

<BUILD. LEARN. TEACH. INSPIRE>

THE TINKER SERIES

Projects For Young Inventors

FAN-tastic Robot

[Part 1 of 2]

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Revision History

- 1.00: First revision
- 1.01: Updated materials list
- 1.02: Converted into two parts

LICENSE



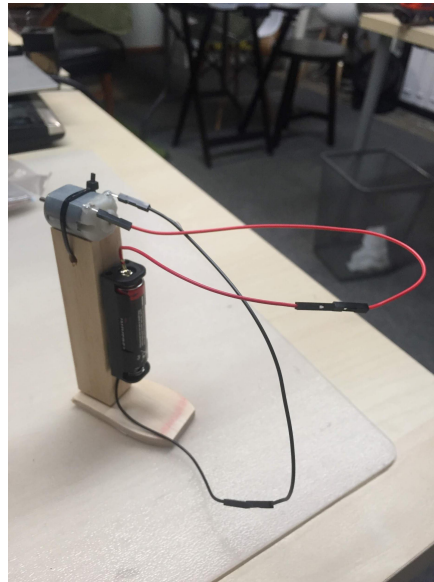
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The FAN-tastic Robot [Part 1 of 2]



Overview

Topics Covered

Open Circuits, Closed-Circuits, Short-Circuits, Voltage, Current, Industrial Design, Breadboarding

Materials Needed

Materials listed required to build one robot.

Item	Qty	Notes	How To Purchase
DC Motor with soldered wires	1		https://shop.barnabasrobotics.com/products/130-size-dc-motor-soldered-wires?_pos=9&_sid=772a84d4d&_ss=r
Wood Base	1	2.5" in length	
Wood Dowel	1	4" in length. Has pre-drilled hole. (9/64" drill bit)	
AA Battery	1		

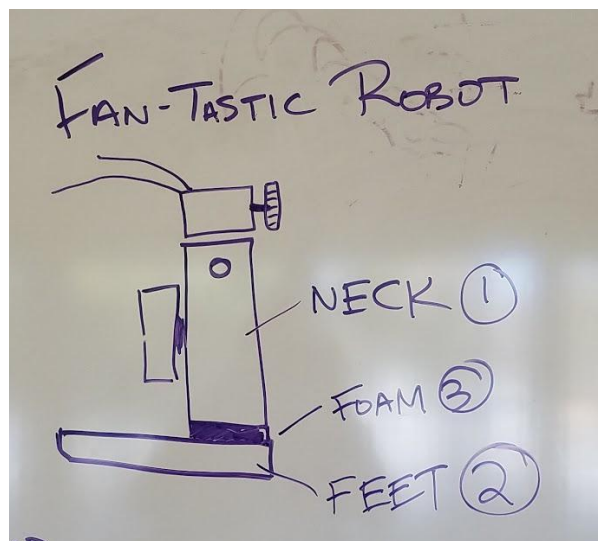
AA Battery Holder (Socket to Socket)	1		https://shop.barnabasrobotics.com/products/1-x-aa-1-5v-battery-holder-socket-connector?_pos=2&_psq=battery%20holder%20socket&_ss=e&_v=1.0
Bottle Cap	1	Has pre-drilled hole	
Double-Stick Foam ($\frac{3}{4}$ " Square)	2	For attaching 1) neck to base ($\frac{3}{4}$ ") , 2) battery holder to neck (skinny strip)	
Zip Tie (longer)	1	For strapping down motor to top of base. Note that the shorter zip tie will be too short	
Tinker Sample	1	If you're teaching	
Additional Craft Materials	1	Scissors, Construction Paper or, markers, Scotch Tape	

Introductions and Ice Breaker (5 min)

- Hand out the engineering worksheets and have the students write their name
- Introduce today's character building lesson. See [Key Life Lessons](#)
- Introduce today's project. Today, we will be building a fan.

The Fan Design (5 min)

Draw the following body of the fan



Building the Wood Base (5 min)

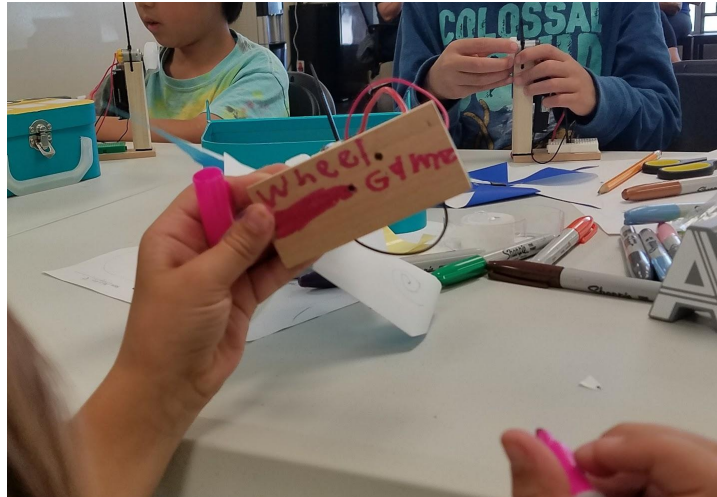


1. The neck is where your motor will go. It also gives your fan height. Note that there is a hole on one of the ends of the neck. This hole must be on the top. Also make sure that the hole is at the right place. It should be at the top of the L.
2. The feet or base is the foundation of the fan. It is like the feet. Without it, your robot can't stand!
3. The foam is used to connect the neck and the base



Center Of Gravity is a very important aspect of balance. The center of an object's weight must be under a point of support (for us that would be our legs). For example, it is impossible to bend over and touch your toes if you have your back against a wall with the heels of your feet touching the wall. This is because your center of gravity is in front of your feet, rather than over them.

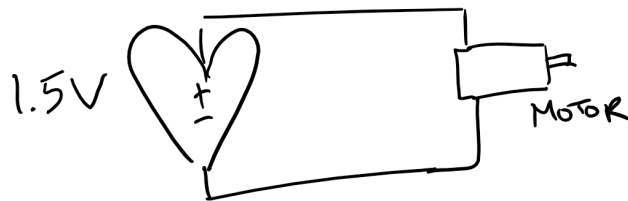
Decorating The Base (10 min)



After the neck is built, take some time to decorate it with markers!

Designing The Motor Circuit (5 min)

- Draw the following circuit:



- Open-Circuit: An open-circuit is when the loop is broken. In this case, electricity cannot flow. Explain that the robot cannot live if we have an open-circuit - much like how we cannot live if blood is not circulating in our body.
- Put the AA battery into the battery holder. Have them figure out which way to put the batter in, and which side is positive and negative (red = positive, black = negative). Teach them not to directly connect the black and red wires together (short-circuit!).



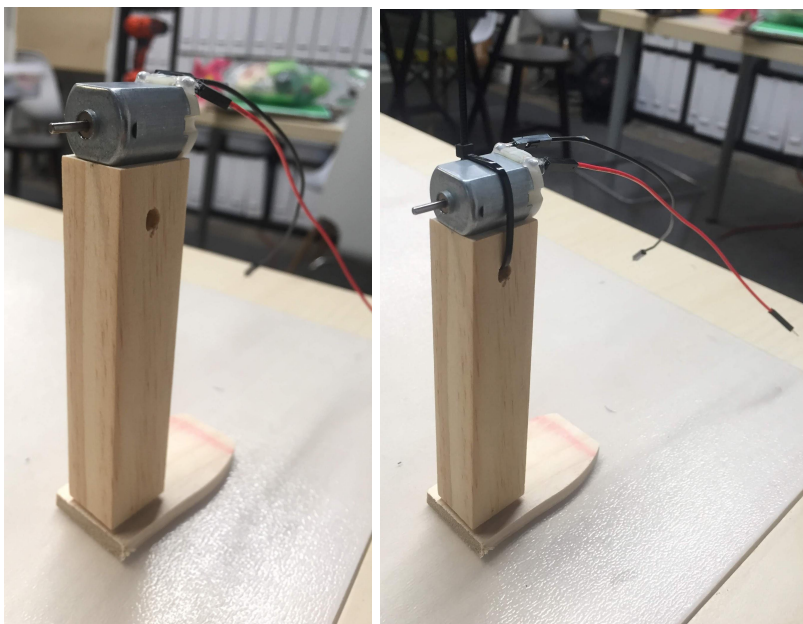
- Short-Circuit: A short-circuit is when you have a loop, but electricity is flowing too fast. Ask the kids what happens in our body when blood flows so fast that our veins can't handle it (it might burst!). In order to fix this, we need to slow it down. This introduces our final concept... resistance!
- Resistance: Resistance is introduced in a circuit to slow down the flow of electricity so that our wires don't burst. It is important, because without it, our circuits may get really hot and catch on fire! In a circuit, we call this component the resistor. Our resistor will be a motor.

Experiment with the robot's heart. See if you can get the motor to turn on!

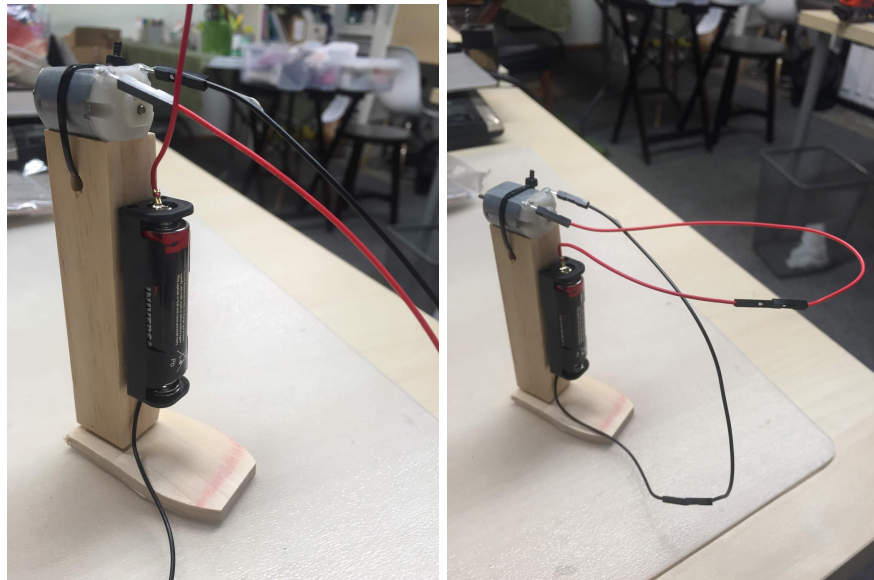
Attaching The Motor (10 min)

Now that we know how circuits work, let's add our motor and our battery

1. The motor. This is what moves your fan. Note that the wires come off the top of the motor, not the bottom. Make sure that the students are aware of this before they start adding the robot's heart. Use the zip tie to attach the motor.

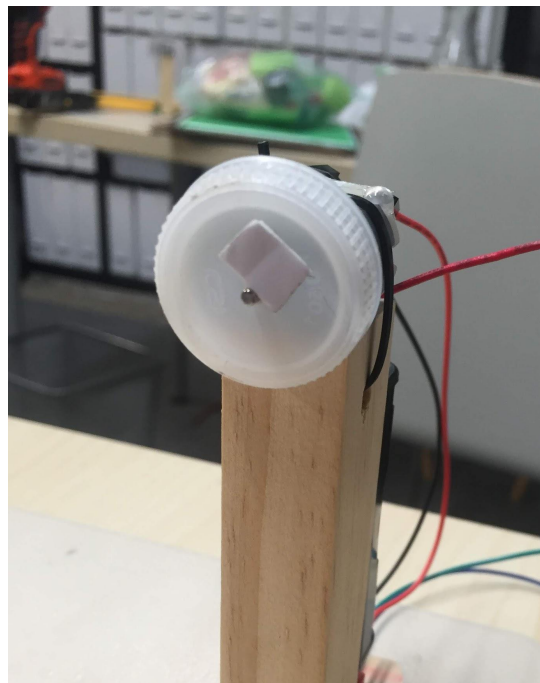


2. Attach the AA battery to the side of the neck.



Attaching The Bottle Cap (5 min)

We will now add something to the shaft of our motor to make a larger motion. This is called a coupling. Pop the bottle cap onto the motor shaft and see what happens when you turn it on. Do you see a difference?



Play & Experiment! (5 min)

Put your robot on its side and see if it can move!

Clean Up and Reflect (5 min)

- What was the most fun?
- What was hard?
- What did you learn?