SIEMENS STEM DAY | Science Technology Engineering Math

SIEMENS STEM DAY ACTIVITY

EXPLORE 3D DESIGN

OBJECTIVES

Students will be able to:

- conceptualize and sketch a scaled drawing of an object that has some everyday use.
- design the unique three-dimensional object in a 3D modeling software program.
- present and explain their designs in terms of the utility of the object in everyday life.

STEM LESSON FOCUS

Engineering Design Cycle

- Creating or Prototyping

21st Century Skills

- Creativity

GRADE RANGE

9–12

OVERVIEW

Students will use geometric shapes to design a unique three-dimensional object that has an everyday use. Students will first sketch a scaled drawing of the object by hand. Then, they will design the object in 3D using a free web-based 3D modeling software program. Students will present their designs and explain the usefulness of the object in everyday life. If possible, the students' designs also may be 3D printed.

MATERIALS

- Inspiration image
- Brainstorm capture sheet (1 per student)
- Computers connected to the Internet
- Paper
- Pencils
- Rulers
- Protractors
- Compass
- 3D printer
- Construction paper (extension)
- Glue (extension)
- Chart paper (optional)

HAVE YOU EVER WONDERED . . .

How visual representations of characters come to life in three-dimensions on the screen? Or, how custom prosthetics are made?

MAKE CONNECTIONS!

How does this connect to students?

Wearable tech is the fashion of the future. 3D designs can be printed into unique pieces of clothing and one-of-a-kind accessories.

How does this connect to careers?

Character Designer
Creates the look and feel of animated characters for video games, animated movies, etc. After sketching draft characters, they use 3D modeling and computer graphics to bring characters to life.

Biomedical engineer
Combines engineering principles with medical and biological sciences to design and create equipment, devices, computer systems, and software used in healthcare.

Architectural Designer/ Drafter
Uses design software to create drawings and design projects for home remodels and new home construction projects

Fashion and Accessory Designer
Works in the fashion industry and is responsible for sketching designs and creating garments, jewelry, bags, shoes, belts, eyewear, and other fashion accessories.

How does this connect to our world?

3D printing holds great potential for revolutionizing manufacturing in various fields ranging from the medical field to aerospace engineering. In fact, NASA has demonstrated that a 3D printer works normally in space using Zero-G technology!

Please allow for more classroom time if you want students to further explore careers.

BLUEPRINT FOR DISCOVERY

1. Group students into pairs and randomly assign each pair one of the careers shown in the table above (character designer, biomedical engineer, architectural designer/drafter, or fashion and accessory designer). Direct students to read the career description.
2. Display the **Inspiration image** and **Brainstorm** capture sheet to engage students in a Think-Pair-Share warm-up activity using their assigned career. Guide students to:

   Think about the solutions to the question, "How could this career incorporate the inspiration image into a 3D design?"
   Pair up to discuss solutions with partner–Use the **Brainstorm capture sheet**
   Share ideas and details with another partner group

   Make sure students consider the medium or materials used and specific elements of the image that would inspire their design. For example, students could draw inspiration from the concentric circles in the water, the mirror-image reflection of the leaf in the water, or the ridges/veining in the leaf.
3. Allow students to share their ideas with the rest of the class and write them on the board or chart paper.
4. Inform students that they will be responsible for using shapes and other elements to design a unique three-dimensional object that has some everyday use based on their career and inspiration image.
5. The first step in the design process, after brainstorming inspiration, is to sketch a scaled drawing of the object. Pass out paper, pencils, rulers, protractors, and a compass and provide time for students to start sketching. Alternatively, students may use a sketch application on a mobile device or tablet.
6. Next, students will use one of the following 3D modeling software programs to design their everyday object in three-dimensions. Each site includes tutorials that can guide students to transferring their sketch into the software.

   Examples of 3D modeling software programs:

   - Sketchup
     https://www.sketchup.com/
   - Tinkercad
     https://www.tinkercad.com/
   - Autodesk123D
     https://autodesk-123d.en.softonic.com/
   - Autodesk Fusion 360
     https://www.autodesk.com/products/fusion-360/overview
   - FreeCAD
     https://www.freecadweb.org/
   - Solid Edge
     https://www.plm.automation.siemens.com/plmapp/education/solid-edge/en_us/free-software/student

7. Ask students to save their final products. In a brief (2 minute) presentation, students will need to explain how they designed their 3D object using their assignment career and inspiration image, and describe the usefulness of the object in everyday life. The graphic designs may be printed and posted around the room. If the school has a 3D printer, students can refine and make a physical model of their object.

TAKE ACTION!

Students can work in collaboration with scientists to solve problems using 3D puzzles and gameplay. Their contribution can help neuroscientists discover how neurons connect to process visual information. https://citizensciencegames.com/games/eyewire/

NATIONAL STANDARDS

Technology Education	**8:** Design—Students will develop an understanding of the attributes of design. **E.** Design is a creative planning process that leads to useful products and systems. **11:** Abilities for a Technological World – Students will develop the abilities to apply the design process. **J.** Make two-dimensional and three-dimensional representations of the deigned solution. Inspiration image

INSPIRATION IMAGE

BRAINSTORM IDEAS

3D modeling is used in a variety of industries including animation, medicine, gaming, fashion, manufacturing, and architecture. It is often used to represent an idea to a client before a final product is created. 3D designs are also the foundation for what can be a physical model using 3D printers. 3D printers create models by layering materials until it builds up a finished product.

Our assigned career: _____

How could this career incorporate the inspiration image into a 3D design?

My Ideas	**My Partners Ideas**
Sketch	**Sketch**
Final Sketch of both ideas	