

# STEM Planning

## Section I - Content

### Unit Plan: Veterinarian: Animal Prosthetics Using 3D Printers

By: middle school ren.

Course/grade level: 6-8

#### LESSON/UNIT DESCRIPTION

##### **Provide a brief (1 paragraph) description of your unit.**

Prosthetic limbs are objects that can be created using this process. Prosthetic limbs are important to people who have lost a limb as they allow the individual to regain capabilities they may have lost. These limbs can also be used by a variety of animals including cats, dogs, and even birds!

#### LESSON/UNIT GOALS

##### **What big idea(s) (i.e., enduring understandings) will result from this unit?**

*Students will understand that:*

- Engineers use a series of steps, called Engineering Design Process, to “ASK” questions about, “Imagine”, “Plan”, “Create”, and “Improve” technologies.
- engineers often have to balance several variables when designing a technology.
- increasing the performance of a design for one variable can decrease its performance for other variables.
- Technological design is a creative process that anyone can do which may result in new innovations and inventions.
- Matter has observable physical properties and the potential to mix and form new materials.

##### **What is the context for your unit design?**

The goal is to provide important information to pet owners and people working with animal shelters, zoos, and aquariums. Each team of veterinarians will open a new clinic specifically designed to help animals that have lost limbs. Each team wants to do this through the use of a 3D printer that can create prosthetics for a wide-range of animals.

##### **What essential question(s) will frame the unit?**

- How would you apply technological design and problem solving in the development of innovations and inventions.
- How are materials identified and sorted?

##### **What Standards are addressed by this unit?**

*AZ.SC08-S3. Science in Personal and Social Perspectives*

- *SC08-S3C2. Science and Technology in Society: Develop viable solutions to a need or problem*

*AZ.CC.WHST.6-8. Writing Standards for Literacy in Science and Technical Subjects*

*AZ.8.MP. Mathematical Practices*

- *8.MP.1. Make sense of problems and persevere in solving them*

- 8.MP.4. Model with mathematics.
- 8.MP.5. Use appropriate tools strategically.
- 8.MP.6. Attend to precision.

AZ.CC.8.RI. 2010 Reading Standards for Informational Text 6-1

AZ.CC.8.SL. 2010 Speaking and Listening Standards 6-12

### Scientific, Engineering, or Mathematics Practices

Identify the relevant practices and crosscutting concepts in this unit as described in the Next Generation Science Standards.

**Engineering Design: Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution and taking into account relevant scientific principles and potential impacts on people and the natural resources.**

### ASSESSMENT (Evidence of Learning)

Provide a brief description of each of the major assessments you plan to include:

#### **Infomercial**

*Your team will need to create a 3-4 minute infomercial that can be viewed on television as an extended commercial or online. This infomercial should use pictures, videos, and other visuals to help the audience understand how animal prosthetics function and how they can help a wide range of animals. The audience will also need to understand how 3D printing works and the types of materials that can be used to make the prosthetics functional and durable. This is meant to be persuasive and should be used to educate people and have them trust your team so that they are willing to work with your clinic. Be sure your team is part of the infomercial and each provides critical information for the audience.*

#### **Magazine Article**

*Your team will need to create an article that can be published in local and national magazines. The article will need to inform and persuade the readers to consider your 3D printed prosthetics. The article will need to inform the readers about how these prosthetics function and can provide a good quality of life for the animals. It should also provide information about the 3D printing process and how different materials can be used to create the prosthetic based upon the needs of the animal. If valuable, your article may include a picture, diagram or other visual to help the reader learn about the process and begin to trust the veterinarians in your clinic.*

#### **Prototype**

- *Your team will need to create a prototype that is the actual size needed for the animal you have selected. This prototype will need to be created based upon the size and dimensions of the animal (your team may need to conduct research to learn the size of the animal. Your measurements must be precise and accurate or the prototype will not function correctly for the animal. Your team should be*

*prepared to create many versions of this prosthetic until success is achieved and the prosthetic is fully functional and of the appropriate size.*

### **Technical Drawing**

- *Your team will need to create a technical drawing that is done to scale and based upon the size of the animal that your team has selected for the creation of a prosthetic. This drawing will need to be accurate and precise and it will be used to inform the building of a prototype. Be sure the drawing includes the various angles for movement that the prosthetic must perform. Provide the viewer with a key and be sure all appropriate parts are labeled. The material selected for the prosthetic should also be included. Your team may want to conduct research to learn about the properties of the material to be sure it is a good choice for your prosthetic. This drawing will also be used to help people understand how the prosthetic will function for the animal in which it is designed.*

### **Webpage**

- *Your clinic wants to attract people not just from the local area, but also from other areas around the country and in other countries. You will want to create a webpage that is easy to navigate, that includes pictures and video, and has important information that people will need to know and understand before choosing to provide your prosthetic for their animal. You should provide people with an in-depth understanding of the design problem and the constraints your team considers for every animal. People viewing the website will need to understand the materials used and the properties of these materials that that help to make the prosthetics through 3D printing works to help ensure a successful solution.*

Provide a scoring rubric that you will use to evaluate final products of your unit.  
See [attached file](#).

Provide examples of 2-3 initial models you expect from the students: *(insert images)*



Provide an example final model you expect from the students: *(insert image)*



## LEARNING GOALS

### List the key learning goals to be addressed in this unit:

- *implement the steps of the Engineering Design Process*
- *Create a working prototype*

## PERFORMANCE GOALS (OBJECTIVES)

### List the performance goals of this unit:

- Infomercial
- Web page
- Technical drawing
- Digital magazine
- 3-d model

### **References:** (curriculum resources, books, websites, etc.)

websites will be accessed to research different types of prosthetics

Includes videos, content connections, materials list, posters

Joomag - digital magazine

Weebly - to create a website

Makerbot - 3D Printer