Grab & Go!

Grade: 3-4

Time: 1 hr

Activity Overview :

Through this activity you will learn all about biomedical engineers and how they design things to solve problems for people all over the world. Parents, you'll be our activity supervisor while the kids get to create their own cardboard prosthetic hand in a minute-to-win-it challenge! Here are some questions to think about together before you begin this activity.

- What do you think a biomedical engineer does everyday? What kinds of things do they make?
- What are the important parts of your arm? How do you use your arms and hands?
- Do you know what a prosthetic arm is?

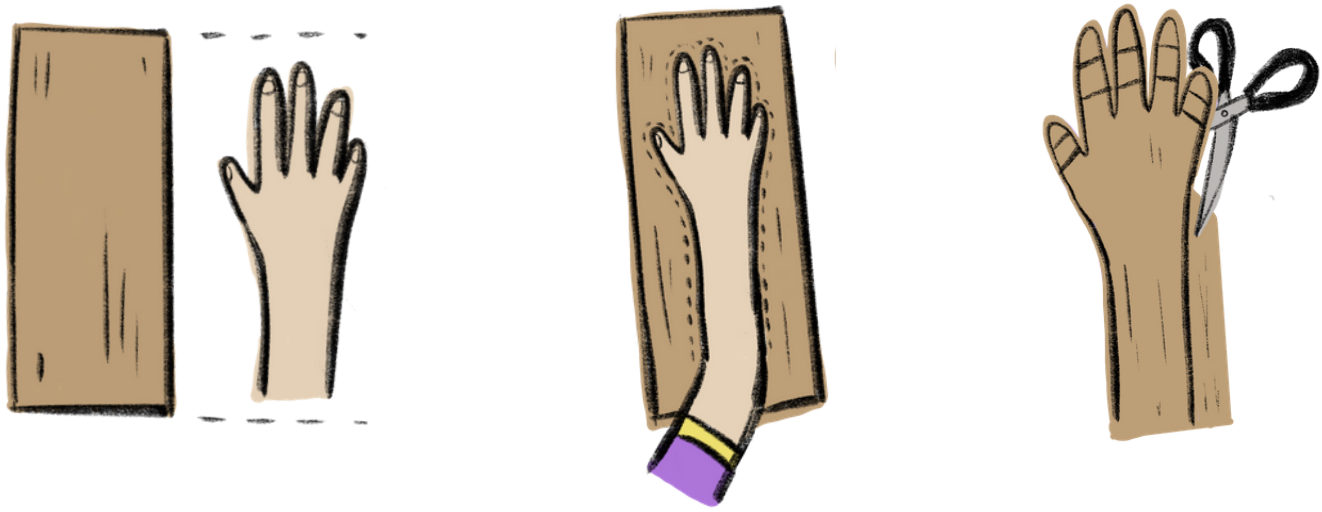
Materials:

- 1 Large piece of cardboard
- 1 Medium cardboard
- Scissors
- Handful of straws
- 5 long pieces of string
- Hot glue gun with its glue sticks, or tape
- Small objects to be picked up with the cardboard hand and a small container

Don't worry if you don't have all these supplies. Experiment with other everyday items and see what you can build!

Activity:

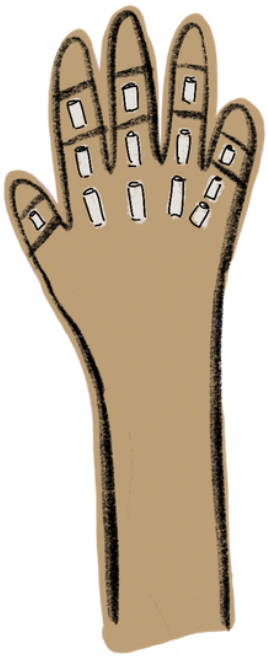
1. Take a large piece of cardboard that is as long as your forearm and hand combined and trace the shape of your own hand, or the hand of your parent near the top. Once you're done tracing, cut around the outline of the hand.



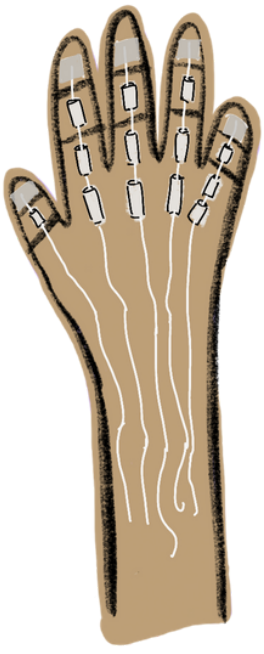
2. Next, bend the fingers to create joints. Grab a straw and cut it into small pieces. Glue the straw pieces onto the fingers and thumb, all the way down to the palm of the hand. You should have three small pieces of straw per finger.

3. At the top of each finger and the thumb, glue or tape a piece of string and feed the string through each one of the little straw pieces.

Step 2



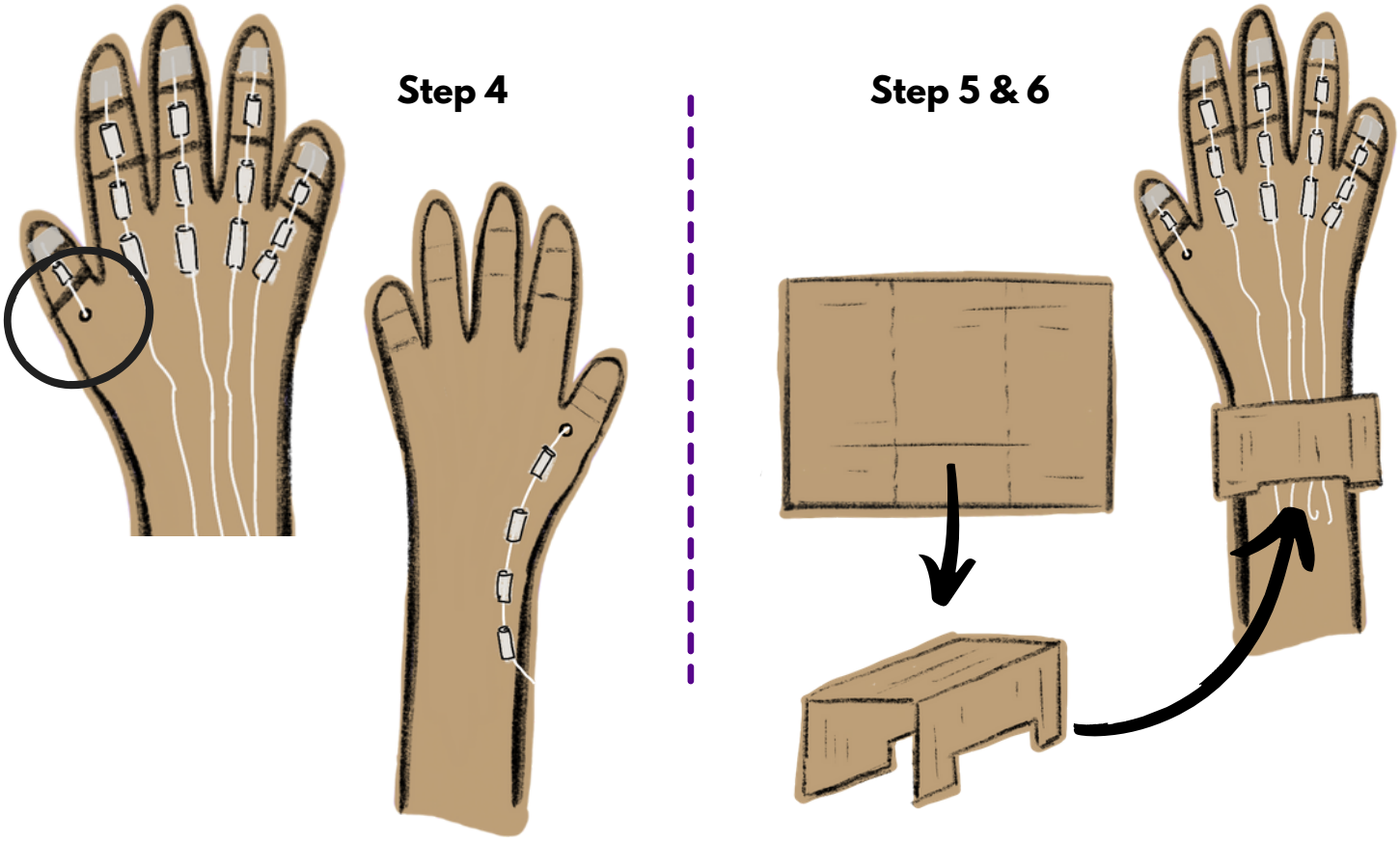
Step 3



4 For the thumb, make a hole under the joint and place a small piece of straw through the hole (use hot glue to keep it in place). Turn the hand over and continue to glue or tape small pieces of straw along the back of the hand until you reach the wrist. Feed the string through the straw pieces.

5 Turn the hand back over and let's get started on the support! To make the hand support, take a medium piece of cardboard and bend it into thirds (make a small rectangle with three sides). Then, cut a small rectangle opening on both sides big enough to fit your hand through.

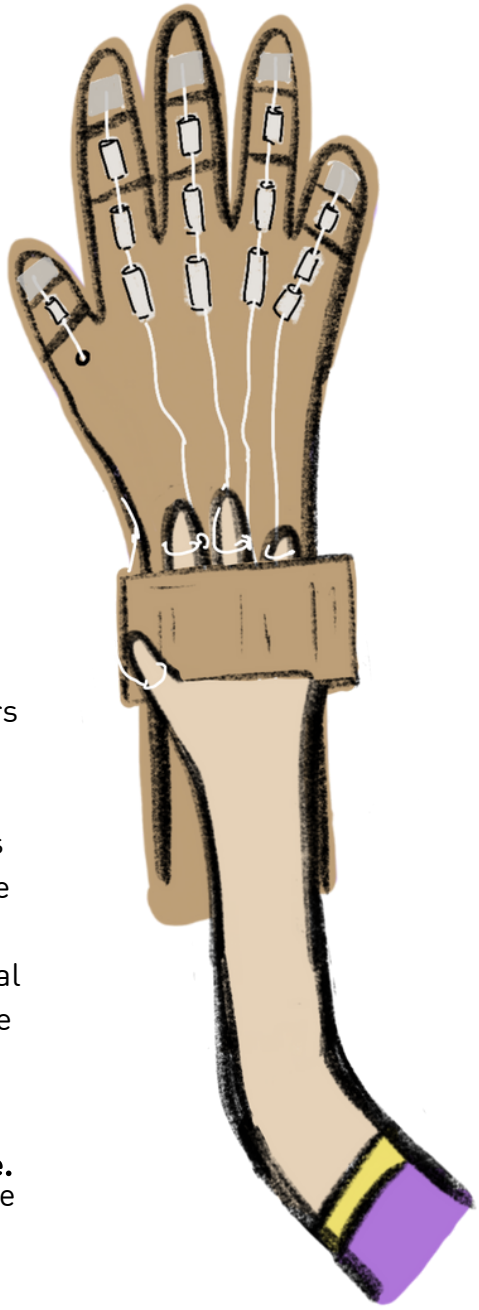
6 Keep it bent and glue it down on the lower wrist of the arm. Add a small piece of cardboard to fill the opening on the thumb side and attach a bent straw on the bottom of it. Take your thumb string and feed it through this final piece of straw (this is where you're thumb will be attached).



7 Put your hand through the rectangle opening and tie the strings to the tips of your fingers.

Challenge time!

Challenge Time! See how many items you can get into a container in one minute using your cardboard hand. Make one for your parent too and do the challenge together.



Engineering Connections:

Biomedical Engineering is when engineering concepts and principles are used in the medical field for healthcare purposes. It can be used to create devices that make other people's lives easier, from a medical perspective, like creating devices like small implants. Biomedical engineering is also used to make equipment like MRI systems as well as devices for making a diagnostic analysis.

Some essential parts of the arm include the upper arm, the elbow the forearm, the wrist and the hand. The hand itself is made up of 4 fingers and a thumb all with knuckles as well as a palm.

A **Prosthetic Arm** is an artificial limb made to replace a limb that was lost at birth, by illness or by injury. They are made with strong, durable and lightweight material since the weight of the limb is an important factor. The weight of an artificial limb is more noticeable than a natural one. Some are controlled by cables that act as muscles and others use rechargeable batteries.

By doing this activity, you also learned all about the **Engineering Cycle.** You started with a problem, designed a solution for it, built a prototype (a simple model of your idea) and then tested it out. If the prototype works then the engineers will use it in their final design. However, if it doesn't work the first time, it's okay, you just go through the cycle again and keep making changes until it works!

Extensions:

If you need more of a challenge, you can go back and reinforce your prosthetic hand to be able to then lift heavier objects. You can also move the containers used in the competition at a further distance and higher height.

Share your creations!

Don't for get to share your experiments and creations with us! We would love to see what you've made. You can Email us at: esqinfo@uwaterloo.ca or send us a message/tag us on our social media!

Facebook: @uwengoutreach

Twitter: @UWEngOutreach

Instagram: @uwengoutreach

Thanks for exploring, discovering, and learning with us!

3, 2, 1 Done!

3 - Write or draw 3 things you learned from this activity

2 - Write or draw 2 things you found super interesting or cool and want to learn more about

1 - Do you have any questions about the activity? Did something make you wonder...what if? how? or why?