



Curiosity Guide #306

Skeletal System

Accompanies Curious Crew, Season 3, Episode 6 (#306)

Making a Prosthetic Leg

STEM Challenge

Description

Work together on a team to design and build a lower-leg prosthetic.

Materials for each team

- Scissors
- Ruler
- Hot glue gun
- Lengths of PVC (13-17 inches long)
- Lengths of 2x4 (13-17 inches long)
- Metal pipes
- Cardboard tubes
- Plungers
- Foam
- Large sponges
- Bubble wrap
- Towels
- Fabric scraps
- Bungee cords
- Long Velcro strips
- Twine or rope
- Rubber bands
- Shoe
- Dry erase board
- Marker

- Scale

The challenge is to design and build a lower-leg prosthetic limb, considering leg structure for support, cushioning for comfort, ease of attachment, and how the prosthetic will attach to a shoe base.

Procedure

- 1) Place the assorted materials out to review.
- 2) As a team, plan a lower-leg prosthetic limb.
- 3) Consider who will "wear" the device.
- 4) How long must the device be to fit?
- 5) What material will provide the best support?
- 6) How will the device provide cushioning to reduce discomfort when the prosthetic rubs against a person's limb?
- 7) How will the prosthetic attach?
- 8) Build the prototype.
- 9) Seek feedback from others.
- 10) Redesign the prototype with improvements.

My Results

Explanation

A prosthesis is a manufactured body part that can replace missing body parts. Some people may have experienced an injury and need such a device. Biomedical engineers design prosthetics for people with missing limbs.

Although prosthetics can be designed for different limbs of the body, this activity focuses on the lower leg. As an engineer, you should take many considerations into account in this design, including the person's size and weight, their level of activity, and age. This information will determine the height and materials selected for the person.

Typically, lower-limb prosthetics are sleeved below the upper leg, and because there is significant contact with each step, comfort is a primary design consideration. Engineers also want to ensure that the device can be easily taken off or put on. Designs continue to improve so that people with prosthetics can take part in most activities. The materials used provide better shock-absorbing power, as well as flexibility and spring with each step.

Think about this: The crew did a great job designing prosthetic legs, but what happens if a person just has a broken bone? The body immediately starts to heal. It sends blood to clot around the break right away, and in just a couple of days, new bone begins to bridge across the break. This is why getting a cast is so helpful. The cast will hold the bones in place so that the delicate bone bridge can get harder and harder. The cast can usually come off in less than six weeks, but the bone continues to heal for several months.

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