

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 | Designing New Foods



### GETTING STARTED

In this activity, students will use the SOLIDWORKS Apps for Kids to create 3D models of new foods. The new foods can be made completely from scratch, or by combining some of the existing food 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 how new foods could be made from existing ones.



## CONSIDER THIS

*Have you ever thought about how we got seedless versions of some foods, like grapes and watermelons? Modern farmers are constantly trying to produce better foods. Over the years, farmers and agricultural scientists have learned how to combine different plants so they'll have new flavors, smells, colors, and ways of being grown. This type of modern farming has created new types of beautiful and incredible-smelling flowers, new foods like cayenne pepper or broccoflower, and new foods that can be grown more easily and in more places around the world.*

- *What are some of your favorite fruits or vegetables and what do you like about them?*
- *What are some meals or dishes those foods are used to make?*
- *What other fruits or vegetables could be combined to make those meals better?*

TIP: If the students are having trouble thinking of foods that could be combined, one suggestion you could ask them to consider is wheat. Since wheat flour is used to make so many foods, if other fruits or vegetables could be combined with wheat, it could lead to some very creative new meals and dishes.

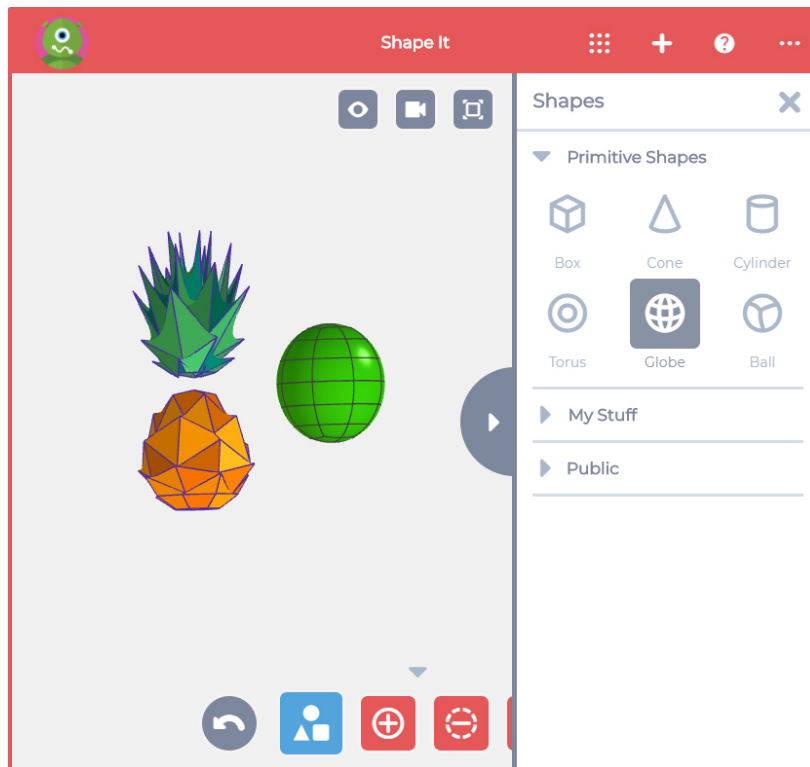


## MODELING THE NEW FOOD

Once the students have had time to consider the new foods they would 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.

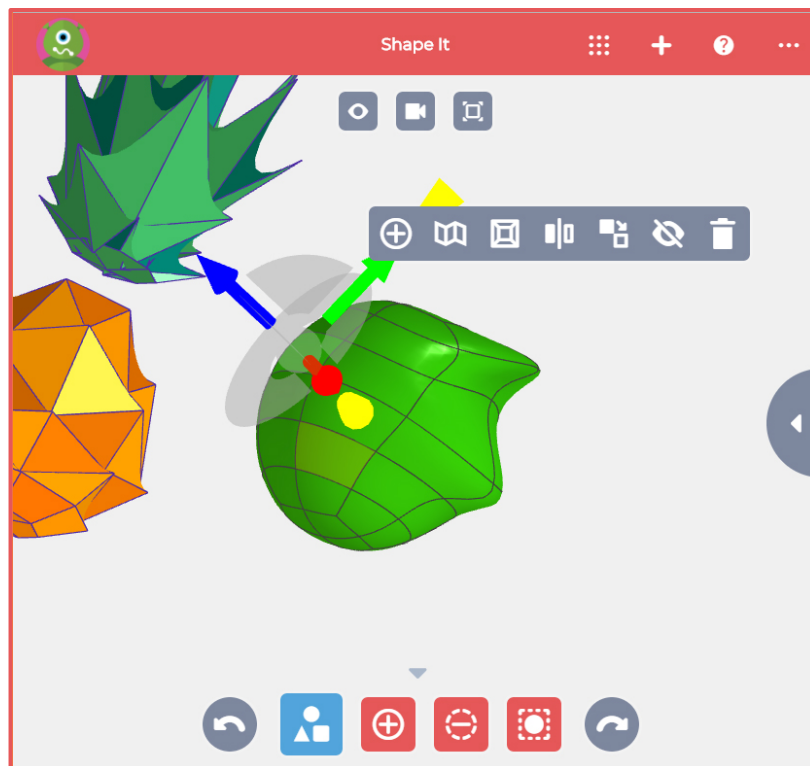
TIP: The included food models for this project may seem advanced, but they are really just combinations of basic shapes that have been pushed, stretched, or reshaped to look like the actual foods. Encourage the students to start working with their models by adding a few of the basic shapes side-by-side onto the work area, and then start clicking on the shapes to mold them into looking more like the new foods they want to create. Also encourage students not to get frustrated if their models do not look like they want immediately. 3D modeling can involve a lot of reshaping to get something exactly right, and students should be reminded that many creations may need lots of changes over time, and that this process of making changes is how ideas are improved.



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.

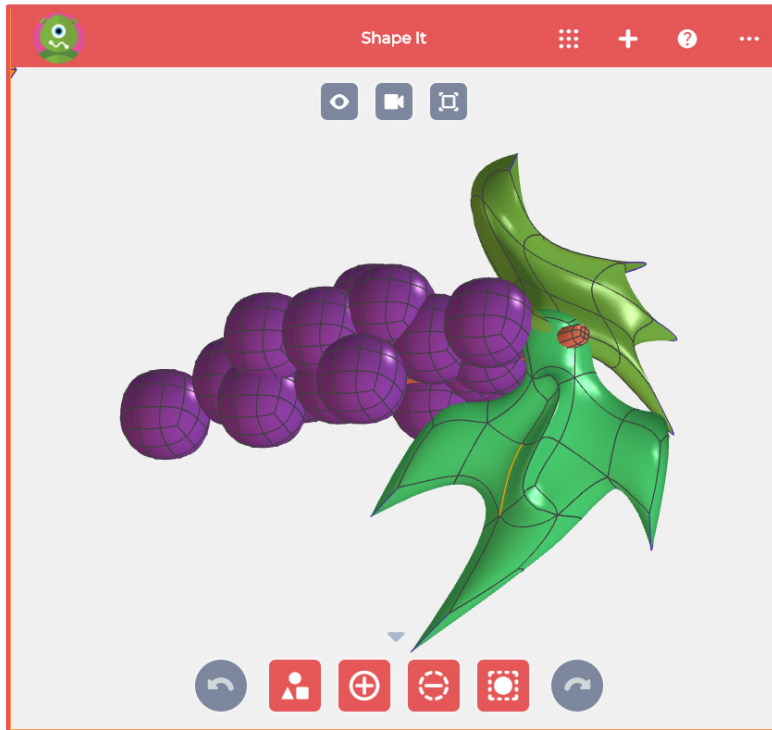
Click the shape you want and it will be added to your model.



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 foods.



Students should keep in mind one way to quickly make their new foods more realistic is grouping together smaller, less complex shapes into a model. The example shown demonstrates how a group of shapes can come together to look like a decently realistic bunch of grapes. In this example, the leaves were 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 models 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.

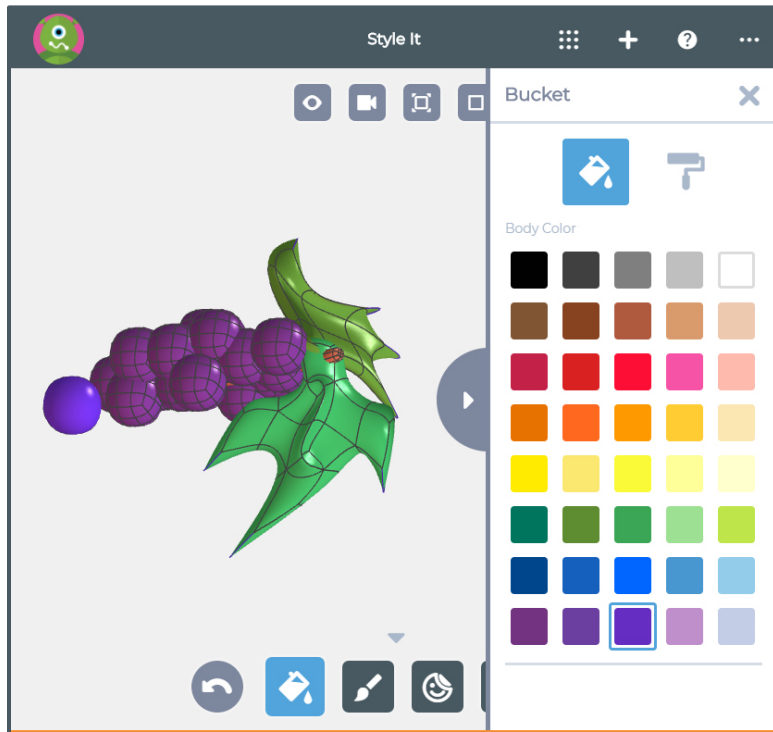


## DECORATING THE NEW FOOD

Once students have shaped their models, they can decorate them to look even more like the new foods they want to create in the SOLIDWORKS **Style It** App. 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 food models, they can add in the Market background with the App's Scenes feature.

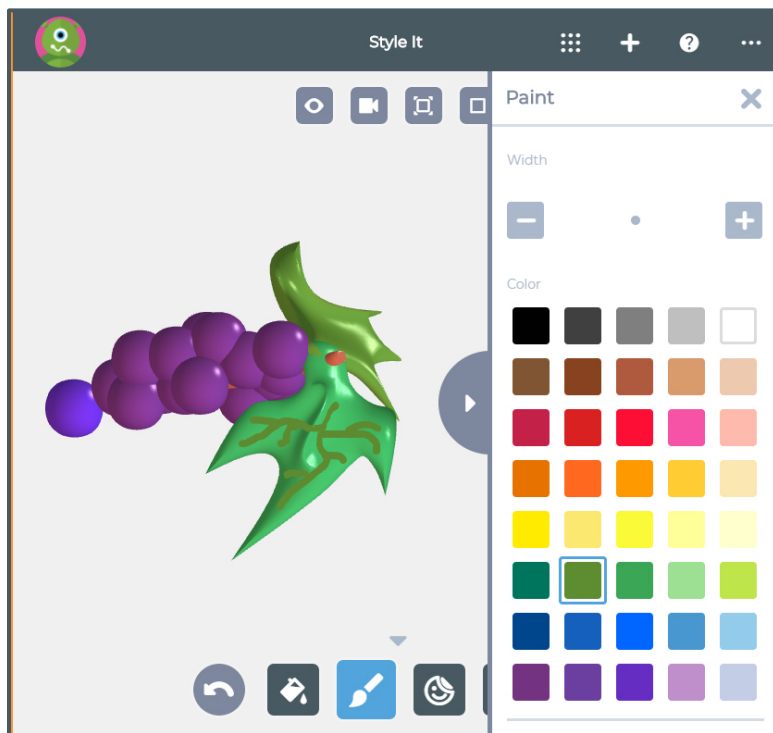
The **Style It** App has a collection of powerful styling tools for students to use:

- 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 new food, 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 Market Scene to show how your new food might look in grocery stores or markets one day.

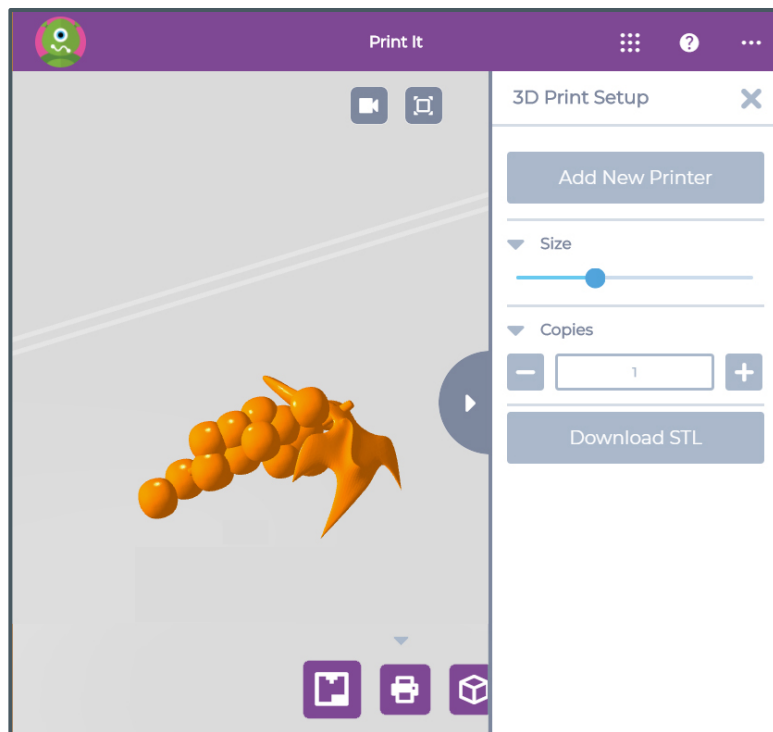


## PRINTING THE NEW FOOD

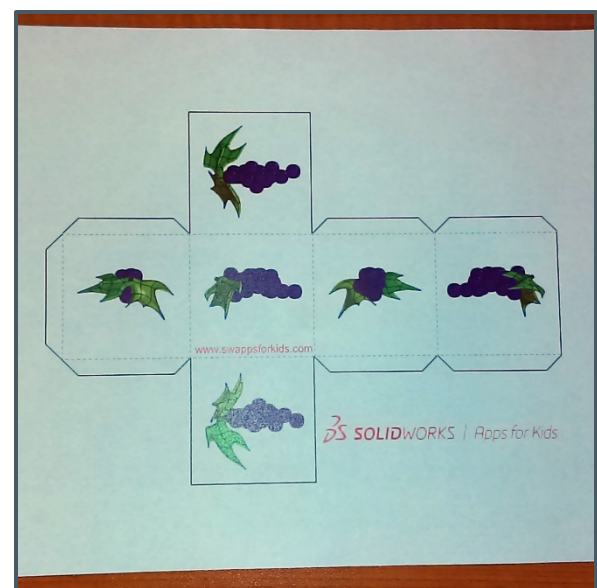
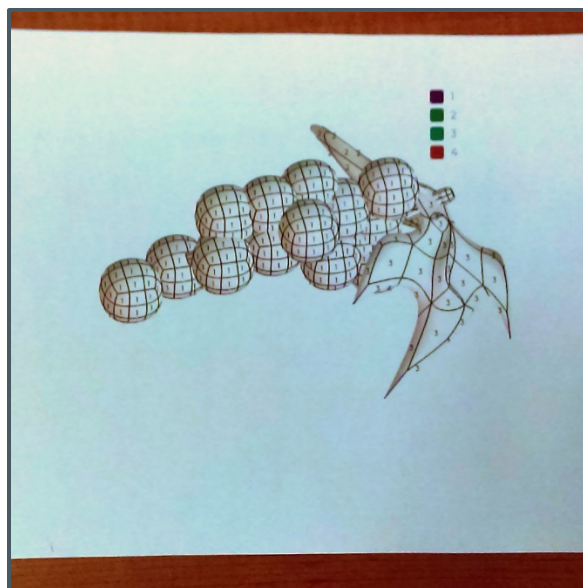
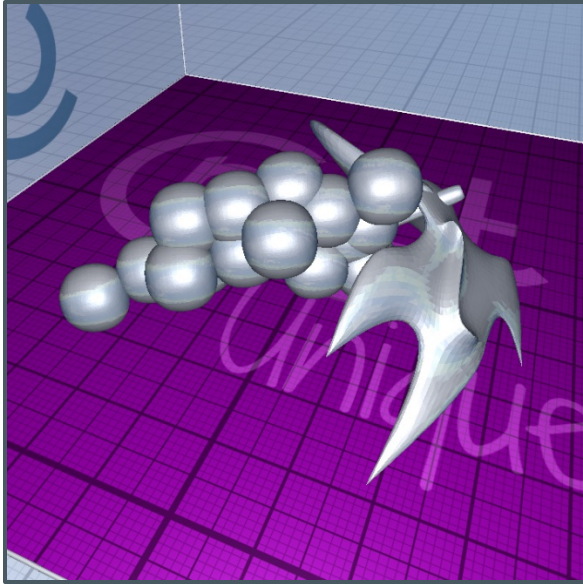
Students can print a 2D or 3D version of their new foods in the SOLIDWORKS **Print It** App. Students can open the **Print It** App by clicking the Apps button in the main menu at the top of the App. The 2D Print feature can print out a color rendering of the new food with the background selected in 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 their new food 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 new food 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 the new foods 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 food models. 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 FOODS

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

- **Think about the parts of existing foods you used to create your new foods. Why did you choose those parts to create your new foods?**
- **How are your new foods an improvement on existing foods?**
- **Try to imagine how your new foods would be grown. Would they make growing foods easier or more difficult? Why?**
- **How will your new foods change what people eat?**
- **Consider how your new foods could be used with other foods. How will your new foods affect how other foods are used?**



## FOOD IN THE REAL WORLD

The videos listed below can help students explore and understand ways new plants and foods are changing our world. 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.

### Healthier Food Choices

**Have you ever thought about how the food you eat can impact your life? MyPlateMyWins is a program created by the U.S. Department of Agriculture to encourage everyone to eat healthier meals. In the following videos, you'll see examples of how small changes to a meal can have big results in healthier eating. After you watch the videos, you'll have a chance to talk about how new foods could be created that would make it easier to eat healthy. Pay attention to the ways the meals were changed.**

#MyPlateMyWins at Lunch:

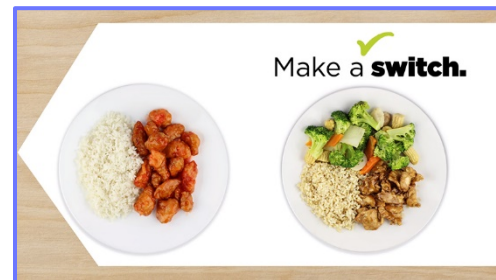
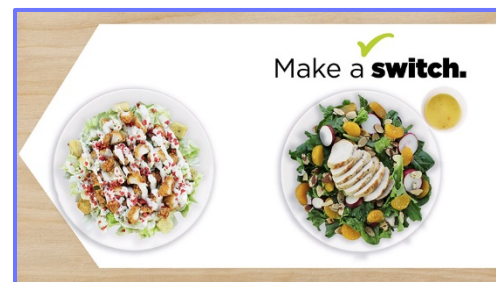
<https://www.youtube.com/watch?v=bqAUUxXs2sQ>

#MyPlateMyWins at Dinner:

<https://www.youtube.com/watch?v=ArSnyWaOAmQ>

#MyPlateMyWins at Snacks:

<https://www.youtube.com/watch?v=srJXLmrmp7s>

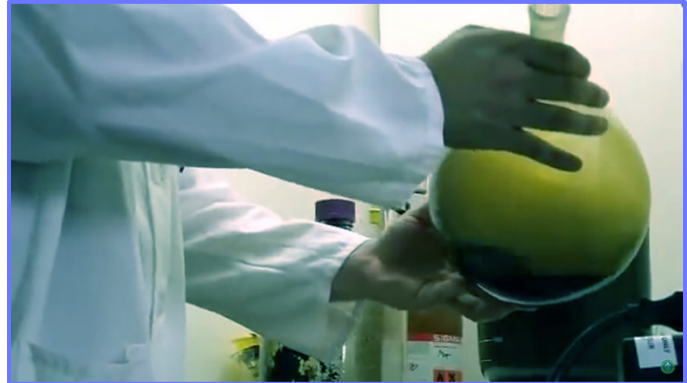


- ***What new foods could be created that would make eating a lunch or a dinner tastier and healthier?***
- ***What jobs can you name that would involve trying to make foods and meals healthier?***
- ***How would having healthier foods change life for the people in your town?***

A nutritionist is a person who helps to create meals that are healthier. This job can be very rewarding through helping other people avoid diseases and other health problems. You can learn more about this career by going to: <http://bit.ly/career3100>

## Fuel from Foods

***Food is the source of fuel for your body, but did you know some plants and foods can also be used to power machines too? In the following video, you'll see how scientists are using plants to create renewable fuel sources that will never run out. These types of fuel are called "biofuel" because unlike petroleum, biofuels can be created when we need them. After you watch the video, you will have a chance to talk about how new plants and foods could be created that would make turning food into fuel even better. Pay attention to why biofuels have so much potential as an energy source.***



Energy 101 – Biofuels: <https://www.youtube.com/watch?v=-ck3FYVNI6s>

- ***What new plants or foods would you make to make better sources for biofuel?***
- ***What jobs can you name that involve trying to get more work done with less energy?***
- ***How would having more ways of making biofuels improve your part of the world?***

Biofuel Technicians help to design ways to create fuels from plants and foods. You can learn more about this career by watching the video here: <http://bit.ly/career4101>.

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**Fuel from Foods** image by US Department of Energy via Wikimedia Commons under Creative Commons license.



## EDUCATOR RUBRIC

ITEM	Does Not Meet Expectations	Meets Expectations	Exceeds Expectations
Understanding the Assignment – Consider This	Student does not express opinions, or could not name any fruits and vegetables.	Student is able to name some favorite fruits and vegetables, and can express how they can be used in a meal.	Student can express how fruits and vegetables are used in the creation of other components of a meal, e.g. that tomatoes are part of a sauce served with spaghetti.
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)	Student 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 Food	Student was unwilling or unable to express why he/she created the new foods, and how those foods would help people to be healthier.	Student was able to express reasoning for the new or modified food, and how it is an improvement to existing foods or how it advances health.	Student was able to express reasoning for the new or modified food, how it is an improvement to existing food, why it would contribute to better health, and also how it would be grown or produced or combined with other foods or recipes.
Food in the Real World	Student did not express or understand careers involved in food production.	Student is able to name some careers that are involved in food production or biofuels.	Student is able to name careers involved in food production and biofuels, and express how those careers contribute to those fields.



## STANDARDS ALIGNMENT

This project is most closely aligned with the middle school engineering and life science standards in the Next Generation Science Standards for developing and using models MS-ETS1-4, MS-LS1-4 and MS-LS3-1, well as extensions into High School Human Sustainability Standards HS-ESS3-2 & HS-ESS3-4.

**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.**

**MS-LS1-4. Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic specialized plant structures affect the probability of successful reproduction of plants.**

**MS-LS3-1. Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.**

**HS-ESS3-2. Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.**

**HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.**

**5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.**

Students design, refine and artistically render their “new food”. Through feedback they iterate their design.

In addition, this project address cross cutting concepts of structure and function demonstrating how the shapes, composition, and relationships among its parts, can be analyzed to determine how they function.

These lessons encourage students to engage with the practices of science and engineering:

- Asking questions (for science) and defining problems (for engineering)
- Developing and using models

This lesson also covers CCSS Math standards for grades 7 CCSS.MATH.CONTENT.7.G.A.2:

**CCSS.MATH.CONTENT.7.G.A.2. Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.**