



## Bristlebots - fun, simple “robot”

Grade level(s) I use with: this is my go-to for 3rd / 4th graders, coming after we spend a day learning about electricity and simple circuits. Fits well into a single 40 min lesson, although sometimes I'll stretch it to a second day where they can build on a basic prototype, decorate and really play with their creation.

Lesson Overview: This is a pretty traditional makerspace project, but I've found it never fails to really hook my younger students, is pretty simple to create and very dependable even when in the hands of 8 year olds. It also lends itself to some good problem solving, creative design as students figure out all the variations on the pipecleaner legs that really impact how it moves.

Since I make these with my youngest students, it pretty much is a “follow the recipe” and I have a link below to the slide deck I use. Here are the basic steps:

1 - build the body, attach a simple set of pipe cleaner legs. I usually cut an 8 inch pipe cleaner in half to help keep the weight of the bot low for more vibration. I very clearly explain that this is a simple prototype and that they will have more time to get creative with the legs, usually even passing out the same color to everyone so our construction keeps moving.

2 - test the button battery and the vibration motor circuit. Since the last lesson was basic circuits using AA batteries, motors and buzzers I can explain the idea of closing the circuit with the two wires. I do find about 1 out of 20 of these little motors are faulty and inevitably my LR44 set has a dud or two so it's a good test before we put everything together.

3 - attach the two sided tape to the toothbrush

4 - attach the motor, put one wire into the foam tape and put the battery on top. Seems like most students quickly know things will work if they touch the other wire to the battery top.

5 - hand out some small pieces of electrical tape and things will quickly be chaotic in your classroom

6 - To get this point usually takes me about 30 minutes so often I'll end the lesson here, but it is fun to store them and then come back for lesson 2 to play with new legs, add googly eyes, etc -

for me it just depends on time. Hot glue also really helps secure the pipe cleaner legs that tend to come loose / roll around.

Materials and equipment I use:

Toothbrushes - originally I was using lots of electric toothbrushes to pull the vibration motors so I tried this lesson as a way to make use of lots of extra toothbrush heads. That got a little expensive so now I use basic 1.5 V RC motors for the scribblebots with cut pieces of hotglue for the vibration and buy toothbrushes in bulk. Then I use our bandsaw to cut off the handles.

[https://www.amazon.com/Disposable-Toothbrushes-Individually-Affordable-Giveaways/dp/B09LH9NLJC/ref=sr\\_1\\_6?crid=1YXH6GNQL3YZU&keywords=bulk+toothbrushes&qid=1698461768&srefix=bulk+toothbrushes%2Caps%2C89&sr=8-6](https://www.amazon.com/Disposable-Toothbrushes-Individually-Affordable-Giveaways/dp/B09LH9NLJC/ref=sr_1_6?crid=1YXH6GNQL3YZU&keywords=bulk+toothbrushes&qid=1698461768&srefix=bulk+toothbrushes%2Caps%2C89&sr=8-6)

Vibration motors -

[https://www.amazon.com/BestTong-Miniature-Vibrating-Vibration-Coreless/dp/B073NGPHDR/ref=psdc\\_306577011\\_t2\\_B07PXZSP7J](https://www.amazon.com/BestTong-Miniature-Vibrating-Vibration-Coreless/dp/B073NGPHDR/ref=psdc_306577011_t2_B07PXZSP7J)

LR 44 Button Batteries -

[https://www.amazon.com/POWEROWL-Capacity-LR44-Batteries-Alkaline/dp/B088BBV7DS/ref=sr\\_1\\_3\\_sspa?keywords=lr+22+battery&qid=1698462024&sr=8-3-spons&sp\\_csd=d2lkZ2V0TmEtZT1zcF9hdGY&pvc=1](https://www.amazon.com/POWEROWL-Capacity-LR44-Batteries-Alkaline/dp/B088BBV7DS/ref=sr_1_3_sspa?keywords=lr+22+battery&qid=1698462024&sr=8-3-spons&sp_csd=d2lkZ2V0TmEtZT1zcF9hdGY&pvc=1)

Two sided foam tape ½ inch width:

[https://www.amazon.com/Tatuo-Double-Sponge-Mounting-Adhesive/dp/B07DWX1NN9/ref=sr\\_1\\_13?crid=10K6UAFS0BNY&keywords=two+sided+foam+tape+1%2F2+inch&qid=1698462187&srefix=two+sided+foam+tape+1%2F2+inch%2Caps%2C85&sr=8-13](https://www.amazon.com/Tatuo-Double-Sponge-Mounting-Adhesive/dp/B07DWX1NN9/ref=sr_1_13?crid=10K6UAFS0BNY&keywords=two+sided+foam+tape+1%2F2+inch&qid=1698462187&srefix=two+sided+foam+tape+1%2F2+inch%2Caps%2C85&sr=8-13)

Pipecleaners:

[https://www.amazon.com/Mr-Pen-Chenille-Stems/dp/B09HKYV4P7/ref=sr\\_1\\_8?crid=ZAUFGRU5OGR&keywords=bulk+pipe+cleaners&qid=1698462285&srefix=bulk+pipe+cleaners%2Caps%2C91&sr=8-8](https://www.amazon.com/Mr-Pen-Chenille-Stems/dp/B09HKYV4P7/ref=sr_1_8?crid=ZAUFGRU5OGR&keywords=bulk+pipe+cleaners&qid=1698462285&srefix=bulk+pipe+cleaners%2Caps%2C91&sr=8-8)

Basic electrical tape (masking tape also works but I find the electrical stays sticky a bit longer). Always needs regular replacing after lots of use.

Related links:

Here is a slide deck I use with this lesson, note that I am very clear talking with 3rd/4th graders about the danger of button battery swallowing by younger siblings - those are in the first few slides.

[https://docs.google.com/presentation/d/1Zz0hoQLKcLDk3KJxrRADuSoPLmxgFOGo\\_FtN0rGCY aE/edit?usp=sharing](https://docs.google.com/presentation/d/1Zz0hoQLKcLDk3KJxrRADuSoPLmxgFOGo_FtN0rGCY aE/edit?usp=sharing)