classroom computers.

3. TinkerCAD (or other equivalent solid modeling program). TinkerCAD is a free, web-based 3D modelling application which allows users to create objects utilizing constructive solid geometry applications.

4. 3D Printers allow students to realize their designs by producing physical objects from their three-dimensional digital models.

5. Adobe Illustrator & Photoshop are industry recognized graphic art software programs. Adobe presently offers a creative cloud suite for education.

6. Vacuum forming machine is a simplified version of thermoforming. In this process, a sheet of plastic is heated then stretched over a preformed mold. The plastic is then shaped into the shape of the mold. This machine allows for exciting project based learning opportunities in the Manufacturing and Production unit.

7. Drill press and bandsaw are presently located in the Technology Workshop, the machines are fixed and utilized only with teacher supervision and proper safety testing accomplished.

8. Consumable Materials such as bass and balsa wood, foam, hot glue, project kits, aluminum foil, wax paper, balloons, fishing line, cups and other materials are needed to support project based learning. Suggested projects include building a model architectural structure, room or facility, bridge, tower, aircraft and more.

9. Personal protection equipment such as safety goggles and gloves are required when students are at risk of injuring themselves while creating projects or utilizing tools and/or machinery.

10. Hand Tools various hand tools such as easy cutters, coping saws, craft knives, hot glue guns and hot wire cutting machine will be utilized within the classroom. Safety precautions and training will be taken and provided at all times.

Standards

TECH.8.2.8.C.2	Explain the need for optimization in a design process.
TECH.8.2.8.C.4	Identify the steps in the design process that would be used to solve a designated problem.
TECH.8.2.8.C.6	Collaborate to examine a malfunctioning system and identify the step-by-step process used to troubleshoot, evaluate and test options to repair the product, presenting the better solution.
TECH.8.2.8.C.7	Collaborate with peers and experts in the field to research and develop a product using the design process, data analysis and trends, and maintain a design log with annotated sketches to record the developmental cycle.
TECH.8.2.8.C.8	Develop a proposal for a chosen solution that include models (physical, graphical or mathematical) to communicate the solution to peers.
TECH.8.2.8.D.1	Design and create a product that addresses a real world problem using a design process under specific constraints.
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.