

STEM Detective Lab

We investigate STEM projects for you.

BrushBot Instruction Sheet



Warning

There have been multiple reports of life-threatening injuries to children who have swallowed coin cell batteries. Experts have explained that this is a result of the current in the battery causing a chemical reaction, leading to burns in the esophagus.

Please keep all coin cell batteries and other small parts used in this activity away from young children.

Overview

BrushBots are the DIY version of the Hexbug Nano, a little toy bug that scurries across the floor to the delight of children and pets everywhere. With just a few supplies, this activity will introduce your students to the wonderful world of robotics.

Check out our blog post, "<u>The Case of the Vibrating BrushBot</u>", for an in-depth look at how we chose the materials listed below, common issues we uncovered during our investigation, and tips on how to fix those issues.

You can also find the instructions for BigBot, an oversized version of our Brushbot, at the bottom of our Vibrating BrushBot post.

Supplies

Parts	Recommendations
Toothbrush	Medium, straight-bristled adult-size toothbrush with a flat head
Motor	Coin mobile phone vibration motor
Battery	CR2032 Lithium 3V coin cell battery
Adhesives	½-inch Scotch foam mounting tape & 2 Instant Tacky sticky dots
Accessories	2 Googly eyes and 1 self-stick decorative foam piece (animal, flower, etc.)

Tools

- Scissors
- Wire Strippers
- Wire Cutters
- Glue Gun (optional)



Challenge

Once your students have built their BrushBot, we recommend you help them take their new robotics skills to the next level. With a table full of miscellaneous supplies, challenge your students to design a mini robot of their own. See if they can determine why some objects make a great robot body when used with a vibration motor and why some don't.

Accessory ideas: Pipe cleaners, straws, paper clips, bottle caps, popsicle sticks, different styles of bristle brushes, etc.

Step 1: Test









Step 3: Assemble



Step 4: Finish



1.1 Take the bare ends of the two wires attached to the vibration motor, place one on each side of the battery, and press firmly. When you feel the motor vibrate, you know both the battery and the motor work.

Note: Always test any electronic or moving parts before you use them and anytime you modify them.

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2.1 Toothbrush

Use a pair of wire cutters to cut the handle off the toothbrush.

With your fingers, apply pressure against the bristles of the toothbrush head in a backward direction to slant the bristles. This will help your BrushBot move in a forward motion.

2.2 Wires

Use a pair of wire strippers to remove enough insulation from the motor's wires to expose $\frac{1}{2}$ -inch of bare wire.

Once you've stripped the wires, re-test the motor to make sure you haven't damaged the motor or wires during the stripping process.

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3.1 Firmly place the ½-inch piece of Scotch foam mounting tape on top of the toothbrush head just to the left of its center.

3.2 Place one of the Instant Tacky sticky dots on top of the toothbrush head near the cut end.

3.3 Place the motor on the sticky dot and one of its wires on top of the foam tape.

3.4 Press the battery firmly on top of the wire and foam tape, then set the second motor wire on top of the battery.

3.5 Stick the piece of self-stick decorative foam on top of the battery and make sure the top wire is between the decorative foam and the battery. Be sure to press the wires into place firmly as the motor will only vibrate once you've made an electrical connection.

3.6 Carefully pull the second wire out from under the decorative foam to stop the motor from vibrating.

Note: The red (+) and black (-) wires on a motor sometimes need to connect to the corresponding positive (+) and negative (-) sides of a battery, but it doesn't matter for this activity.

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4.1 Add the googly eyes and any other accessories you may have to your BrushBot.

Congrats, you've just built your very own mini robot.