# Reimagining the World

Educational Exercises Helping Students See Technology at Work

3S SOLIDWORKS

SOLIDWORKS Apps for Kids are designed to inspire students to create, invent, and shape their futures. Educators can use the following exercise to engage their students, and help them imagine and explore how their abilities can impact the world.

SOLIDWORKS Apps for Kids | New Designs
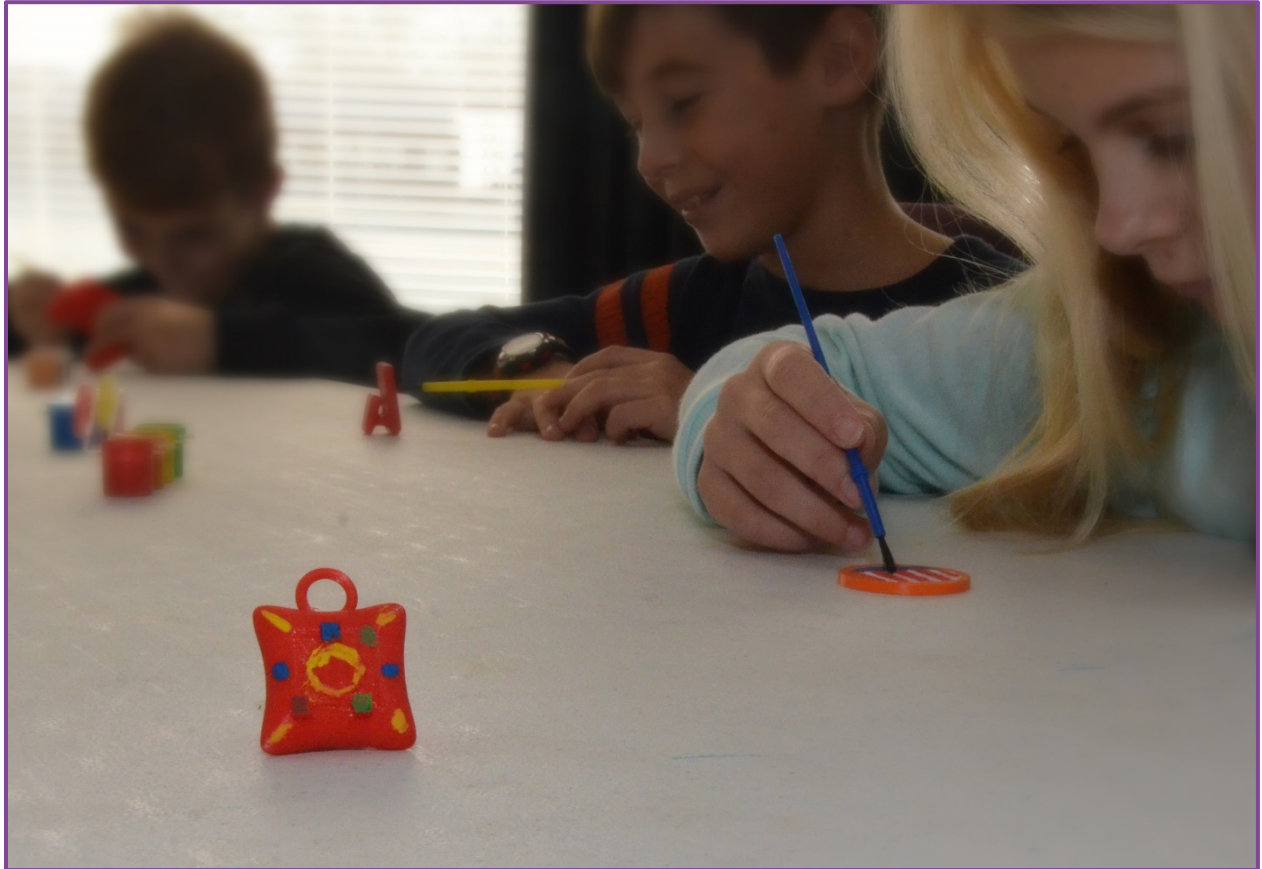
GETTING STARTED

In this activity, students will use the SOLIDWORKS Apps for Kids to create 3D models of new jewelry items. Students can either start from scratch, or use one of the basic ring, pendant, coin, or bracelet models provided as part of this exercise.

Before introducing the students to SOLIDWORKS Apps for Kids, read the "Consider This" section below to your students, then use the included questions to encourage them to consider what type of unique jewelry they'd like design.

CONSIDER THIS

Have you ever thought about how new fashions and jewelry are created? Companies use industrial, commercial, and fashion designers to make things more interesting and fun. These types of designers work with a wide range of tools and materials to turn their ideas into the products you see in stores. In fact, pretty much every product you'll see has gone through some sort of industrial or commercial design process.

- *What are some famous pieces of jewelry you may know about, read about, or seen in a movie or TV show?*
- *What are some of the materials those pieces of jewelry were made of?*
- *What are some things about the jewelry's shape, color, or design made those pieces of jewelry unique or special?*

TIP: If the students are having trouble thinking of famous pieces jewelry, you may want to prompt them with items from popular children's movies, adventure stories, or even real world items like championship rings, coins, or achievement medals.

MODELING THE NEW JEWELRY

Once the students have had time to consider the new jewelry they'd like to create, have them launch SOLIDWORKS Apps for Kids Classroom. To help the students get started, we've created a few simple animal models for this exercise. You can access the Sample Content in the Sample Lessons section of the Organization tab in your Classroom account. Share this content to your class and the students can use it as a starting point by clicking the "Riff" button on the model they like. Students can also start completely from scratch by launching the **Shape It** App from the plus sign in the main menu at the top of the App.

SOLIDWORKS has some video tutorials that can help students get familiar with the **Shape It** App's basic features. Students can watch the videos by clicking the Help icon in the main menu at the top of the App. But since the **Shape It** App works a lot like modeling clay, many students will be comfortable jumping right in and learning about the App as they go.

TIP: The included jewelry models aren't designed to be any specific size. So if your students wish to 3D print their new jewelry, you may need to adjust the scale of the jewelry in the 3D printing software that comes with your printer to better fit the student. Also, encourage students not to get frustrated if their models don't look like they want immediately. 3D molding can involve a lot of reshaping to get something exactly right, and students should be reminded that many new creations may need lots of changes over time, and that this process is how ideas are made better.
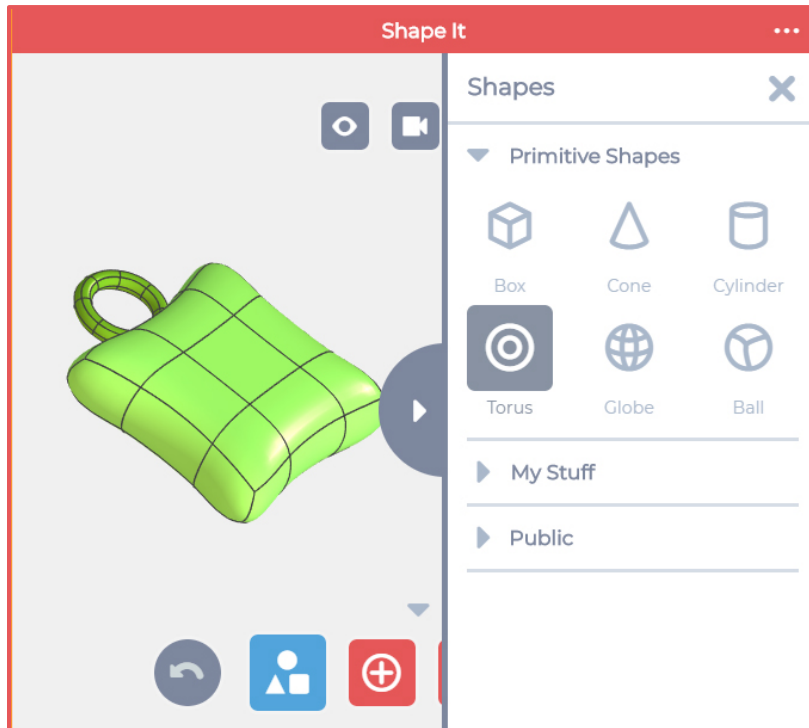
The **Shape It** App allows students to place multiple objects together to make more complex models.

To add new shapes, click the Shapes button at the bottom of the App, then select the shape you want to add. If you want to work with a simple shape, choose the Box, Cone, or Cylinder. The App also allows you add more complex shapes like a Torus, Globe, or Ball as well.

Click the shape you want and it will be added to your model.
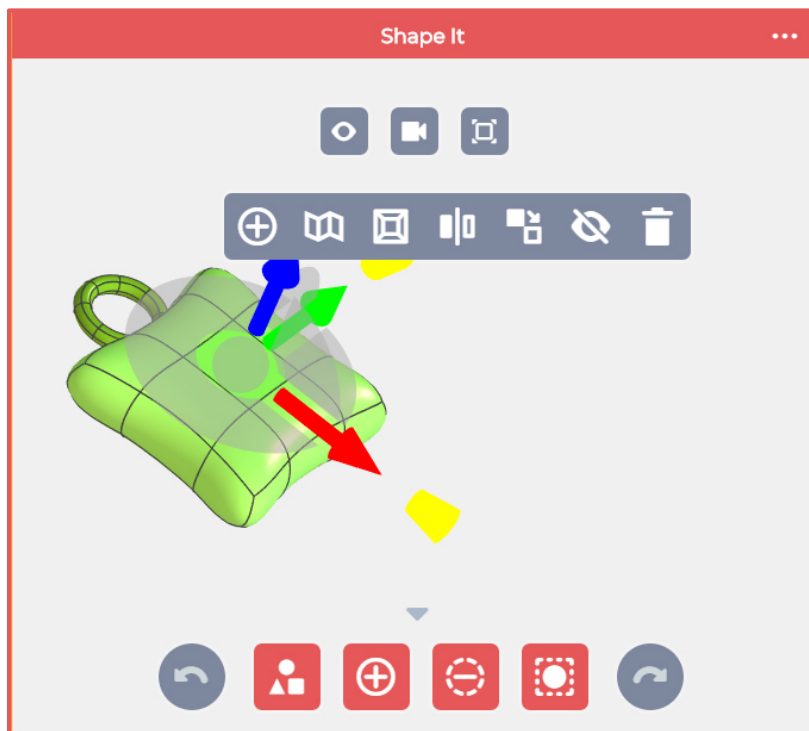
The **Shape It** App works similar to modeling clay. Just click on a section of a shape and drag it somewhere to begin changing the shape. You can also click on edges and corners between sections of a shape, and then drag those as well.

When you click on a section of a shape, a popup menu with more editing options Appears. These extra options can allow you make big changes to the shape, like add new sections, smooth or sharpen a section, or even make a duplicate of the shape in the model.

Experiment with different options to see how creative you can be with your new jewelry.
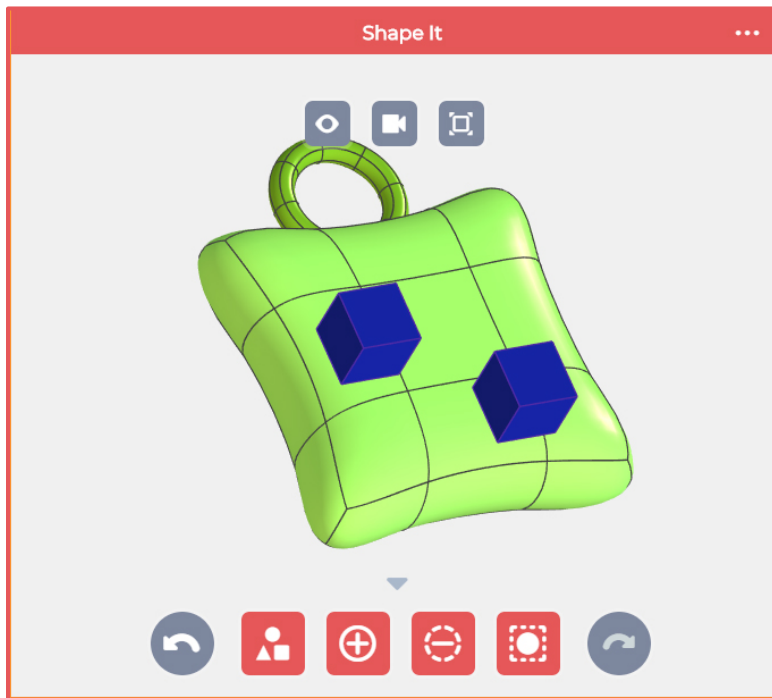
Students should keep in mind one way to quickly make their new jewelry is by grouping together smaller, less complex shapes into a model. The example shown demonstrates how a group of shapes can come together to form an overall design. In this example, the symbol was made from stretched and modeled cubes, and the rest are basic ball shapes.

TIP: It's important for students to not get frustrated if their jewelry don't look perfect. Patience, and determination are great qualities to have when creating new things. Encourage students to stick with it, and focus on completing individual parts of their models one-at-a-time.

DECORATING THE NEW JEWELRY

Once students have shaped their models, they can decorate them in the SOLIDWORKS **Style It** App to create a more unique design. Students can open the **Style It** App by clicking the Apps button in the main menu at the top of the App. Students should experiment with the different painting and styling tools in the App. Once the students have finished styling their new jewelry, they can add in the Store background with the App's Scenes feature.

The **Style It** App has a collection of powerful styling tools for students to use:

- The Bucket tool lets students paint an entire shape a single color in Body Color mode, or paint just parts of a shape in Patch Color mode.
- The Paint tool lets student select a brush size and paint colors directly onto shapes.
- The Stickers tool lets students add even more detail with stickers on the shapes.
- The Scene tool lets students add a background picture to their model.
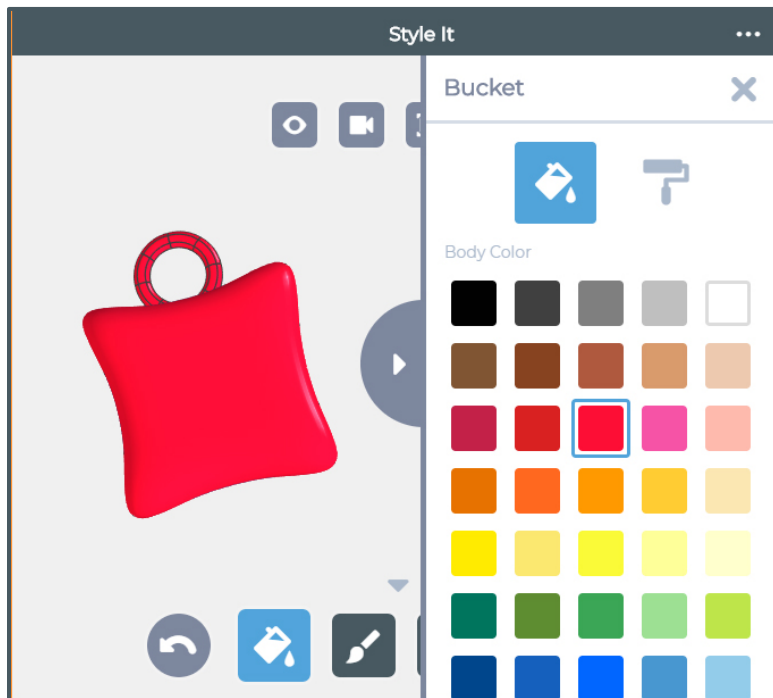
To use the Bucket tool, click the Bucket tool icon at the bottom of the App. This will open up the Bucket tool side menu.

The Bucket tool has two modes: Body Color and Patch Color. Body Color mode will paint and entire shape, while the Patch Color mode will paint individual sections of the shape in the color selected. This will open up the Paint tool side menu. The Paint tool.
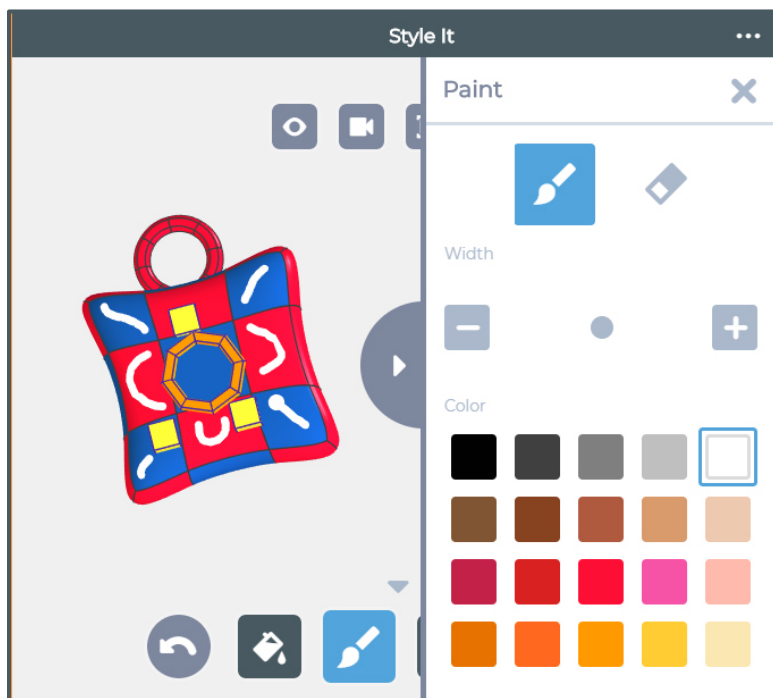
To use the Paint tool, click the Paint tool icon at the bottom of the App. This will open up the Paint tool side menu.

The Paint tool has two modes: Paint and Erase. The Paint mode allows you to change the brush size and draw the selected paint color directly onto the shape. The Erase mode allows you remove parts of what you've painted in Brush mode.
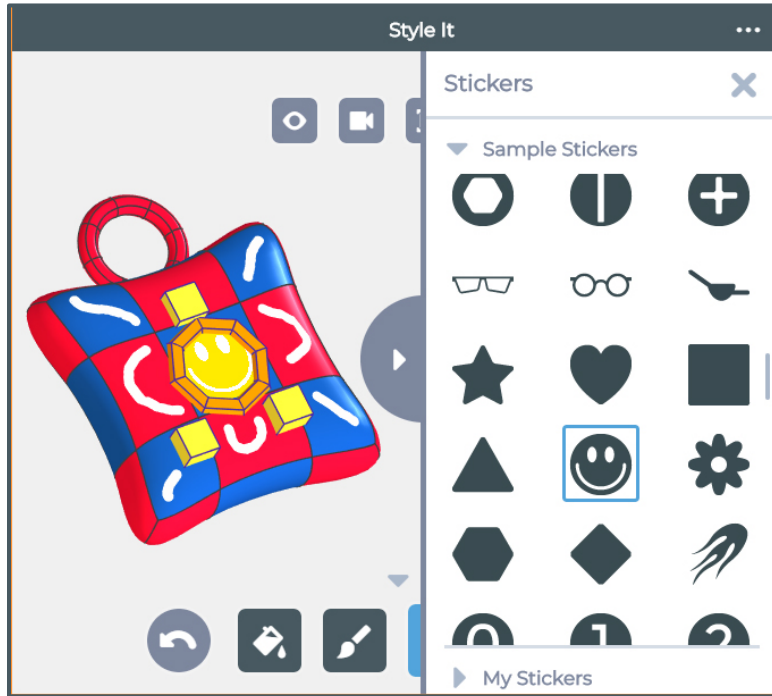
To add stickers to your model, click the Sticker tool at the bottom of the App. This will open up the Sticker tool side menu.

The **Style It** App has a collection of exciting stickers available. To add a sticker, click on the sticker you want, and then click on the section of the shape in your model to place the sticker.

To add a background picture behind your jewelry, click the Scene tool at the bottom of the App. This will open up the Scene tool side menu.

The Scene tool will let you add a background picture, or a solid color behind your model. Click either the scene or the color you'd like to complete the scene.

TIP: For this exercise, we recommend using the Store Scene to show how your new jewelry might look in a department store one day.
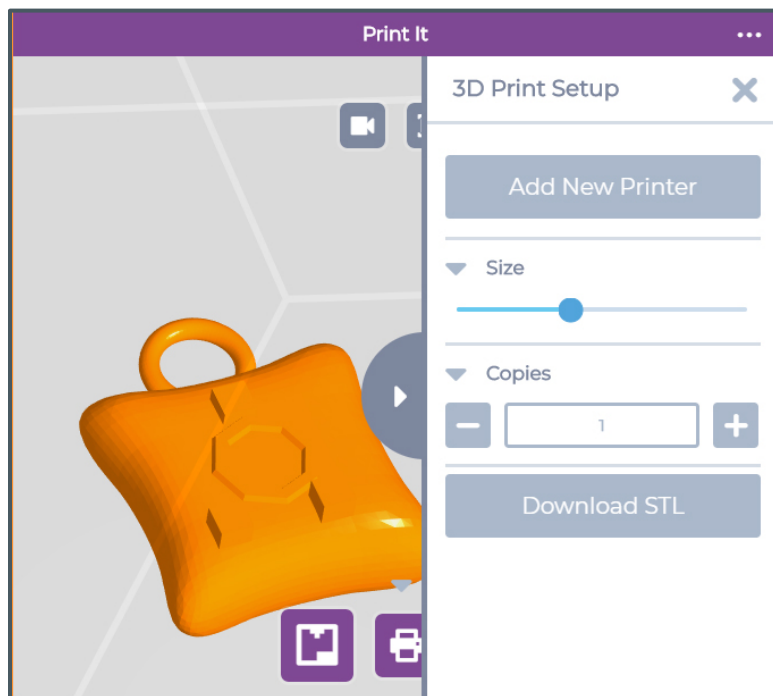
PRINTING THE NEW JEWELRY

Students can print a 2D or 3D version of their new jewelry in the SOLIDWORKS **Print It** App. Students can open the **Print It** App by clicking the Apps button in the main menu at the top of the App. The 2D Print feature can print out a color rendering of the jewelry with the background selected in the **Style It** App. The 3D Print feature will let students download an STL file to be imported into the software that comes with most 3D printers. Students should make sure their models are scaled to fit within the printable area of their 3D printer before 3D printing.

TIP: Depending on the complexity of the jewelry models, and on the speed of the device being used, it may take a moment for the 3D Print button to become available. This is normal behavior, as the system is having to run a lot of calculations to translate the models into the 3D files.

After the print is complete, students should carefully remove their models from the printer. The models may need to be cleaned up to remove any unwanted, stray filament material. Once removed, the students can paint the physical model of their jewelry to make them just like the digital versions in the **Shape It** App.

The **Print It** App relies on a very easy-to-use design to enable students to print their new jewelry. After selecting the type of print, click on the download button (Download STL, 2D Print, or Cube Print) and the files will be downloaded to your device's drive. From there, use the printing software you've setup on your printer to print what you'd like.
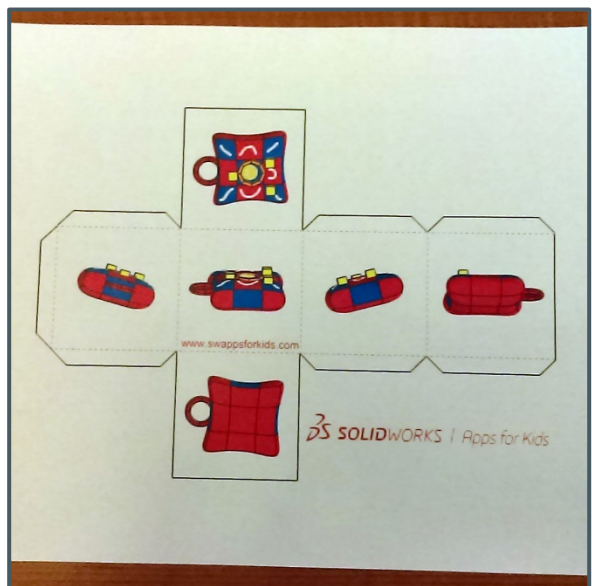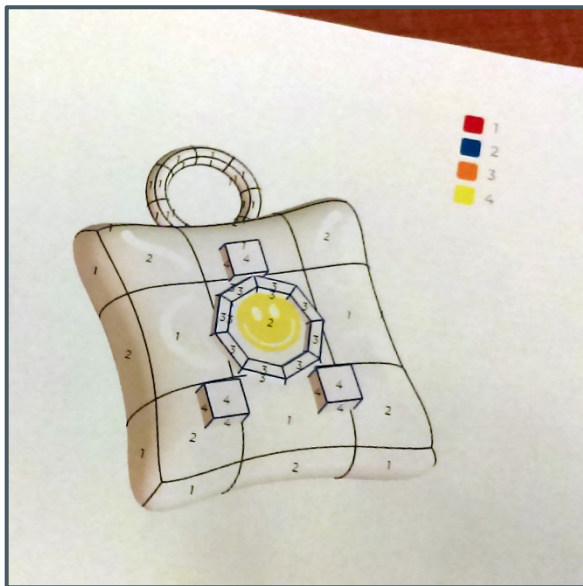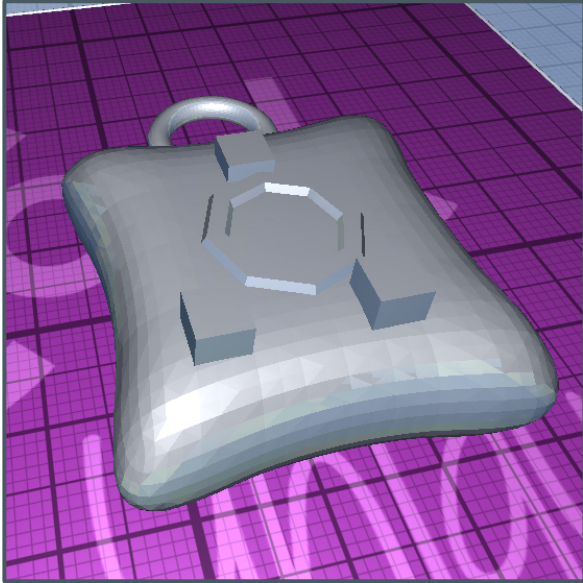
💬 DISCUSSING JEWELRY AND CRAFTING

After students have shaped and styled their models, have them consider and discuss the following questions about creating new jewelry:

- *Think about the jewelry you made. What parts do you think turned out the best?*
- *What parts of your jewelry could be used for something, and not just interesting to look at?*
- *How would people would use, or for what occasions, would they wear your jewelry?*
- *How would your jewelry affect or change people's lives?*
- *How would your jewelry inspire new fashions or new trends?*

🌐 CRAFTING IN THE REAL WORLD

The videos listed below can help students explore and understand how industrial and commercial design effects so many of the products we buy and use. Read the introduction paragraph to the students, then have them view the videos for that topic. After students have viewed the videos, you can use the included questions to encourage discussion on those topics.

Designing New Looks

Have you ever wondered where new clothing designs come from? In the following videos, you'll learn how fashion designers turn ideas into the clothes we wear. After you watch the videos, you'll have a chance to talk about what these designers do. So, pay attention to the skills and tools needed to work in the fashion industry.

Fashion Designers Career Video:
http://bit.ly/career2200

- *What are some jobs that require unique-looking clothes?*
- *In addition to fashion designers, what other jobs are needed to turn fashion ideas into the clothes we buy in stores?*
- *What would the world be like if there were no fashion designers?*
- *How can clothes communicate something about the person wearing them?*

Fashion Designers use their artistic skills and technical abilities to make our clothing and accessories more useful and exciting. In addition to the video above, the CareerOnestop website has more information on this, and related fashion careers

The Finer Details

Have you ever heard that something was "set in stone?" Usually that means something is so important, it needs to be around for a while. Even though the world is becoming more digital, there's always a need for well-designed things made of lasting materials. In the following video, you'll learn how etchers and engravers use traditional and modern tools and methods to add creative designs to products. After you watch the video, you'll have a chance to talk about how these skills are necessary to make everyday items more beautiful and exciting.

Etchers and Engravers Career Video: http://bit.ly/career9400

- *What are some things that couldn't be made without etchers or engravers?*
- *How different would our system of money be if there were no etchers or engravers?*
- *What are some of the biggest things you can think of that need etching or engraving? What are some of the smallest?*
- *How have modern tools like electric drills, industrial lasers, and water jet cutters changed how designs are etched or engraved onto objects?*
- *In what ways have computerized tools changed the etching and engraving of products?*

Etchers and Engravers use their skill and experience to carve words, images, and other patterns into various materials such as metal wood, glass, and resins. In addition to the video above, the CareerOnestop website has more information on this exciting career.

EDUCATOR RUBRIC

ITEM	Does Not Meet Expectations	Meets Expectations	Exceeds Expectations
Understanding the Assignment – Consider This	Student does not express opinions, or does not know what that fashion items are.	Student is able to name some jewelry or fashion items, and can express why they are important.	Student can express why design is important to the creation of fashion items, e.g. if this part were different, it wouldn't do what it's supposed to.
Using the Shape It App to Modify or Create a Model	Student was unwilling or unable to add shapes and objects to a new model, or add or adjust objects in a riffed copy of an existing model.	Student modified an existing model or created a new one by adding or modifying shapes in the model.	Student demonstrated original creativity and/or artistic ability by making substantial modifications or new models that are associated with the goals of the lesson.
Using the Style It App to Decorate a Model	Student was unwilling or unable to add decorations to a new model, or add or adjust decorations in a riffed copy of an existing model.	Student decorated an existing or new model by adding or modifying colors or stickers in the model.	Student demonstrated original creativity and/or artistic ability by making substantial decorative modifications that are associated with the goals of the lesson.
Printing the Model (optional)	Students was unwilling or unable to print the model, even with assistance.	Student was able to print the model with assistance.	Student was able to print the model with little or no assistance.
Discussing Jewelry and Crafting	Student was unwilling or unable to express why he/she created the jewelry, and why it would be useful or valuable to someone.	Student was able to express their reasoning for the jewelry, and in what way it would be useful or valuable to someone.	Student was able to express reasoning for their jewelry, why it is useful or valuable, how it could improve lives or inspire other fashions or trends.
Crafting in the Real World	Student did not express or understand careers industrial or commercial design.	Student is able to name some careers that are involved in producing clothing, or can name items that require etching or engraving.	Student is able to name some careers involved in producing clothing, and why good design in clothing is important, or can name items that require etching or engraving, and express how these careers can make items better.

STANDARDS ALIGNMENT

This project is most closely aligned with the middle school engineering standards in the Next Generation Science Standards (MS-ETS1-1 and 1-4).

> **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.**

> **MS-ETS1-4. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.**

Students design, develop and then refine their own fashion jewelry. They test and improve their designs.

In addition, this project addresses cross cutting concepts of structure and function, stability and change and scale proportion and quantity.

Keep in mind that the performance expectations shown in Middle School Engineering Design couple particular practices with specific disciplinary core ideas. Instructional decisions allow for use of many practices that lead to the performance expectations.

This lesson allows students to focus on a two-stage process of evaluating the different ideas that have been proposed. By using a systematic method to determine which solutions are most promising and by testing different solutions, students combine the best ideas into new solutions that may be better than any of the preliminary ideas. Improving designs at the middle school level involves an iterative process in which students test the best design, analyze the results, modify the design accordingly, and then re-test and modify the design again. Students may go through this cycle two, three, or more times in order to reach the optimal (best possible) result. Connections with other science disciplines help students develop these capabilities in various contexts.

The discussion and communication elements of this lesson can lead to instruction on the following cross cutting concepts –

> **Connections to Engineering, Technology, and Applications of Science Influence of Science, Engineering, and Technology on Society and the Natural World:**

>> **-The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions.**

>> **-Technologies extend the measurement, exploration, modeling, and computational capacity of scientific investigations.**