Introduction to STEAM and Design Thinking

Collaboration

Stage 1: Desired Results

Standards

NJ: 2014 SLS: Technology

NJ: Grades 3-5

8.1 Educational Technology

8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate to create and communicate knowledge.
A. Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
   - 8.1.5.A.1 Select and use the appropriate digital tools and resources to accomplish a variety of tasks including solving problems.
   - 8.1.5.A.3 Use a graphic organizer to organize information about problem or issue.
E: Research and Information Fluency: Students apply digital tools to gather, evaluate, and use information.
   - 8.1.5.E.1 Use digital tools to research and evaluate the accuracy of, relevance to, and appropriateness of using print and non-print electronic information sources to complete a variety of tasks.

8.2 Technology Education, Engineering, Design, and Computational Thinking

8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.
A. The Nature of Technology: Creativity and Innovation
   Technology systems impact every aspect of the world in which we live.
   - 8.2.5.A.4 Compare and contrast how technologies have changed over time due to human needs and economic, political and/or cultural influences.
   - 8.2.5.A.5 Identify how improvement in the understanding of materials science impacts technologies.
B. Technology and Society: Knowledge and understanding of human, cultural and society values are fundamental when designing technology systems and products in the global society.
   - 8.2.5.B.1 Examine ethical considerations in the development and production of a product through its life cycle.
   - 8.2.5.B.5 Explain the purpose of intellectual property law.
   - 8.2.5.B.6 Compare and discuss how technologies have influenced history in the past century.
C. Design: The design process is a systematic approach to solving problems.
   - 8.2.5.C.2 Explain how specifications and limitations can be used to direct a product’s development.
   - 8.2.5.C.6 Examine a malfunctioning tool and identify the process to troubleshoot and present options to repair the tool.
D. Abilities for a Technological World: The designed world is the product of a design process that provides the means to convert resources into products and systems.
   - 8.2.5.D.1 Identify and collect information about a problem that can be solved by technology, generate ideas to solve the problem, and identify constraints and trade-offs to be considered.
   - 8.2.5.D.2 Evaluate and test alternative solutions to a problem using the constraints and trade-offs identified in the design process to evaluate potential solutions.
   - 8.2.5.D.5 Describe how resources such as material, energy, information, time, tools, people and capital are used in products or systems.
- What is STEAM?
- What is a Technology?
- What resources do we need to make a technology?
- How and why does technology change over time?
- What is Design Thinking and how can we use it to help us design?
- What are the available tools of the lab and how do you safely and properly use them?

Why do engineers and designers strive to improve products used in our daily lives? Why do we use the engineering design process to solve design challenges? How can the engineering design process benefit us in solving problems in our daily lives?

**Knowledge/Skills**

1. STEAM means Science, Technology, Engineering, Art, and Math and all of these areas work together to create our designed world
2. Engineering is the designing and building of technology
3. Technology is the use of resources to solve problems that satisfy human needs and wants
4. Design Thinking is the process used to design new technologies using empathy and designing with a purpose.
5. Steps of the Design Process are: Empathize, Define, Ideate, Prototype and Test
6. Inventions are ideas that have been turned into new devices or systems
7. Innovations are improvements made to existing devices or systems
8. Innovation is driven by human needs and economic, political and/or cultural influences
9. Technology impacts people, plants, animals, and the environment in positive and negative ways
10. Technology can be categorized in six areas: Communication, Construction, Energy, Transportation, Manufacturing, and Biotechnology
11. Technology is made using seven different resources: Materials, Tools & Machines, Energy, Time, Money, People, and Knowledge
12. Material selection is an important part of product production
13. Tools and machines are used to alter the size, shape, and appearance of materials
14. Different materials require different tools for cutting and you must select the proper tool for the job
15. The cutting tools of the lab are scissors, paper cutter, wire cutters and shears
16. Adhesives and fasteners are used to assemble materials into three-dimensional designs
17. Adhesives like tape and glue are used when making prototype models
18. Hot glue guns contain a heating element inside that changes the form of the solid glue stick into a liquid glue
19. Hot glue cools and hardens in one minute
20. The hot glue gun has many rules to safely and properly use it

**Stage 2: Assessment Evidence**

**Assessments**

- **Design Notebook/Journal**
  - **Formative: Written: Journal/ Diary**
  Students will keep written notes and journal entries that include but are not limited to: Reflections, prototypes, "check for understanding", Exit tickets and notes for a group project.

  Notebooks will be shared with teacher throughout the course.

- **Teacher Observation**
- **Other: Teacher Observation**
Stage 3: Learning Plan

Learning Experiences

Intro to the Design Process - video clips and discussion about the steps of the design process. Allows students to visually see and then discuss the various stages of design. Can be used for review during any lesson.

Spaghetti and Marshmallow Design Challenge - (learn about Prototype and Test) using limited materials to learn about the design project and how to work in a group.

5 Chairs Challenge - learn about Empathy, Define, Prototype and Test

Technology Integration

Resources

Intro to Design Process PBS Design Squad

Spaghetti and Marshmallow Exercise - https://dschool.stanford.edu/groups/k12/wiki/c6410/Spaghetti__Marshmallow_Exercise.html

5 Chairs Exercise - https://dschool.stanford.edu/groups/k12/wiki/17761/5_Chairs_Exercise.html

Differentiation