

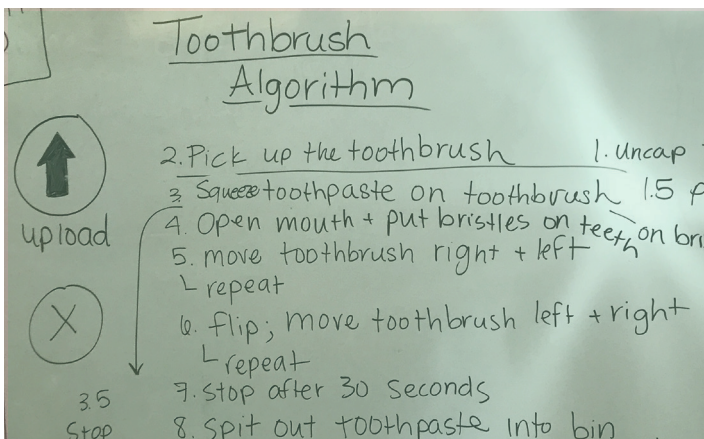
# Toothbrush Robot



10-15  
min.

## Overview

Families learn about algorithms by working together to program the human robot to brush their teeth. You will need a partner facilitator or volunteer to act either as the coder or the human robot, someone who is an expert in toothbrushing! What could possibly go wrong?

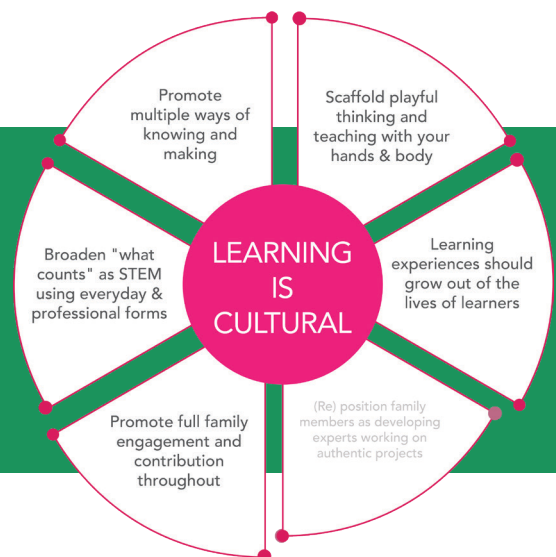


## Materials

- Toothbrush & toothpaste
- Cup of water & cup to spit in
- Towel
- Whiteboard or large paper
- Dry erase marker

## This activity:

- Provides an opportunity to learn by doing
- Encourages iteration and experimentation
- Makes room for families to form their own understanding of algorithms
- Invites playful, collaborative problem-solving
- Connects to daily routines



## Family Sketch

Often families will forget small details when coming up with their toothbrush code. For instance, they forget to specify how much toothpaste should be squeezed onto the toothbrush, which means that the human robot just keeps squeezing and squeezing. It can get a little messy, but its worth it!

## Step-by-step

- 1 Draw an "Upload" button, a "Stop" button, and designate an area to write the code on the board. Explain that we are here to experiment and work together. It's okay if what you're working on doesn't look or work the way you think that it should. Every time you come up against something difficult, it's a chance to learn.
- 2 Introduce the human robot (your volunteer or co-facilitator) to the families. Explain that we'll be programming this human robot to brush their teeth!
- 3 Ask families to describe the steps of brushing your teeth in order. Give them a minute to brainstorm first and then write down the steps as people call them out.
- 4 Once you have a few steps written out, pause and "upload the code to the robot." Explain that this is what families will be doing as they code their own robots: they will have a code that is a list of steps, also called an algorithm, and then the robot will read that list of steps and do exactly what it is told to do. Let's see what that means as our robot follows our steps!
- 5 Read each line of code out and have the human robot complete the tasks exactly as they hear it in that order. Remind learners that the robot is doing exactly what it is told. What do we want to change about our algorithm?
- 6 Troubleshoot and debug, repeating the steps until it works. Explain that this is part of the process: you will have an algorithm that you think will do one thing and then something else happens! You go back and debug the algorithm (or fix the mistakes) until the computer does exactly what you imagined.
- 7 This process of going back and forth between your code and the robot is a process that is used a lot by engineers as they design a solution to a problem. They never get it right the first time. You are all engineers because you just made an algorithm for brushing your teeth!

## Background Info

<b>Algorithm</b>	A set of very specific instructions for a computer to do something. It's a little bit like a cookie recipe, which includes all the ingredients, amounts, tools, and instructions that need to be completed in order to bake cookies.
<b>Upload</b>	Sending data (in this case, your program) from one computer to another. The second computer is the robot.
<b>Troubleshoot</b>	Locating the cause of a problem and treating it.
<b>Debug</b>	Tweaking the setup of a project (in this case the code) to fix errors (bugs) and work toward getting an expected outcome.



## What worked for us

We use this as a precursor for the “Program Your Family” activity.

This was something that we could refer back to when families begin coding their own robots and things go wrong (“Remember when this happened with the toothbrush robot?”).

We thought it was hilarious to play up the fact that our human robot was masquerading as a human all along.

We embraced (and prepared for) the fact that this activity always caused a small mess.

When we didn’t have a second facilitator to act out the human robot part, we would ask for a volunteer “with a lot of toothbrush experience.”

Ask your human robot to think through how they might literally interpret the code families upload, like “put toothpaste on toothbrush” as resting the toothpaste tube on the bristles.

It was fascinating to see how the human robot playfully pushed-back on the instructions given. Were they specific and literal enough? This is where it can get really funny!



## Other ideas

**How can this activity fit into your setting?**

What other tasks could you program your human robot to do? Make a sandwich maybe?

If you’re short on props, choose a different everyday task for your human robot to demo like walking around something, putting on glasses, or tying your shoe.

Developed with resources from  
MakerKids in Toronto, Ont.

More tools like these available on [techtales.online](https://techtales.online)  
Robotics Backpacks for Family Learning | NSF DRL - 1516562



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