



Prosthetic Prototype

You have been hired as a biomedical engineer to help design a prosthetic prototype. Remember, to help amputee patients, the prosthetic should be durable, comfortable, and life-like. Use your creativity to first sketch your prototype, then design your prototype to help your patient.

TEKS:

7.11B Explain variation within a population or species by comparing external features, behaviors, or physiology of organisms that enhance their survival.

7.12B Identify the main functions of the systems of the human organism, including the circulatory, respiratory, skeletal, muscular, digestive, excretory, reproductive, integumentary, nervous, and endocrine systems.

How To:

1. Your challenge is to design a prosthetic (replacement) limb that can be used by an amputee patient.
2. First, select a "patient" and determine which of their limbs needs to be replaced. *Are you going to design a human leg? A monkey tail? A dolphin fin?* Keeping your materials in mind, sketch a design of your prosthetic on paper.
3. Now you are ready to create a prosthesis! Think about the following factors in your design: *Is it durable? Comfortable? Will you add a joint?*
4. Test your limb. *Does it move the way the limb is supposed to move? Can you add more features to make it better?* Make modifications as needed.

Materials:

- 2 Q-tips
- 2 rubber bands
- 2 toothpicks
- 3 cotton balls
- 3 pipe cleaners
- 1 felt square
- 2 craft sticks
- 1 Nerf gun arrow
- 1 note card
- 1 plastic spoon
- Paper
- Pencil

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The STEM Explanation:

After a patient has had a limb surgically removed because of a traumatic event or disease, the limb is replaced with a prosthetic, which acts as the limb that the patient has lost. For many years, prostheses, the artificial devices that replace a missing body part, were made out of wood. Realizing that this was uncomfortable and did not look life-like, engineers began using a material called carbon fiber, which allowed them to create more realistic prosthetic limbs. Titanium is also used in modern prosthetics because it makes the limbs more durable. Just as you did when you designed your prosthesis, biomedical engineers have to continue evaluating their designs and materials to advance the field of prosthetics and further help the individuals who need them.

Career Connection:

Biomedical engineers design appliances to straighten or support body parts. They also use technology to engineer prosthetic limbs for people and animals that have suffered a serious injury that resulted in the loss of a body part.

Recently, biomedical engineers have been working on technology called targeted muscle reinnervation. This technology allows amputees to control their prosthetic using their brain, just as if it was their own biological limb. They have also engineered robotic knees, called microprocessor knees, which contain a computer within the prosthetic that allows amputees to have better control when walking, stopping, and moving on inclines.

Biomedical engineers make a positive difference in the lives of the people or animals they help by fitting them with prosthetics that make movement easier.

Resources:

- http://www.teachengineering.org/view_activity.php?url=collection/cub_/activities/cub_biomed/cub_biomed_lesson01_activity1.xml
- <http://news.discovery.com/tech/robotics/five-major-advances-robotic-prosthetics.htm>

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