Ozobots

Ozobots are small, programmable robots designed to teach coding/STEAM. The small robots follow black lines and can do tricks if given the correct color sequence.

A Geering Up presenter will give a short demo on how to use the Ozobots and general instructions are also outlined below.

Activity Instructions

Step 1: Meet Your Ozobot

- Grab an Ozobot from the table to **share with a partner.**
- Press the power button on the side to turn it on (the light should glow).

Step 2: Place on the Map

- Choose one of the provided Ozobot maps.
- Place your Ozobot on the starting point **test that it follows the black line.**

Step 3: Discover Color Codes

- Use the markers to **add colour codes to the maze.**
- Experiment with making the Ozobot:
  - Speed up or slow down
  - Spin at certain spots
  - Take alternate paths

*Note: a full Color Code chart is provided at the table for reference.

With Ozobots, students practice:

- **Coding foundations** – sequencing, cause & effect, problem-solving
- **Critical thinking** – predicting, testing, and debugging
- **Creativity** – designing maps, stories, and challenges
- **Collaboration** – working together and sharing ideas

Back-to-Back Mystery Drawing

At this station, you'll take part in a no-tech partner activity to practice coding skills. One person will give step-by-step instructions while the other follows them. Just like a programmer giving instructions to a computer, being precise matters—small changes can lead to very different results!

Activity Instructions

Step 1: Set Up

- Pair up and grab paper and pencils.
- Assign roles: **Drawer** (creates the picture) and **Replicator** (follows instructions).
- Sit back-to-back so you **can't see each other's papers.**

Step 2: Place on the Map

- The Drawer picks a slip of paper from the container which will name an item (e.g., house, tree, smiley face) and draws a simple sketch of it.

Step 3: Replicate

- Drawer gives step-by-step instructions to help the Replicator recreate the picture—**without naming the object.**
  - Ex: "Draw a large circle in the center" or "Draw a second line perpendicular to the first."
- Replicator may ask clarifying questions **but cannot peek at the drawing.**

Step 4: Reflect & Switch

- Compare drawings: how close are they? Was giving clear instructions easy?
- Switch roles and try a new picture!

With this activity, students practice:

- **Clear communication** – giving precise, step-by-step instructions
- **Listening & following directions** – interpreting instructions accurately
- **Sequencing & logic** – understanding the order of steps matters
- **Collaboration** – working together and asking clarifying questions

Discussion

This is your chance to be the expert! At this discussion station, you'll swap tips, tricks, and real-world solutions that have worked for you. If you have any questions about how to make robotics activities work at your school this is the time to chat with likeminded folk and brainstorm some ideas! Pick a prompt from those below and discuss with a buddy.

Poster Questions

- Each poster paper has a prompting question. Use the markers provided to add a response, follow up question or comment to the poster paper.

Web Resources

- Explore one or both of the following websites (type weblink into browser or scan QR code with your phone). Each link contains examples of simple but fun robotics projects for students that could be used at your school!

https://makecode.microbit.org/projects/toys

https://www.sciencebuddies.org/blog/robotics-lessons

Micro:bit Inchworm

The Inchworm is a small robot built with a micro:bit and a continuous rotation servo.
When you press a button, the servo moves a “leg” and the robot crawls forward like an inchworm.
A Geering Up presenter will give a short demo, and general instructions are outlined below.

Inchworm Instructions

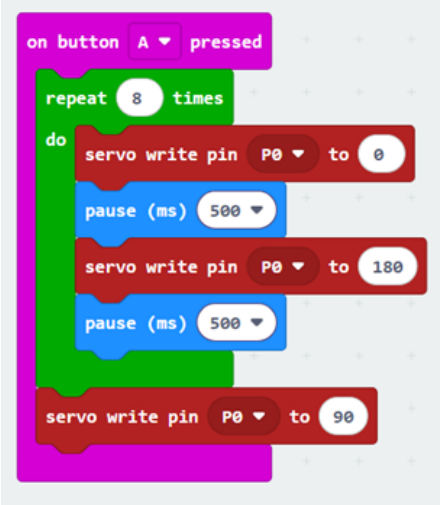
Step 1: Gather Your Materials

- 1 micro:bit
- 1 continuous rotation servo
- Cardboard or other lightweight material for the “body”
- Alligator clip and jumper cables
- Tape or glue
- 1 Paper clip

Step 2: Upload the Code

- Open: https://makecode.microbit.org/
- Click New Project and give it a name (e.g., “Inchworm”).
- Switch to the JavaScript or Blocks editor.
- Enter the following code (or drag in the equivalent blocks):

```
input.onButtonPressed(Button.A, function () {
    for (let index = 0; index < 8; index++) {
        pins.servoWritePin(AnalogPin.P0, 0)
        basic.pause(500)
        pins.servoWritePin(AnalogPin.P0, 180)
        basic.pause(500)
    }
 pins.servoWritePin(AnalogPin.P0, 90)
})
```



What the Code Does

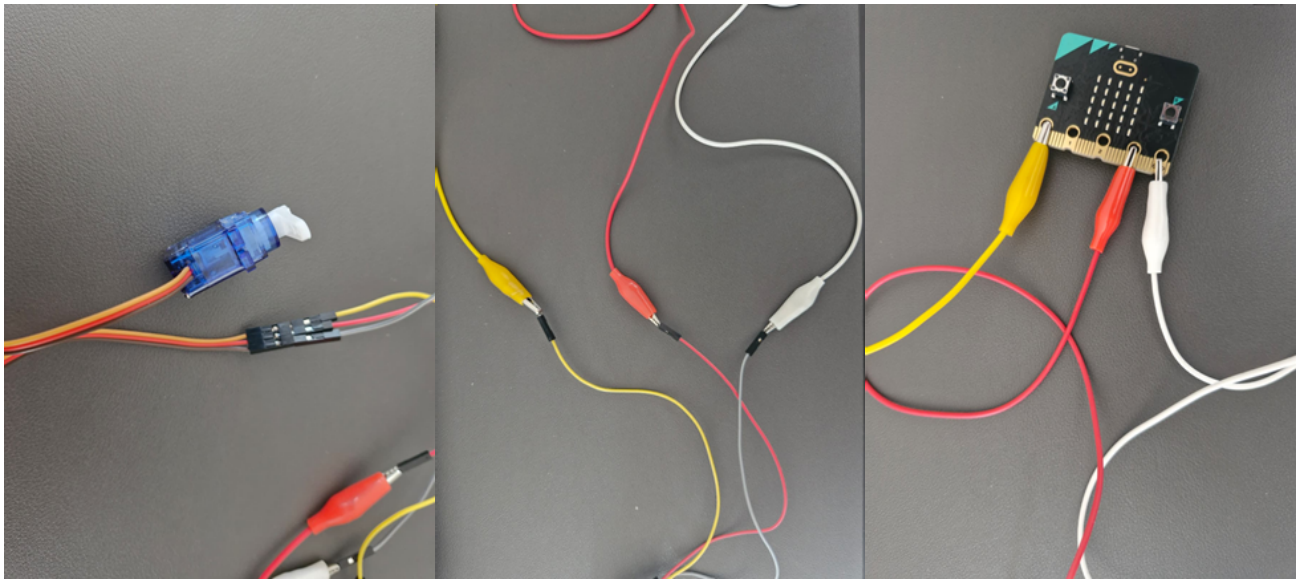
When you press Button A on the micro:bit, the servo moves back and forth 8 times (0° → 180°).
After completing the movement, the servo is set to 90°, which makes it stop.
In simple terms: Press A → the Inchworm “crawls” forward five times → then rests.

- Connect the micro:bit to your computer using the USB cable.
- Click Download in MakeCode, then drag the downloaded .hex file onto the MICROBIT drive that appears on your computer.

Micro:bit Inchworm

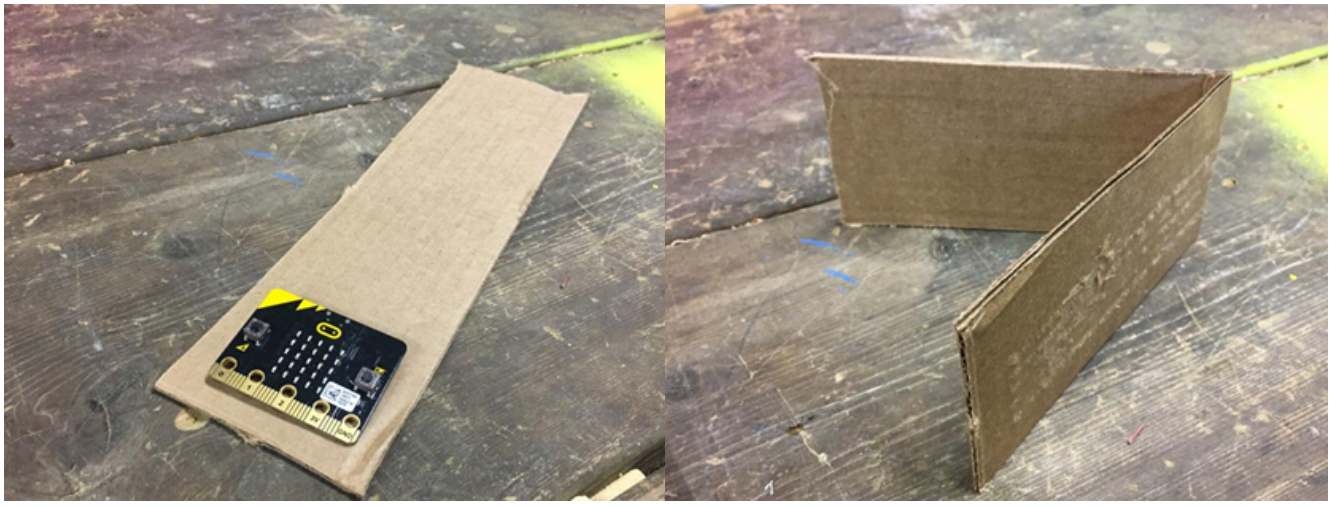
Step 3: Build the Inchworm

- Connect the servo's signal wire (Yellow) to Pin 0, the ground wire (Brown) to GND, and the power wire (Red) to 3V:



***Note**: You can use either jumper wires or alligator clips to connect the servo and batteries to the micro:bit. Choose whichever is easier for you to handle.*

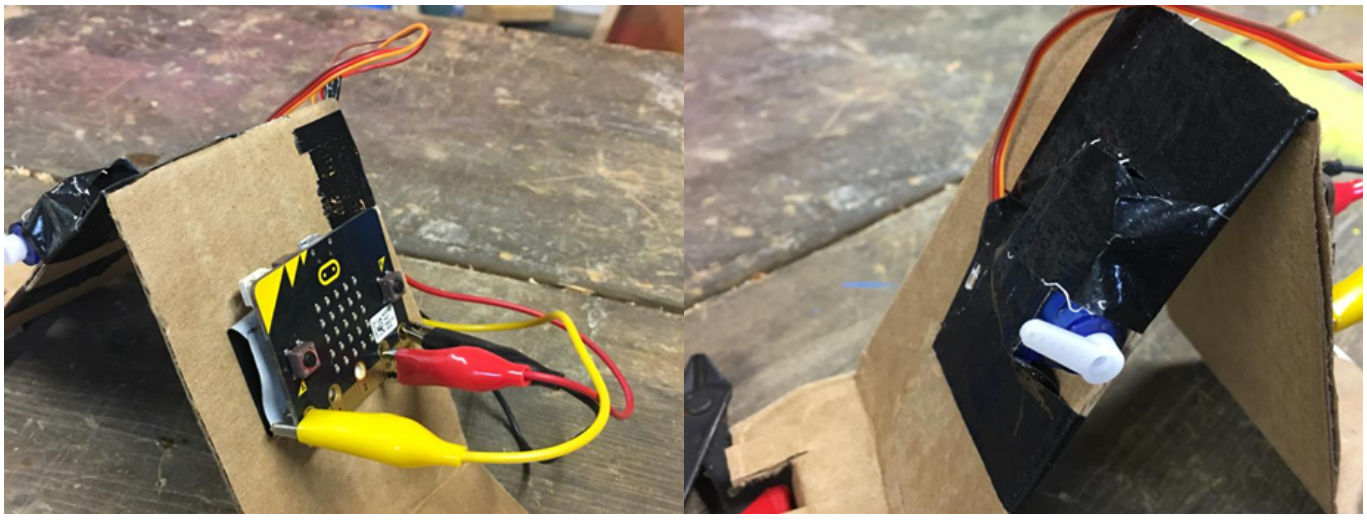
- Cutout a cardboard rectangle. You can use the micro:bit as a ruler to figure out the size
- Make a fold in the cardboard right in the middle of the long side.



Micro:bit Inchworm

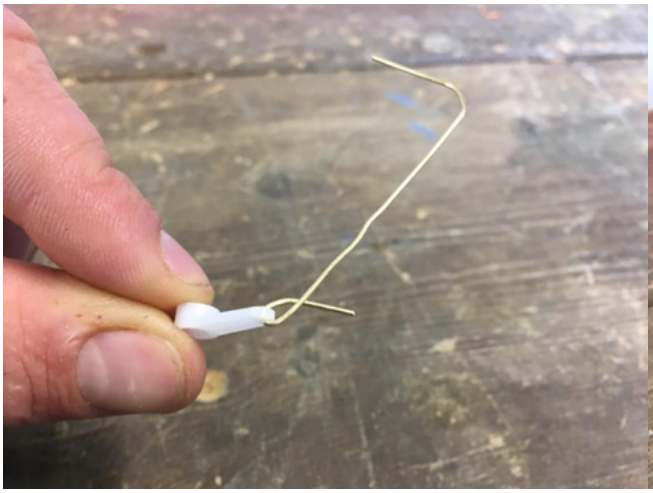
- Make two smaller folds at the ends which lay flat on the ground. This is the base of the inchworm's body.
- Fold in each of corner on one end of the cardboard. This is the front of the inchworm which will grip the ground.
- Using scissors or a cutter (watch your fingers!), cut slits at the other end to create finger-like shapes. Fold one up, one down, and so on — these will act as the "feet" that grip the ground.

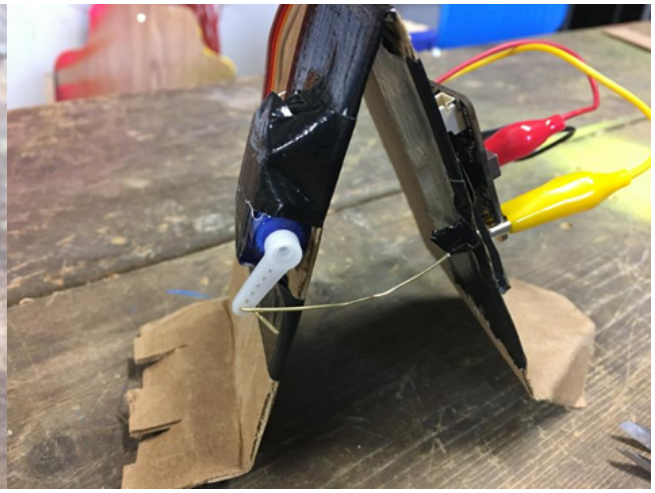
- Using tape or a glue gun, mount the micro:bit on one side.
- Attach the servo (with tape or glue) on the edge of the other side of the cardboard.



- Unfold a paper clip and attach it to the servo arm.
- Slide the folded part of the paper clip into the cardboard and use tape to secure it. You might need to toy around with the size of the clip so that the servo rotation opens the inchworm sufficiently.

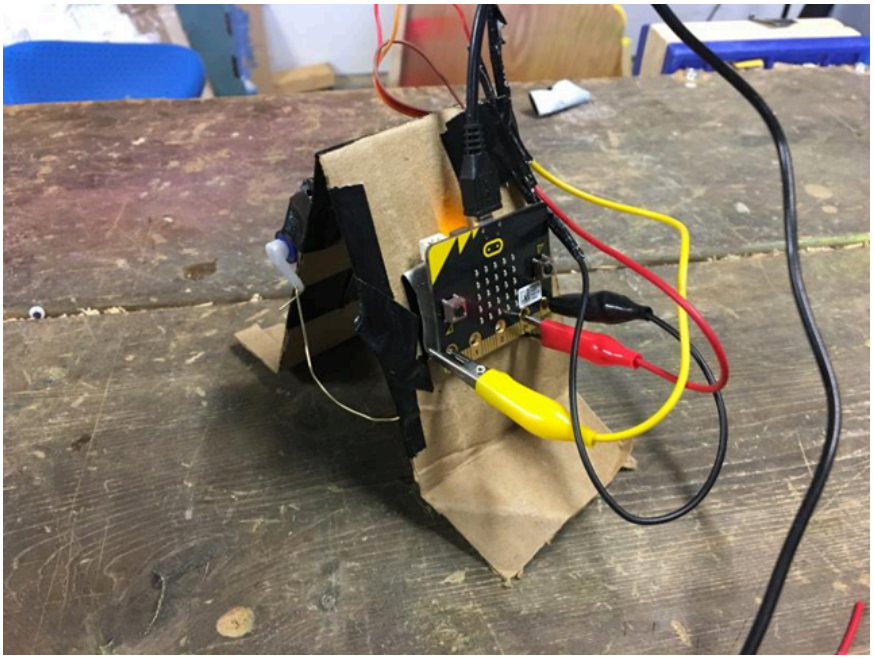
Micro:bit Inchworm





Step 4: Test and Adjust

- Place your Inchworm on a flat surface.
- Press Button A and watch it crawl forward 8 times, then stop.
- Experiment by changing the pause values in the code or adjusting the “leg” design to see how movement changes.
- Your inchworm is ready!



Micro:bit Inchworm

***Note**: If you want more resources to build the Inchworm, visit:*

- https://makecode.microbit.org/projects/inchworm
- https://makecode.microbit.org/projects/inchworm/make
- https://www.youtube.com/watch?v=qXBeo6aFx8g
- https://www.youtube.com/watch?v=mvq4vsetDao&t=1s

You can visit these QR codes to access additional instructions and detailed information about the Inchworm activity.

You can visit these QR codes to access YouTube videos with additional explanations, especially tutorials related to the coding part of the Inchworm activity.

Robotic/Prosthetic Hand

At this no-tech station, you will design and build a simple robotic hand using cardboard, string, and straws. The robotic hand shows how engineers use simple machines and design principles to mimic human movement.

A Geering Up presenter will give a short demo, and general instructions are outlined below.

Robotic Hand Instructions

Step 1: Gather Your Materials

- Cardboard (hand-shaped piece)
- Scissors
- Drinking straws (cut into small segments)
- String or yarn
- Tape or glue
- Markers (optional, to decorate)

Step 2: Build the Hand Frame

- Trace your own hand onto a piece of cardboard.
- Cut out the cardboard hand shape.
- Lightly score or bend the cardboard along the finger joints so the “fingers” can curl.

Robotic/ Prosthetic Hand

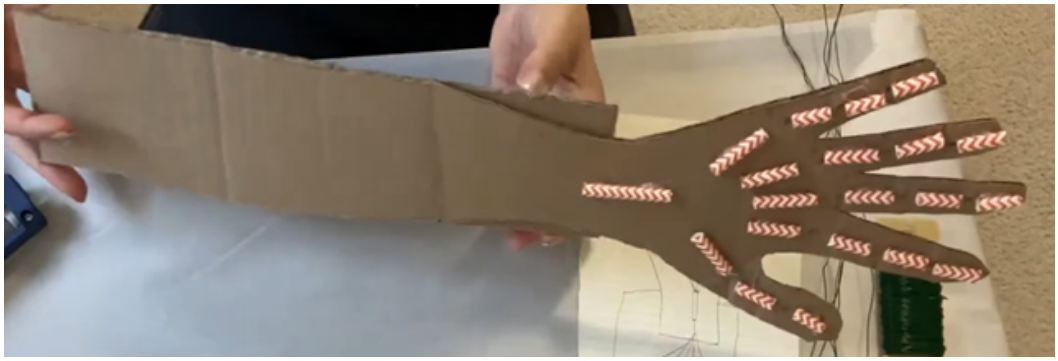
Step 3: Add the Tendons

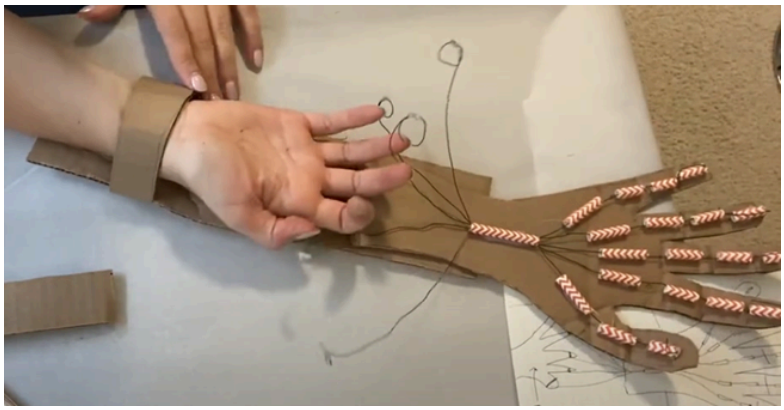
- Cut drinking straws into small segments (about 1–2 cm).
- Tape or glue one straw piece onto each finger segment (phalanx) so the finger can bend at its joints.
- Add extra straw pieces on the palm to guide the strings toward the wrist.

Step 4: Add the Forearm Support

- Cut an extra piece of cardboard to act as the forearm extension.
- Attach it securely to the base of the cardboard hand.
- Create a wrist strap by rolling a strip of cardboard into a loop that fits around your arm. Tape or glue it to the forearm extension.
- This support will allow you to slide your own hand and arm into the cardboard hand model.

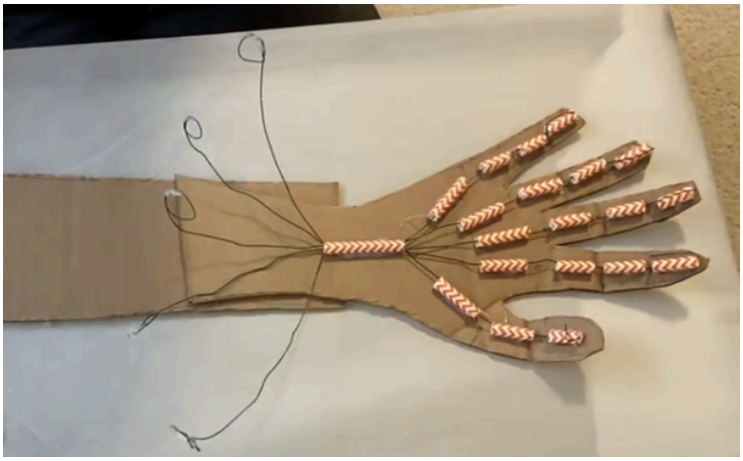
Robotic/ Prosthetic Hand





Step 5: Thread the Strings

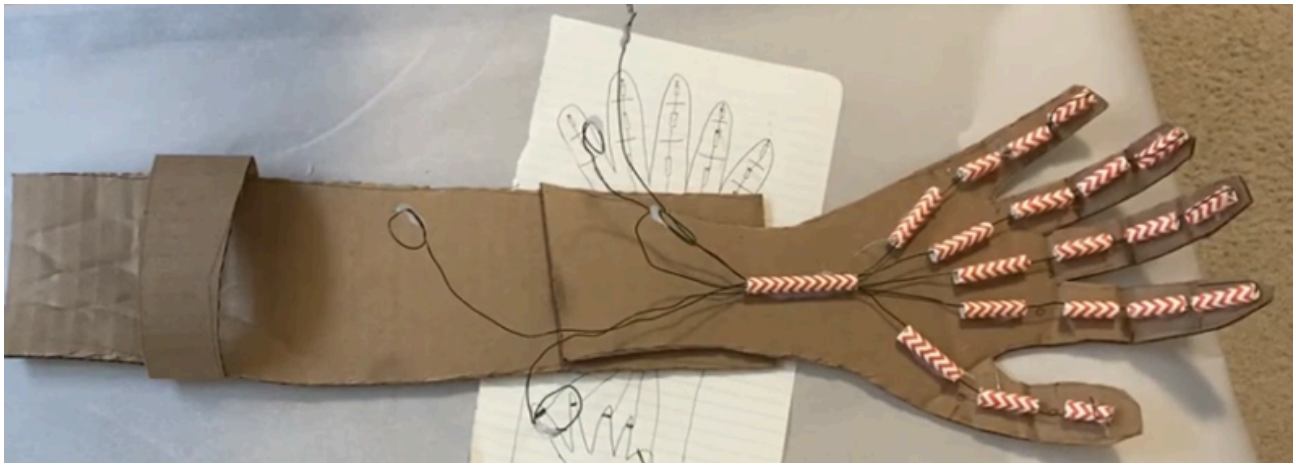
- Tie one end of each string to the fingertip of the cardboard hand.
- Pass the string segments through the straw “joints” on the fingers and the guiding straws on the palm.
- Extend each string beyond the wrist area of the cardboard hand.
- Make finger loops at the loose ends of the strings (one loop for each of your real fingers).



Robotic/ Prosthetic Hand

Step 6: Test and Adjust

- Put the cardboard hand on your arm using the wrist strap.
- Pull the string loops with your real fingers to curl the cardboard fingers.
- Try to grasp or pick up a lightweight object (e.g., sponge, paper ball).
- Ask yourself:
  - Do the fingers bend enough?
  - Should I move a straw or tighten/loosen a string?
  - What could improve the grip or comfort?



***Note**: If you want more resources to build this cardboard arm, visit:*

- https://pro-d.geeringup.ca/curriculum/prosthetic-limb
- https://www.youtube.com/watch?v=x2Du5wDt_2k
- https://www.youtube.com/watch?v=ybFy-zyLYco