



Artbots

Hack apart electric toothbrushes to create a robot that scribbles, scrapes, sings, or splatters.

Project Type: Creative, tactile, tinkering

Group/Individual: Individual or pairs

Lesson Plan Audience: Maker Mentor

Time: 1 hour

Hard Skills: Understanding balance, using batteries, taking things apart, hacking, taking ownership of a consumer good, reverse engineering, simple electronics, wire stripping, hot glue gun, soldering (optional)

Soft Skills: Creative thinking, design, resilience and patience, problem solving

Ideal # of Participants: Can be used with large groups

Age Group: age 8 + (older if soldering is added)

Difficulties/Tips:

To make the motors more robust and reusable, we usually solder some extra wire onto the leads and reinforce it with hot glue. This can be a great way to increase the maker engagement and difficulty in an artbot project.

Artbots appeal to a large age range - youngsters can simply insert the battery and try taping markers to the toothbrush and turning it on, whereas older/more dexterous makers can actually strip wire and solder wire onto their motors.

Frequently makers want to take their creation home, which may be expensive for spaces with large numbers of participants.



Materials:

[Dollar store electric toothbrushes](#)

Large sheet of paper

Needle nose pliers

Markers

Paint

Q-tips

Alligator clips

Duct tape

Cups

Hot glue gun and sticks

Popsicle sticks

Straws

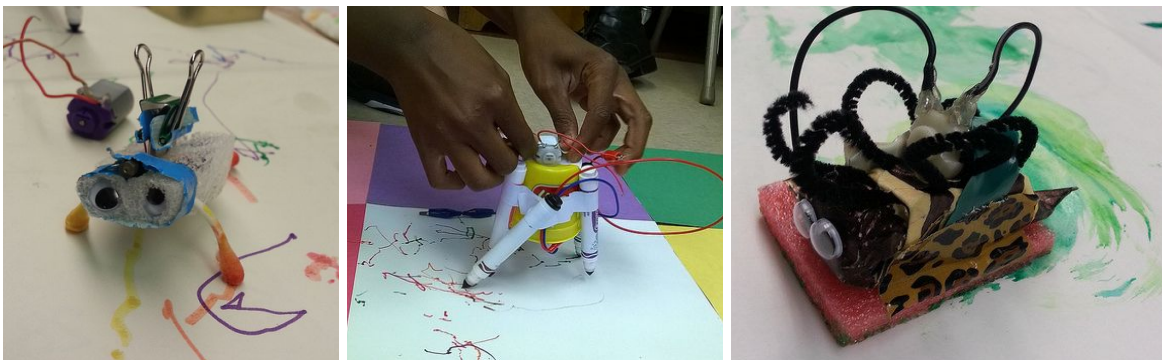
Packing foam

Scissors

AA batteries

Copper tape

See [Soldering lesson plan](#) for solder supplies



Steps:

1. Lay out a large piece of paper to cover the workspace. This will be the canvas for the artbots.
2. Hand out toothbrushes to makers and introduce them to the project. Say something like, "Can you put a battery in the toothbrush and turn it on? What does it do? Today we're going to take these toothbrushes apart and use their motors to create robots that make art." You may have to show an example or be a little more specific about how the robot will make art for the first artbot session.
3. Unwrap toothbrush. Pull off bottom cap. Insert battery, replace cap, and switch on.



- a. For young makers, have them make their artbots by duct taping a few markers to the vibrating toothbrush. Let them fail a few times before giving them help on getting the right balance.
4. Pull out the toothbrush motor. First, pull off the bottom cap that has the switch. Remove the battery. Then, using a pair of needle nose pliers, grab the opaque battery holder within the toothbrush. Often, the toothbrush motor will come out when the battery holder does because they are attached by a spring. If not, try getting the motor out with a pair of needle nose pliers. If all else fails, give the toothbrush a few good whacks on your palm, workspace, or the ground to loosen it up.
5. Move the motor. The motor will have two copper leads. Attach an alligator clip to each lead. Then attach the remaining ends of the alligator clips to the positive and negative sides of the battery.
6. Build a structure. Now that you've got your motor running, experiment with various materials to attach it to. There's no right way to do this, which is part of the fun of the activity. We usually show two examples. One is an upside-down cup with four markers attached as feet. We attach the motor and battery to the bottom of the cup, which is now the top of the artbot. The second example we show is a piece of packing foam with four Q-tip feet. Motor and battery are affixed to the top, and the feet are dipped into different watercolors.
7. Attach motor to structure solidly. A loosely attached motor will just vibrate on the structure, instead of shaking the entire robot. Hot glue usually works best, but can melt lighter materials like Styrofoam cups and packing foam.
8. Let 'em rip! Watch your artbots scribble, scrape, sing, and spatter across the workspace and make a collaborative art piece on the large sheet of paper.
9. Redesign/reflect. Ask makers, "Can you change the marks your artbot makes? Can you make it go faster, slower, jumpier, cloggier, louder?"

