

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 | Animals in Habitats



GETTING STARTED

In this activity, students will use the SOLIDWORKS Apps for Kids to create 3D models of animals found in different habitats. Students can either start from scratch, or use one of the basic animal 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 animals adapt to their habitats.



CONSIDER THIS

Have you ever wondered how many different animals there are in the world? There are so many nobody really knows for sure. This doesn't stop Zoologists and Wildlife Biologists from trying to find out everything they can about all of the animals in our world. The more we can learn about animals and their habitats, the better we will be at protecting them and making sure we always have healthy animal populations on our planet.

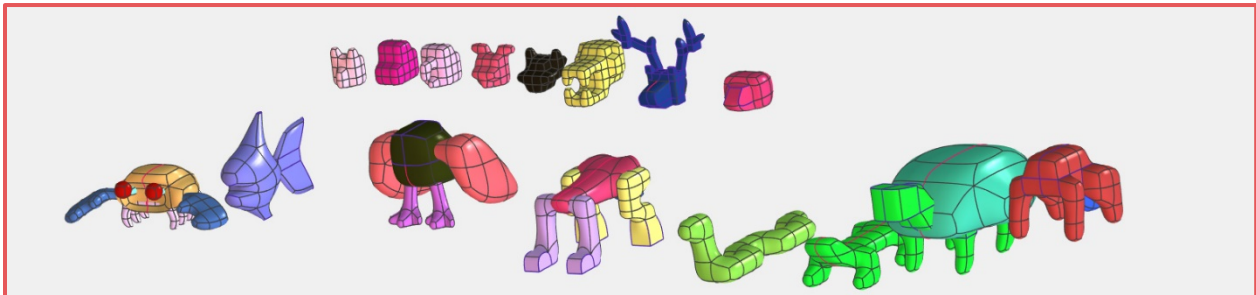
- *What are some animals that live in habitats like: deserts, forests, jungles, and oceans?*
- *What are some ways animals stay safe from other, larger animals?*
- *What are some signs, traces, or other evidence of the animals that live around them?*

TIP: If the students are having trouble thinking of how animals stay safe from predators, you may want to prompt them with examples of animals with good natural camouflage like rabbits, chameleons, or turkeys, and ask the students what characteristics make it difficult for other animals to catch them.



MODELING THE ANIMALS

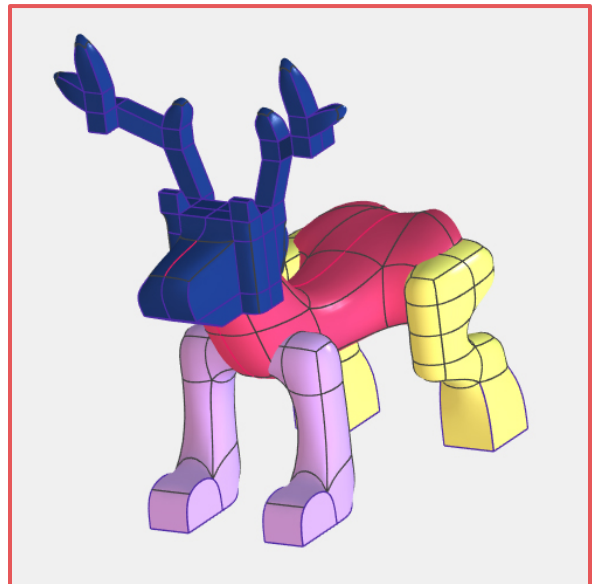
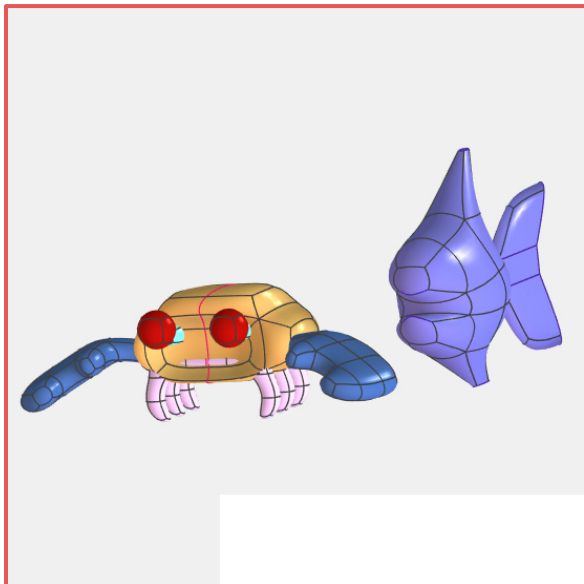
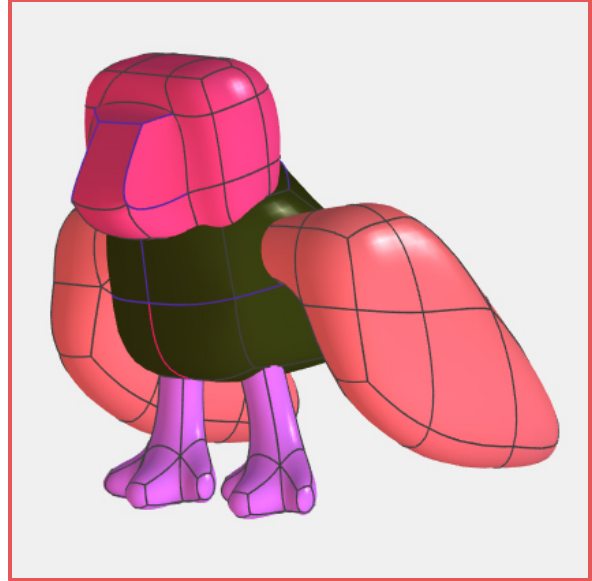
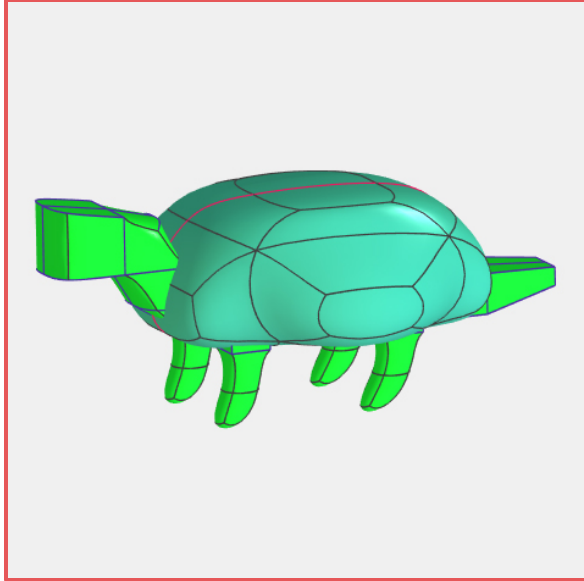
Once the students have had time to consider the animals they'd like to create, have them launch SOLIDWORKS Apps for Kids Classroom. To help the students get started, we've created a few simple animal models for this exercise. You can access the Sample Content in the Sample Lessons section of the Organization 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.

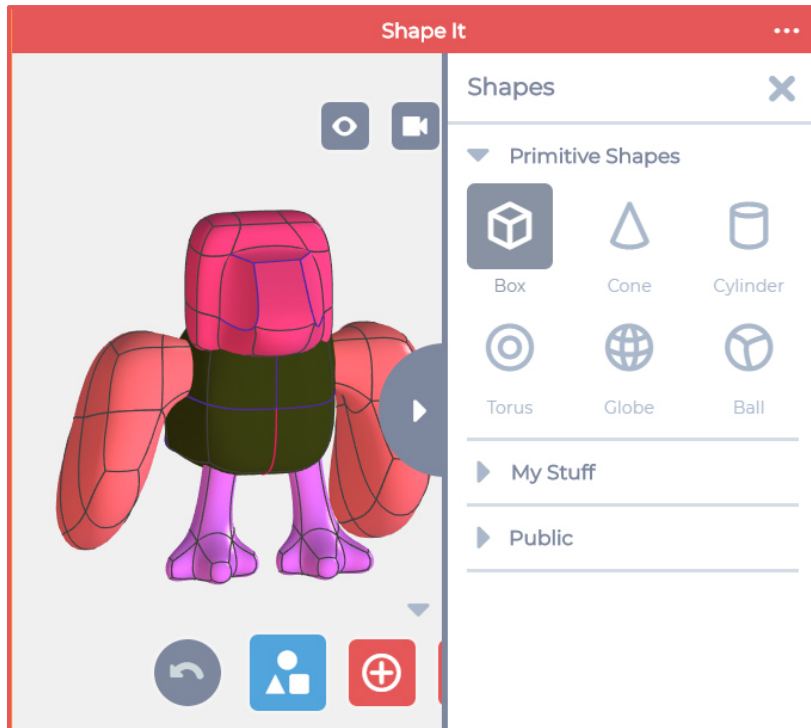


SOLIDWORKS has some video tutorials that can help students get familiar with the Shape It app's basic features. Students can watch the videos by clicking the Help icon in the main menu at the top of the app. But since the Shape It app works a lot like modeling clay, many students will be comfortable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

TIP: The included animal 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 animals. 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 animals 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.

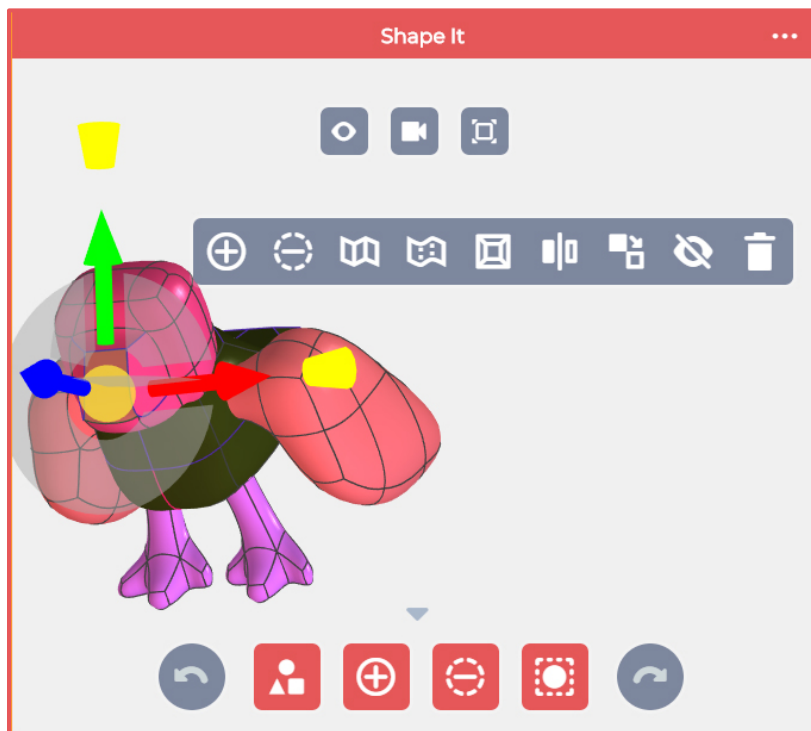




The **Shape It** app allows students to place multiple objects together to make more complex models.

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.

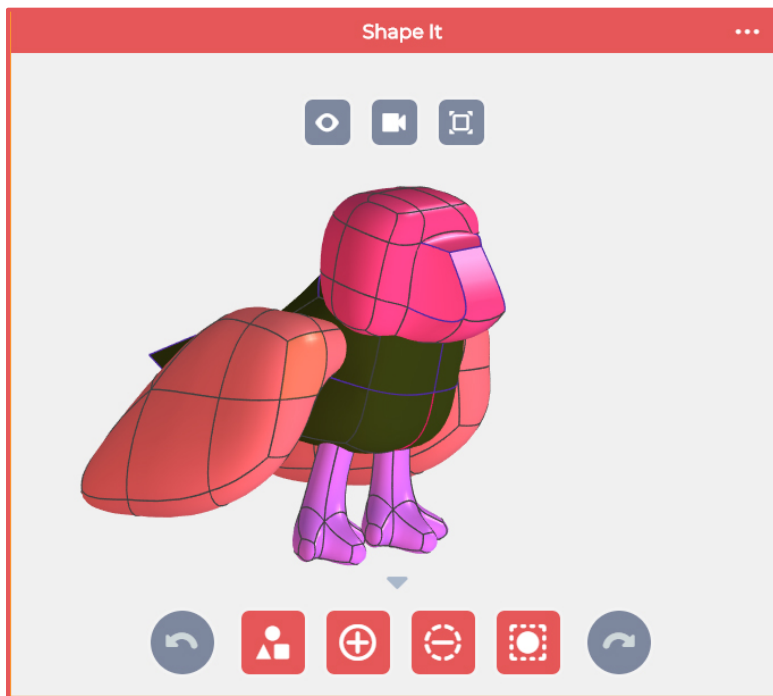
Click the shape you want and it will be added to your model.



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 animal.



Students should keep in mind the shape of the animal is only one part of its design. The way animals look is sometimes even MORE important than their size and shape.

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 animals one-at-a-time.

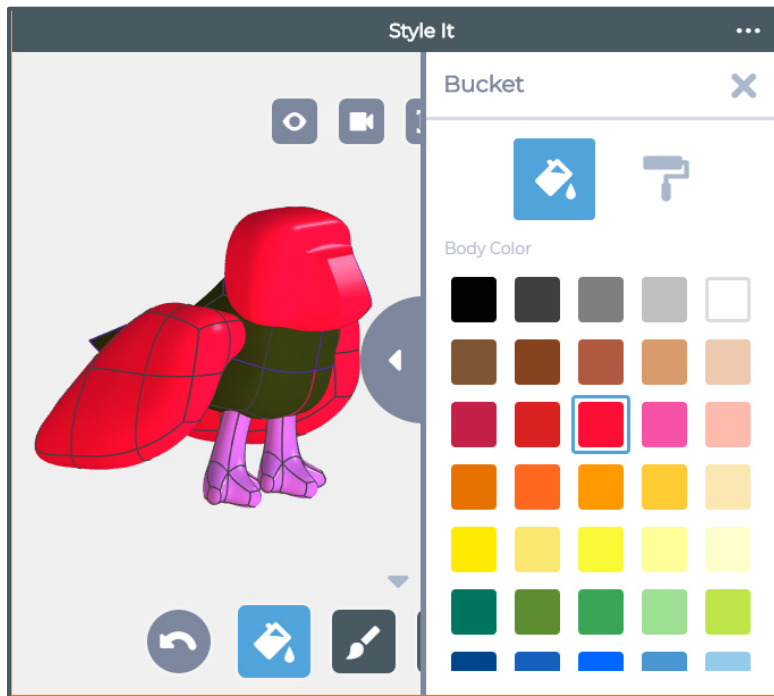


DECORATING THE ANIMAL

Once students have shaped their models, they can also decorate them in the SOLIDWORKS **Style It** app. Student 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.

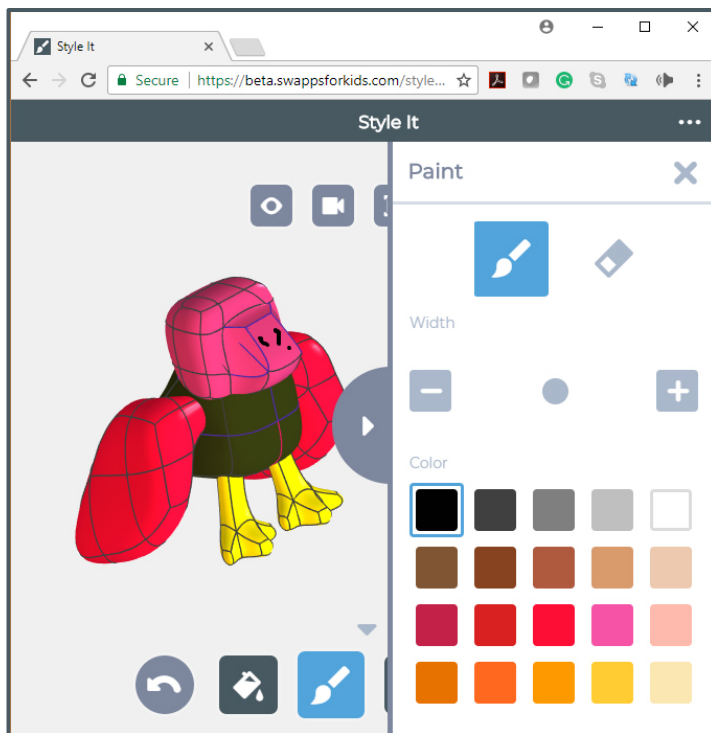
The **Style It** app has a collection of powerful styling tools for students to use:

- 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.



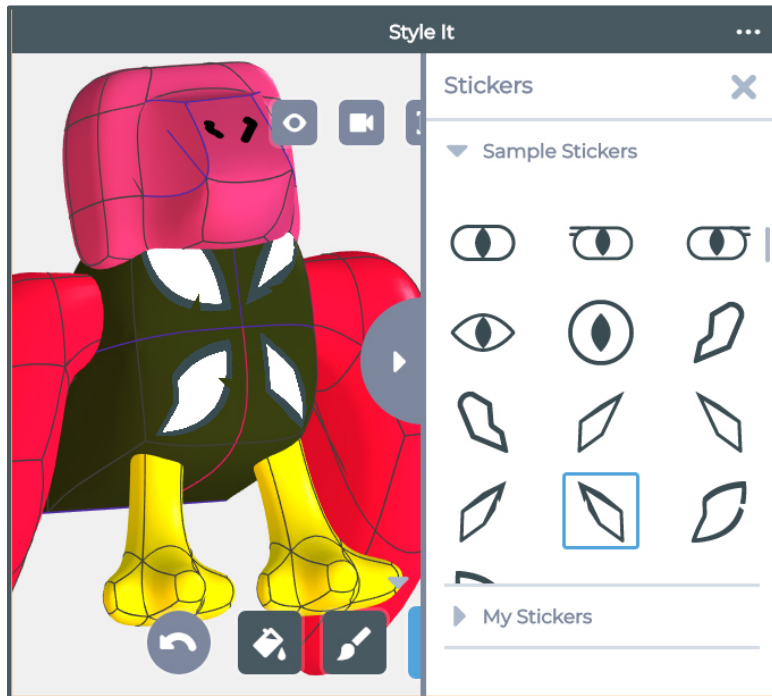
To use the Bucket tool, click the Bucket tool icon at the bottom of the app. This will open up the Bucket tool side menu.

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.

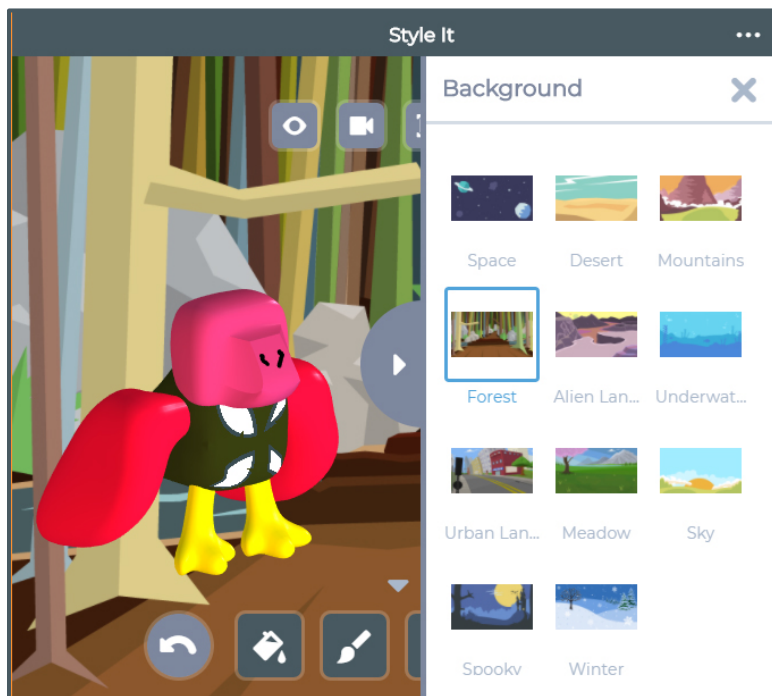
The Paint tool has two modes: Paint and Erase. The Paint mode allows you to change the brush size and draw the selected paint color directly onto the shape. The Erase mode allows you remove parts of what you've painted in Brush mode.



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.

Because an animal's ability to blend into its surroundings is so important, encourage the students to use a background scene as a guide to decorating their models. There are several different backgrounds, like Desert, Forest, Ocean, Meadow, and Jungle included in the app's Scenes feature, that should be helpful in styling the students' animals.



To add a background picture behind your animal, click the Scene tool at the bottom of the app. This will open up the Scene tool side menu. Click a scene for your animal.

TIP: For this exercise, we recommend using a background Scene that makes a good habitat for your animal. You might even consider using colors similar to one in the Scene when you style your animal.

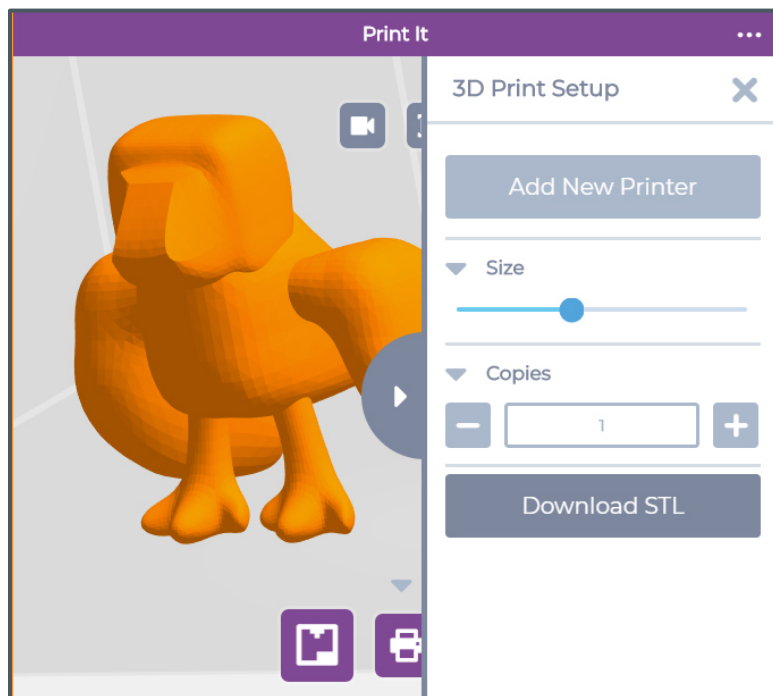


PRINTING THE ANIMAL

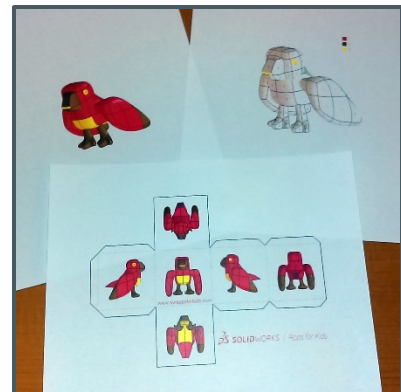
Students can print a 2D or 3D version of their animals in the SOLIDWORKS **Print It** app. Student can open the **Print It** app by clicking the Apps button in the main menu at the top of the app. The 2D Print feature can print out a color rendering of the animal with the background selected in the **Style 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 animal 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, student 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 their animals to make them just like the digital versions in the app.



The **Print It** app relies on a very easy-to-use design to enable students to print their new animal model. 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 ANIMALS AND THEIR HABITATS

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

- ***Think about the animal you made. What parts do you think turned out the best?***
- ***What parts of your animal help the animal survive in its habitat?***
- ***What changes to your animal would make it easier to survive in other habitats?***
- ***How could you use your animal model to explain to someone the ways humans and animals live in the same areas without disrupting each other's lives?***



ANIMALS IN THEIR HABITATS

The videos listed below can help students explore and understand how humans oversee and protect animals and their habitats. 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.

Protecting Wildlife

Did you know there are millions of different animal species that roam our country? Have you ever wondered who makes sure such a large number of wild animals coexist with humans as peacefully as possible? In the following video, you'll learn how Fish and Game Wardens monitor and control the enormous wildlife population inside and around our country. After you watch the video, you'll have a chance to talk about what these game wardens do. Pay attention to the skills and tools needed to help oversee our animal populations.



Fish and Game Wardens Career Video: <http://bit.ly/career3330>

- ***What are some types of animals that game wardens oversee and protect?***
- ***What are some examples of the ways game wardens work with people and animals?***
- ***What would happen if our country didn't have Fish and Game Wardens?***
- ***Think of some of the wild animals in your area. What problems in the habitat, food supply, or general health would Fish and Game Wardens be needed to solve?***

Fish and Game Wardens use their training and expertise to enforce our country's laws protecting wildlife. Also called Wildlife Conservation Officers, these professionals serve a valuable role in making sure humans and animals share our natural resources in the best possible ways. In addition to the video above, the CareerOnestop website has more information on this, and other wildlife-related careers

Watching in the Wild

Have you ever wondered how we know so much about the animals throughout the world? Zoologists and Wildlife Biologists spend their careers studying animal origins and behaviors. In the following video, you'll learn how these wildlife professionals observe, record, and process all sorts of information about the animals in our world. After you watch the video, you'll have a chance to talk about how their work is necessary to make sure the animals in our world are healthy and thriving.



Zoologists and Wildlife Biologists Career Video: <http://bit.ly/career2300>

- ***What are some animals that live in the habitats near your home or school?***
- ***How is the information collected by Zoologists and Wildlife Biologists used?***
- ***What would the world be like without Zoologists and Wildlife Biologists?***
- ***What are some things you can do to help ensure the animals and wildlife around us remain healthy and protected?***

Zoologists and Wildlife Biologists are experts at studying different types of animals, and their work is used to maintain healthy animal populations. In addition to the video above, the CareerOnestop website has more information on how zoologists and wildlife biologists work to make sure humans coexist with the wildlife around us.

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Protecting Wildlife and **Watching the Wild** images by US Fish and Wildlife Service 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 animals in the example habitats.	Student is able to name some animals in the example habitats, and can name ways they keep safe.	Student can express how certain animals stay safe in the wild and can name examples of the traces animals that live around them.
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 decorating their models in ways that blended successfully with the background scenes in 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 Animals and the Habitats	Student was unwilling or unable to express why he/she created their animal, and which parts of it would be useful in its habitat.	Student was able to express their reasoning for their animals, and which parts of it would be useful in its habitat.	Student was able to express reasoning for their animals, why its traits are useful, and how those traits allow it to coexist with humans.
Animals in the Habitats	Student did not express or understand careers in zoology or wildlife conservation.	Student is able to name some ways wildlife wardens help animals, or the type of information wildlife biologists collect about animals.	Student is able to name some wildlife conservation careers, and why those careers are important to maintaining healthy animal populations, or can name ways humans can help animal populations coexist around them.



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) and (MS-LS 2-2) MS-LS 4-4:

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.

MS-LS2-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.

MS-LS4-4. Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.

Students design, develop and then refine their own animals based on characteristics of their habitat. They have opportunities to improve their designs.

In addition, this project addresses cross cutting concepts of how patterns can be used to identify cause and effect relationships.

Additional standards addressed in the conversation and development of this model include:

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

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.