STEAM – Unit 3 (3D DESIGN)

Content Area: **3D DESIGN (Grade 3rd)**
Course(s):
Time Period: **Ongoing**
Length: **Ongoing**
Status: **Published**

Big Idea

The technology, now widely known as 3D printing, is advancing rapidly, making its way to consumers, and reshaping manufacturing in the 21st century. 3D printing opens up inspiring possibilities and opportunities, like the ability to produce a fully functional "machine" in one print. It is the only manufacturing process that can interlock parts within parts to produce functioning closed systems that require no assembly. Furthermore, because 3D printers produce objects directly from computer models, users can immediately hold, evaluate, test and use their ideas – and share them digitally with the world. The Internet revolutionized the creation, modification and dissemination of digital media. Now, 3D printing makes that possible for physical objects. 3D printing is reshaping the fields of art, design, architecture, science, technology and engineering by revolutionizing how things are made. (Stratasys Education, 2017)

Enduring Understanding

SWBAT understand the difference between 2 dimensional and 3 dimensional shapes. SWBAT identify common 3 dimensional shapes. SWBAT use a digital modeling program to design a 3 dimensional object. SWBAT estimate the size of objects using units of measurement in both the customary and metric system.

Skills

- Identify 2 dimensional and 3 dimensional shapes.
- Use a digital modeling program such as Tinkercad to design a 3 dimensional object.
    - Digitally manipulate objects in a 3 dimensional environment.
    - Digitally zoom in and out on the object.
    - Observe the object by moving the workplane.
- Identify the actual printable size of the object using the metric system.
- Students identify customary and metric units of measurement on a ruler.
- Download the file for 3D printing.

Standards

3-5	Apply the design process.	**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.
	Use and maintain technological products and systems.	**8.2.5.D.3**	Follow step by step directions to assemble a product or solve a problem.
		8.2.5.D.4	Explain why human-designed systems, products, and environments need to be constantly monitored, maintained, and improved.
		8.2.5.D.5	Describe how resources such as material, energy, information, time, tools, people and capital are used in products or systems.
	Assess the impact of products and systems.	**8.2.5.D.6**	Explain the positive and negative effect of products and systems on humans, other species and the environment, and when the product or system should be used.
		8.2.5.D.7	Explain the impact that resources such as energy and materials used in a process to produce products or system have on the environment.

Assessments

- Tracking of student lesson achievement in Tinkercad (or other online 3D design application)
- Teacher observation
- Successful design and/or printing of project

Resources/Instructional Materials

VIDEOS

Connell instructional videos on how to use Tinkercad tools
Brainpop Weather
Worldbook Network: What is a Weather Vane

BOOKS

LESSON PLANS

DESIGN A HOUSE. In this lesson, students learn how to use a 3 dimensional design software. They utilize the tools to construct a house. Students drag and drop cubes and rectangular prisms to make the basic house shape, windows, and doors. Students drag and drop a roof shape to make the roof. Students drag and drop a cylinder shape to make a chimney. Students compare the virtual lifting of the objects on top of each other to the lifting of objects by a crane. Students learn that hollow shapes can make windows and doors. Students learn that they can use the wheel on their mouse to zoom inside the house and put treasure inside of it.

THINGIVERSE WEATHER VANE SPINNER PROJECT. This project is intended for elementary aged students to expose them to and educate them on engineering design, 3D software programs, and 3D printing. This project is done in connection with a unit on weather. The students will design and print a spinning weathervane. The aim of the activity is for the students to become more proficient in 3D design using Tinkercad. The project uses 4" bamboo skewers from the grocery store as the shaft of the spinner. They fit nicely into a 4 mm socket. If you use different size skewers you may have to adjust the size of the socket. Students must follow the specifications on a design sheet to construct their weathervane spinners. The weather vane spinner must have each student's name and it needs to have structural integrity. The weather vane needs to be designed with 3D printing software and printed on the 3D printer.

WEB SITES
Tinkercad lesson plans
Thingiverse lesson plans
Maker's Empire lesson plans

Modifications

Individual accommodations

• Additional support

• Adapting lessons to meet various learning styles

Integration of 21st Century Skills

Focus on the development of 21st Century Content Skills:

- Global awareness
- Civic literacy
- Health and wellness awareness
- Environmental literacy

Focus on the Development of Learning and Thinking Skills:

- Critical Thinking and Problem Solving Skills
- Communication Skills

- Creativity and Innovation Skills
- Collaboration Skills
- Information and Media Literacy Skills
- Contextual Learning Skills

Focus on the Development of Life Skills:

- Leadership
- Ethics
- Accountability
- Adaptability
- Personal Productivity
- Personal Responsibility
- People Skills
- Self Direction
- Social Responsibility

Interdisciplinary Connections

- Academic and Technical Rigor - Projects are designed to address key learning standards identified by the school or district.
- Authenticity - Projects use a real world context (e.g., community problems) and address issues that matter to the students.
- Applied Learning - Projects engage students in solving problems calling for competencies expected in high-performance work organizations (e.g.,teamwork, problem-solving, communication, etc.).
- Active Exploration - Projects extend beyond the classroom by connecting to community explorations.
- Adult Connections - Projects connect students with the wider community.
- Assessment Practices - Projects involve students in regular, performance-based exhibitions and assessments of their work; evaluation criteria reflect personal, school, and real-world standards of performance.