Week 2:
Steady Hand Game

Welcome to Week 2 of our 2021 STEM Program!

We are so excited to have you, but as stated last week for those of you who were here, we have a few rules:

1) We would really appreciate if you all had your cameras on! It really helps us guide you through the workshops!
2) Please ask any questions you may have during the process! These are challenging workshops with complex concepts so it is completely normal to run into problems or questions. Asking questions and fixing errors is all part of the experimental process
3) Try not to go too ahead! We know you are very curious and want to try to figure out things for yourself but this is a tricky project and things need to be done in a certain order.

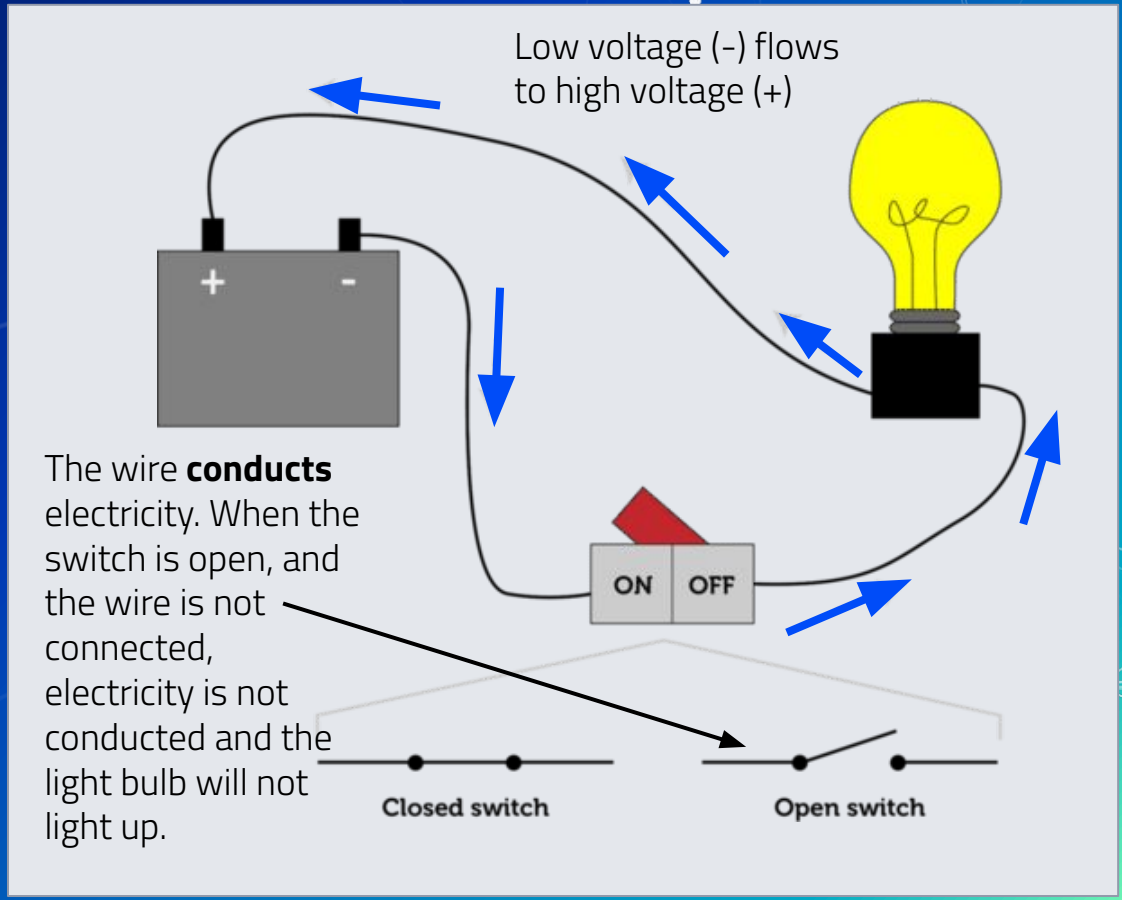
Alessandro Volta

- 1745 - 1827
- Italian physicist that pioneered the field of electricity
- Invented the first battery!
  - Done through studying why a frog's leg twitched when it was being dissected
  - Electrical currents can be conducted through water and certain metals
- One unit of electric energy is a "Volt"!

What is a circuit?

A circuit is a connection of wires and components such as batteries, switches, resistors, etc. through which electricity flows.

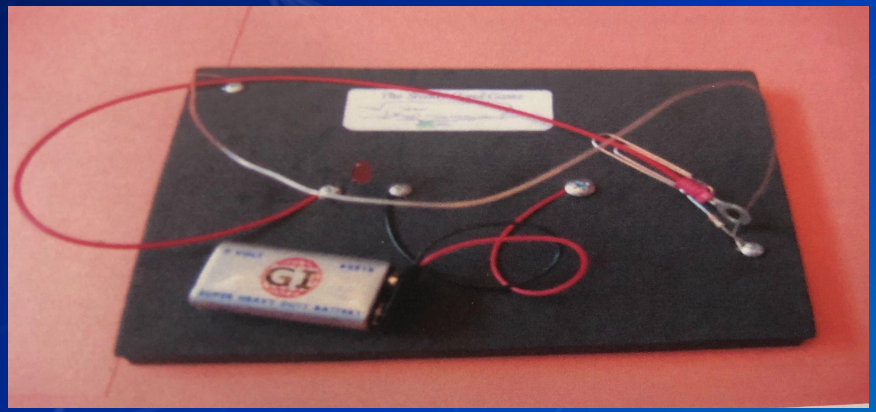
Electricity wants to flow from **low voltage** to **high voltage**. This “flow of electricity” is what can power things such as this light bulb!

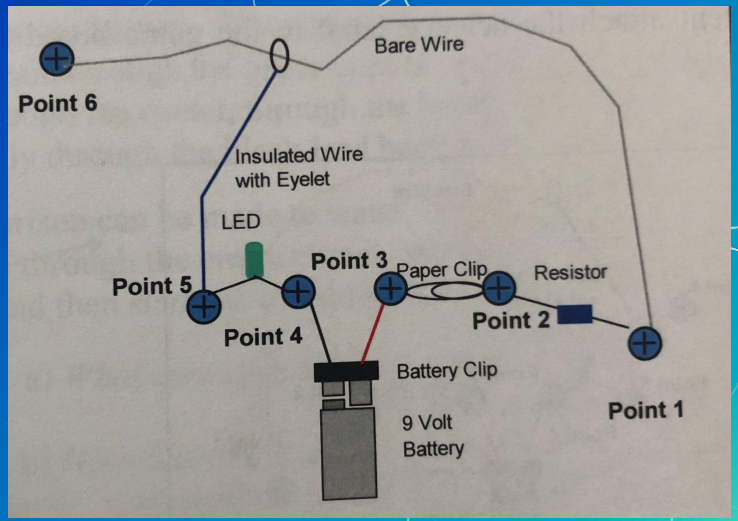


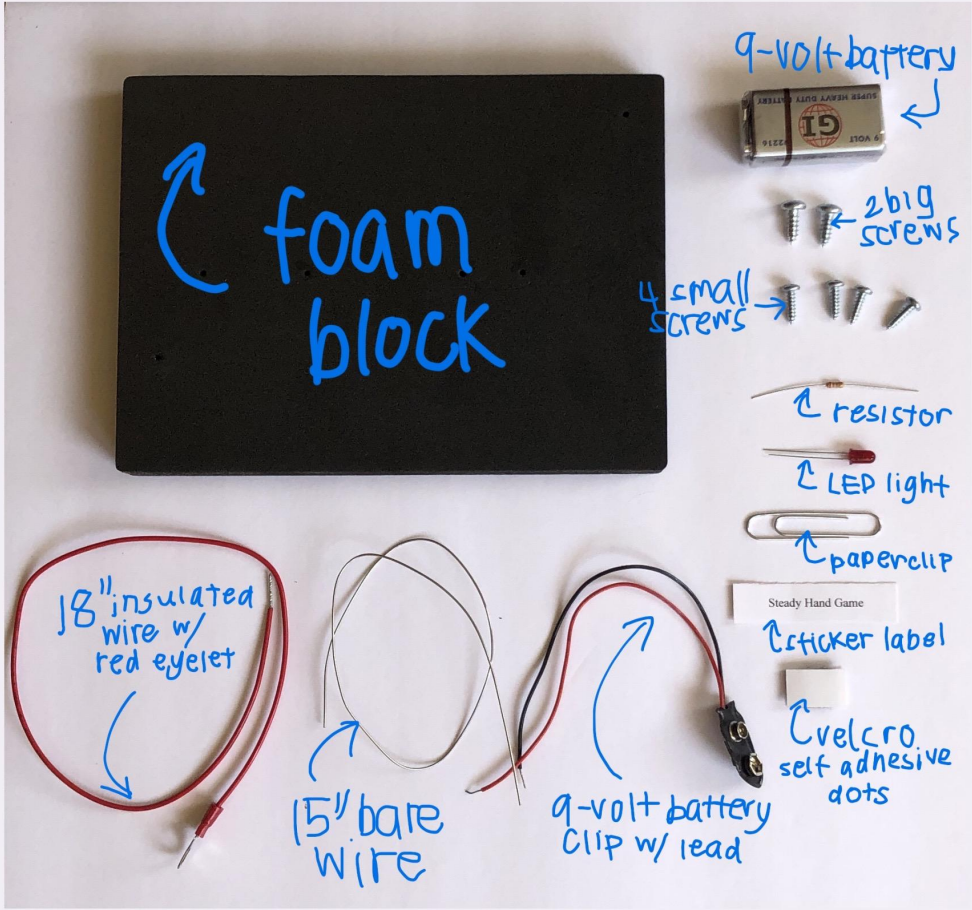
Overview

Today we will be making our own simple circuit in the form of a Steady Hand Game. It will contain a battery, a resistor, a switch, and a light!

Similar to the popular game Operation, in this game the LED light will light up if you touch the wire.

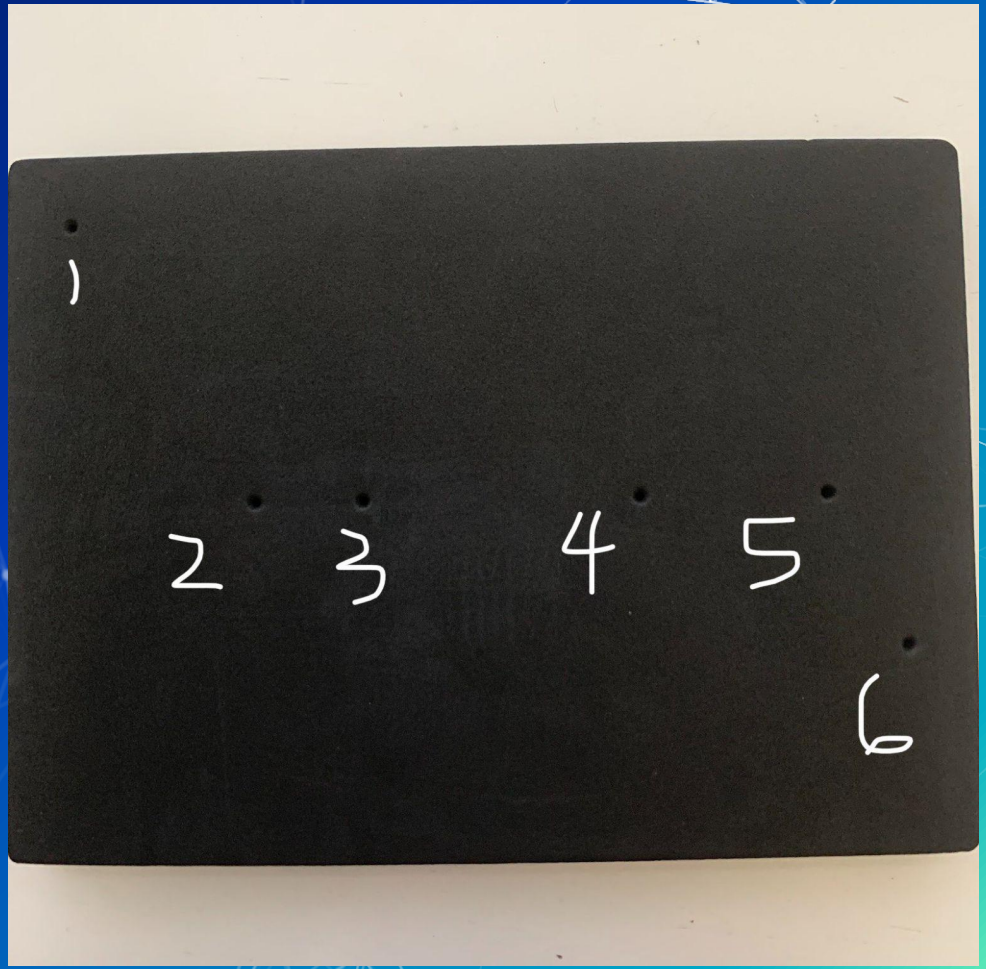


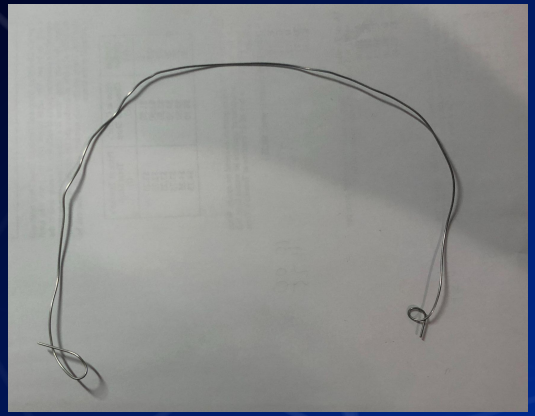


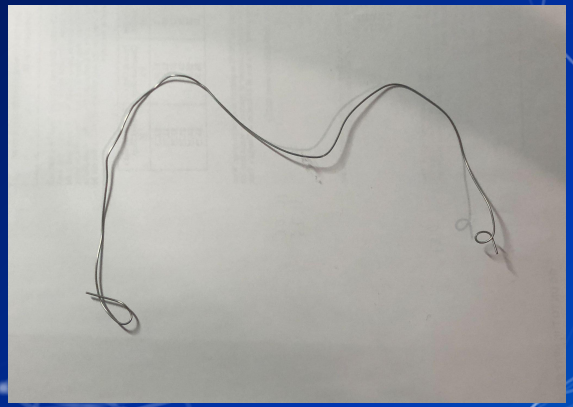

foam block
9-volt battery
2 big screws
4 small screws
resistor
LED light
paperclip
Steady Hand Game
sticker label
velcro self adhesive dots
18" insulated wire w/ red eyelet
15" bare wire
9-volt battery clip w/ lead

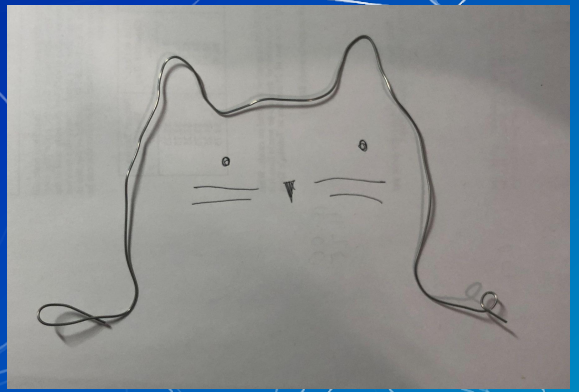
To start off with, grab the foam block from your bag and make sure it is arranged in this orientation.

We recommend using a pencil to label each of the holes from 1 to 6 as shown in the image. Make sure your foam board is in the right orientation! The hole closest to a corner should be on the upper left labeled “1”.









Next, find the bare wire and make a loop at each end as you see on each example above.

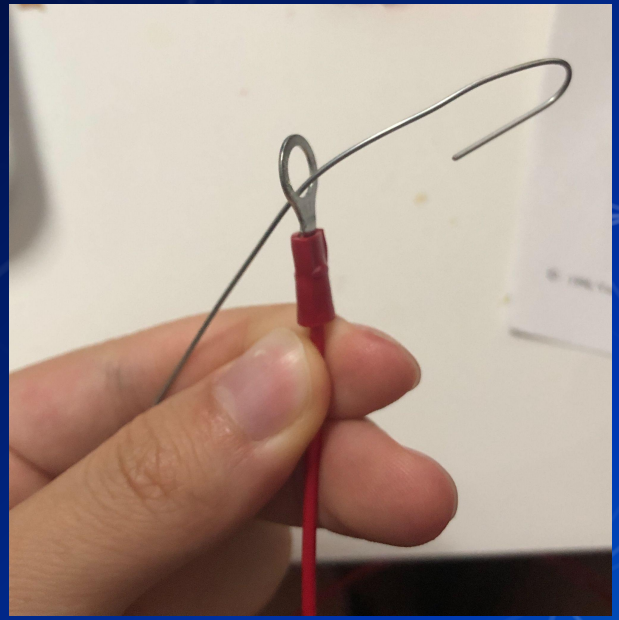
Here is where you can get a bit creative: you can bend your wire however you like as long as they follow these two conditions:

1) **The two ends should still be pretty far apart; they should not be close together.**
2) **Do not make the design too complex as it will be difficult to play your game. Keep your wire design with only a few peaks as shown above.**

With the right end of your creatively bent bare wire, wrap the wire around a small screw and make sure it is touching.

Afterwards, take your resistor (the wire with a bead) and make two loops on either end like you did with the other wire. Take one end of the resistor and wrap it around the screw similarly to the bare wire previously.

Resistors are important to control the voltage levels in the circuit to prevent overheating and too much current from flowing through the circuit!



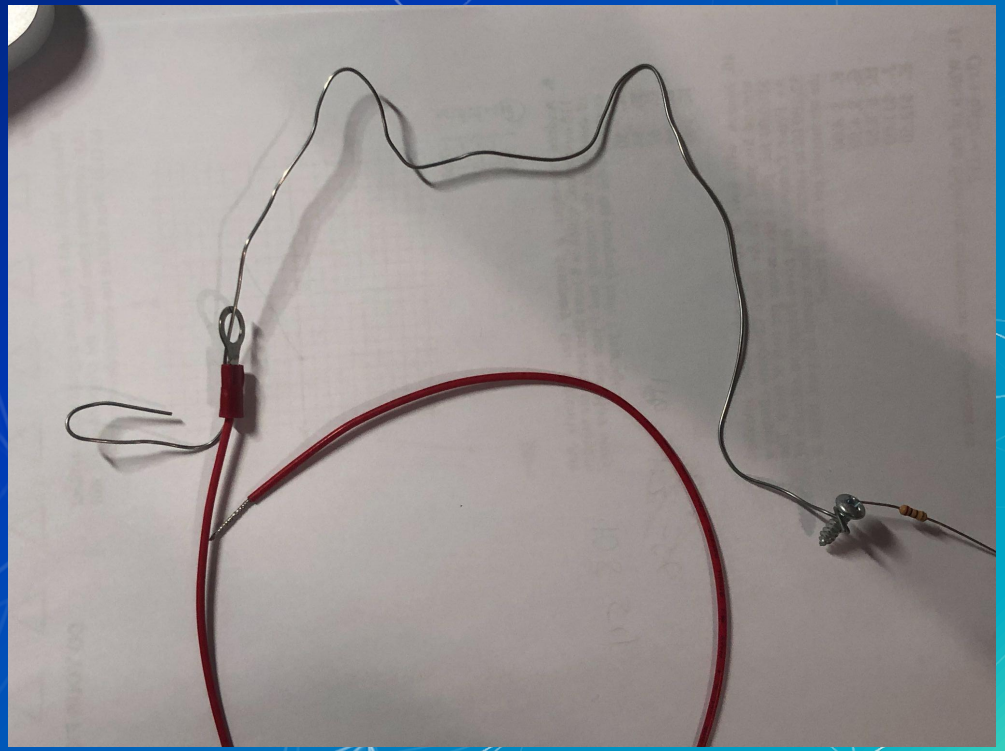
Thread the eyelet of the red wire through the other end of the bare wire like so.

When the game is made and working, you will try not to touch the bare wire to that eyelet or the light will light up.

You should now have something that looks a little bit like this:

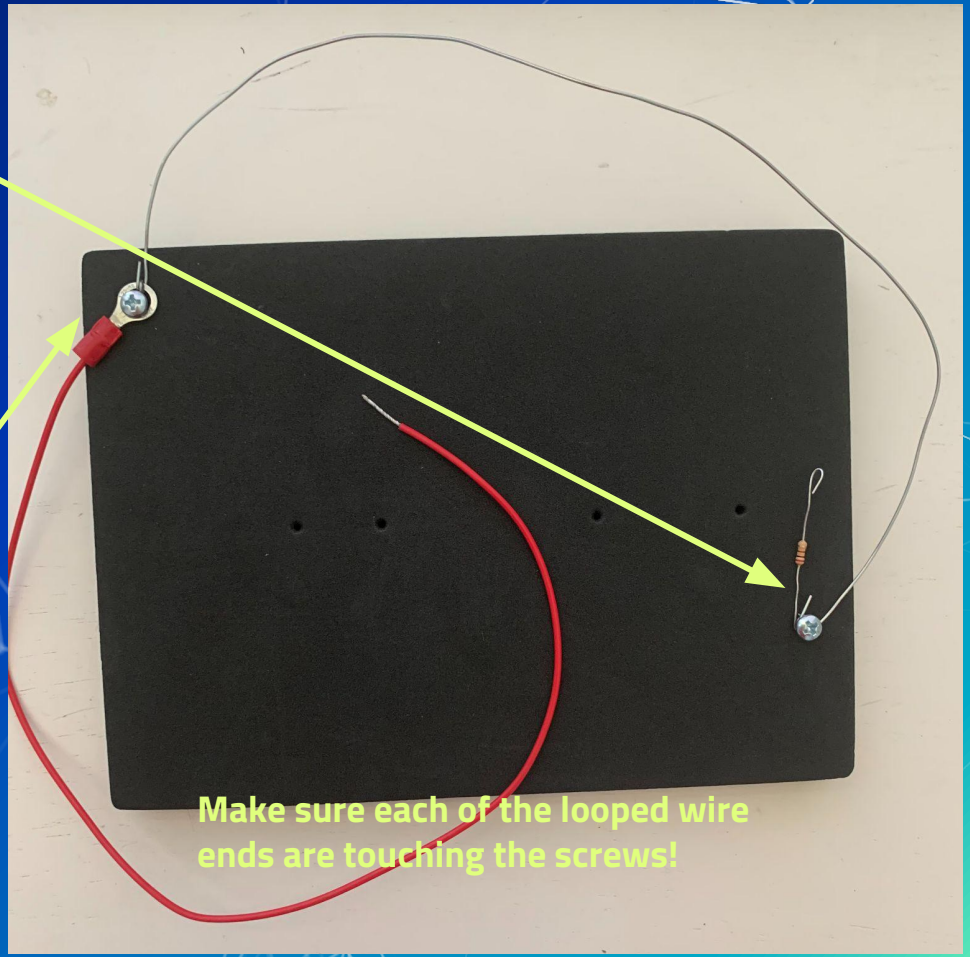
- Bent wire
- Screw and resistor on the right end
- Wire going through the eyelet of the red wire

If yours does not look like this, let us know!



The next step is to take the end of the wire with the resistor and the screw and screw it into the **6th hole** with your **screwdriver.**

Then, with the other end of the wire (the left end), make a small loop in the wire, take a small screw ,and screw the small loop on the right end of the wire into the 1st hole.

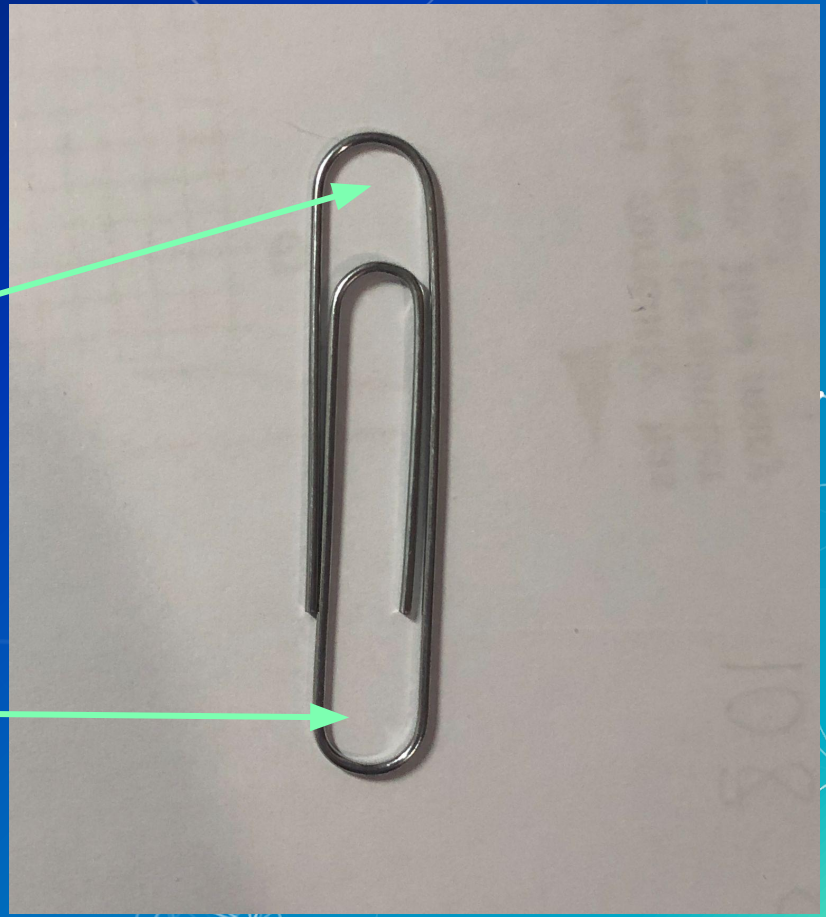


As stated on the previous slide, you want to make sure that the wires are touching the screw. Otherwise, it will not be a complete circuit and won’t work properly.

Note the two ends of the paper clip:

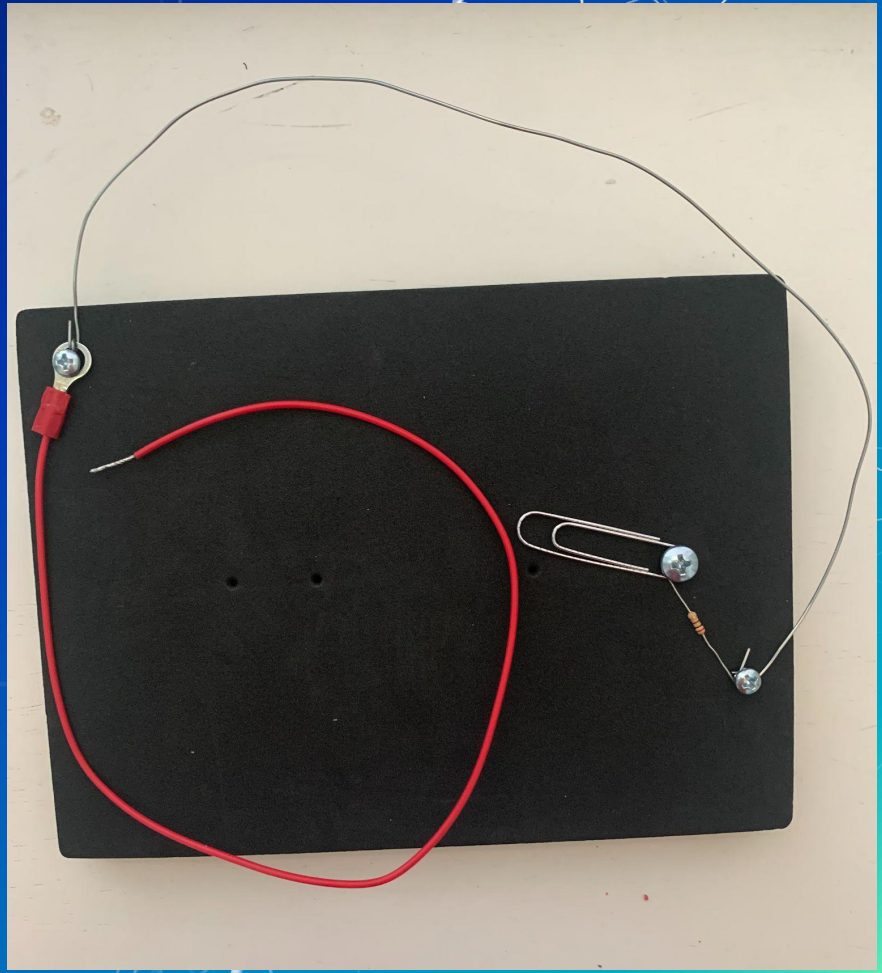
“Big” End

“Small” End



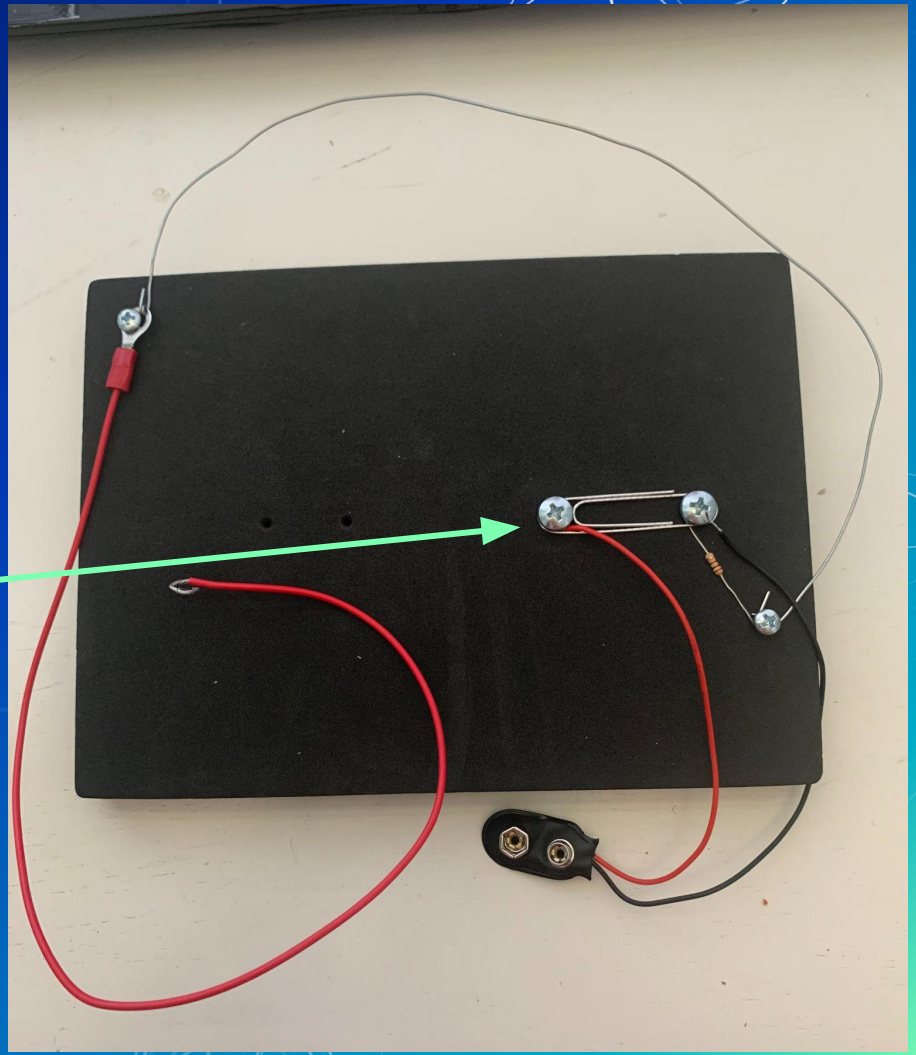
For the fourth step, you want to take the other unused end of the resistor and wrap it around a **large screw**.

Next, put the **small end** of the paperclip into the screw and then screw it into **hole 5** on the foam.



Next, you want to take the **red end** of the **battery clip** and wrap it around another **large screw**.

Also, put the screw through the l**arge end of the paperclip** (the unscrewed end) and screw the large screw into **hole 4** on the foam.

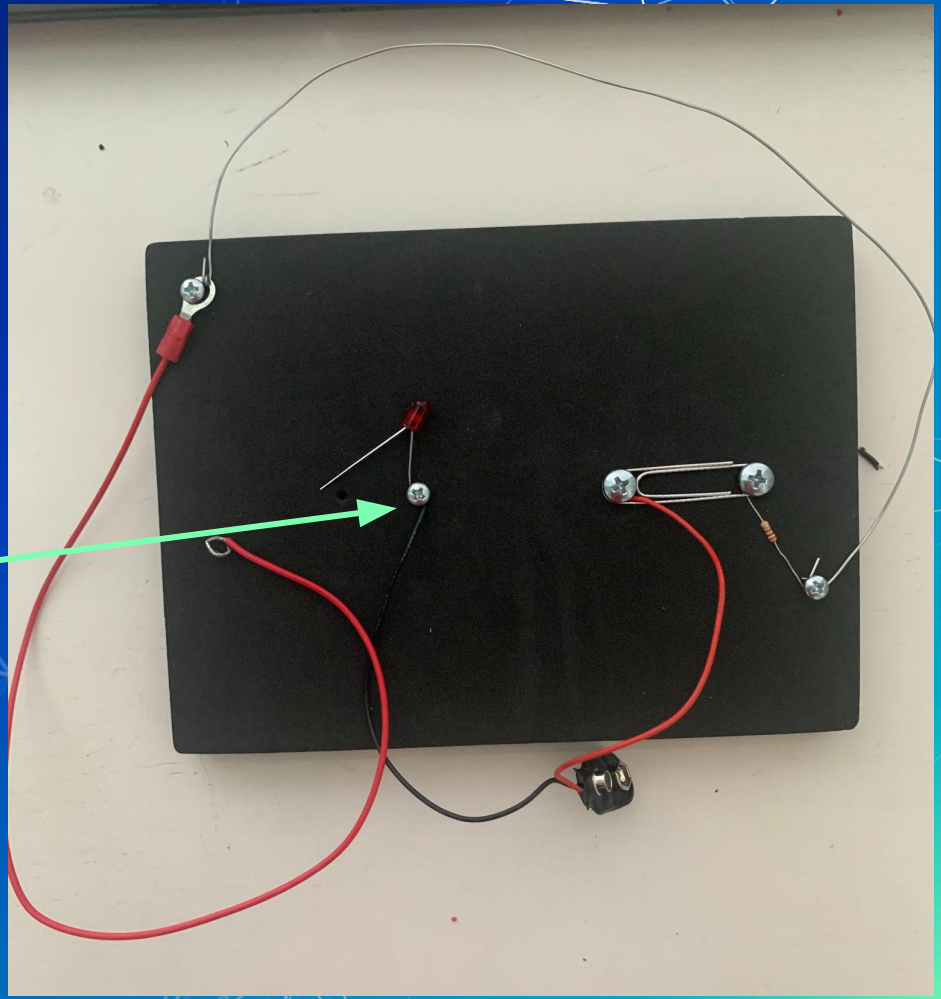


Notice how on the LED, there is a **short end** and a **long end**.

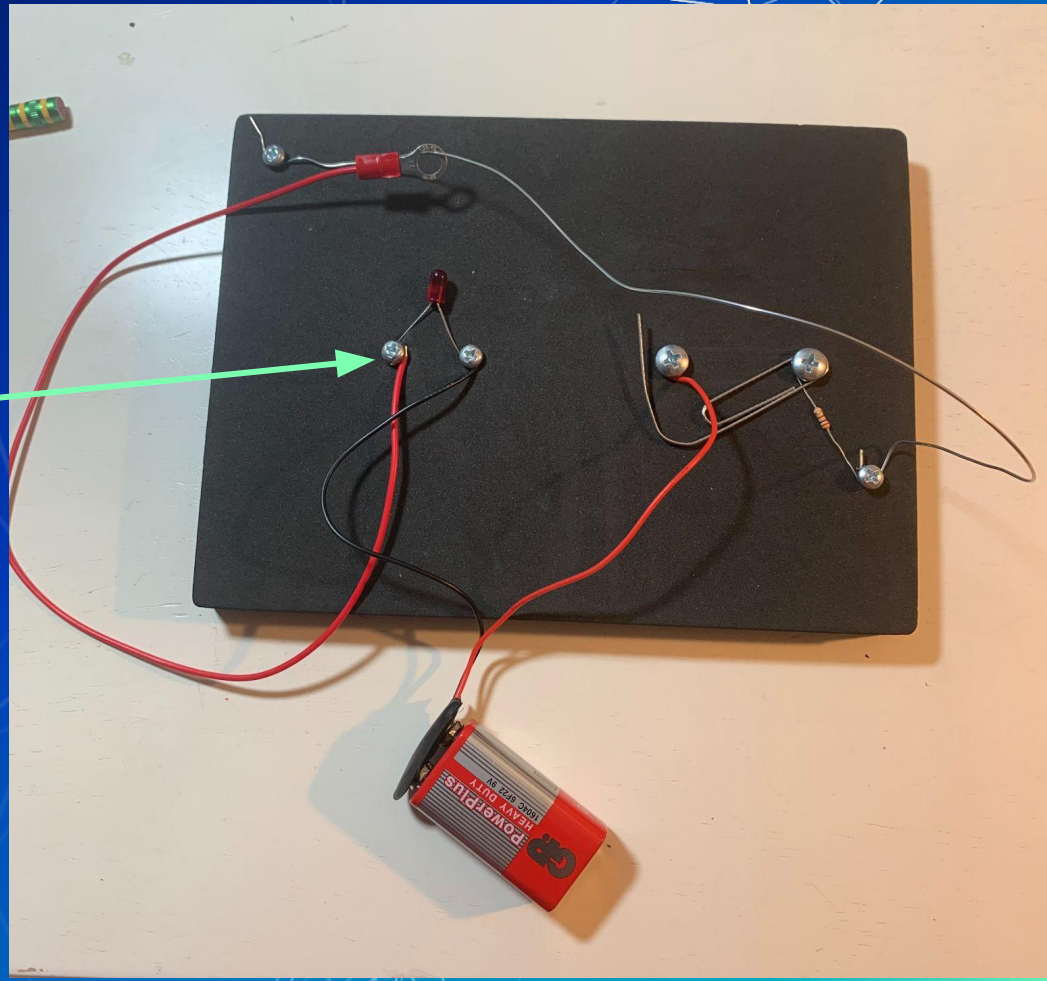
Next, you take **the black end of the battery clip** and wrap it around a **small screw.**

Take the **short end** of the LED, and wrap it around the small screw.

Once you have done that, screw the screw into **hole 3.**



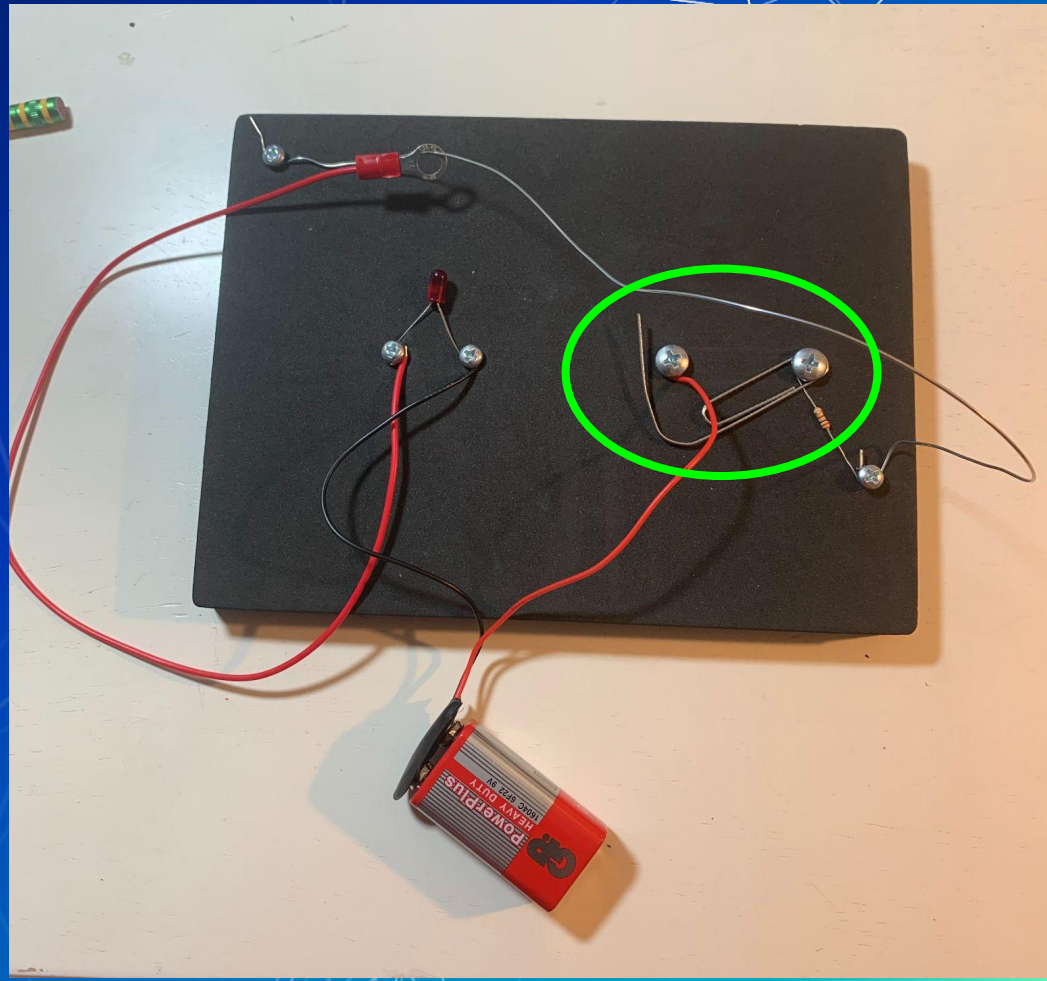
For the final step, take the **end of the red eyelet wire** that is not attached to anything, and put it next to **the second hole**.
Next, take the **long end** of the LED light, and place it next to the **second hole** as well.
With a small screw, you want to push both the red eyelet and the LED light into the second hole.
Finally, attach the battery to the battery clip and you are good to go.

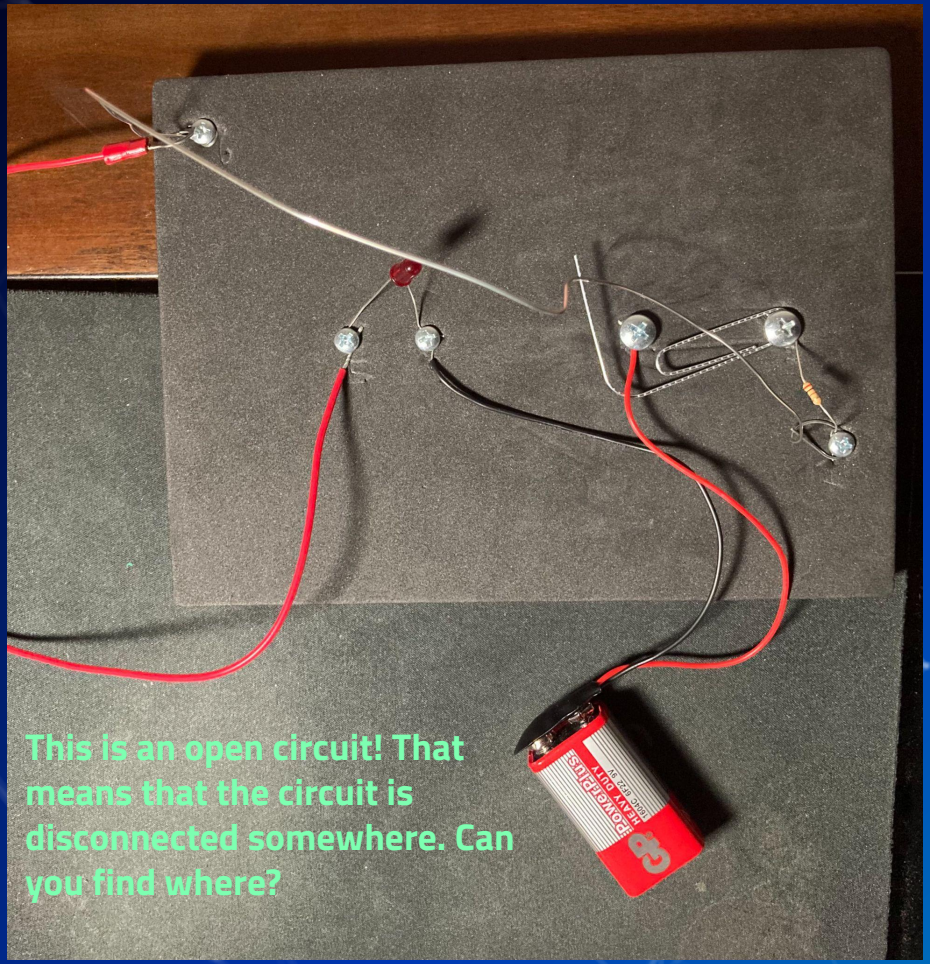


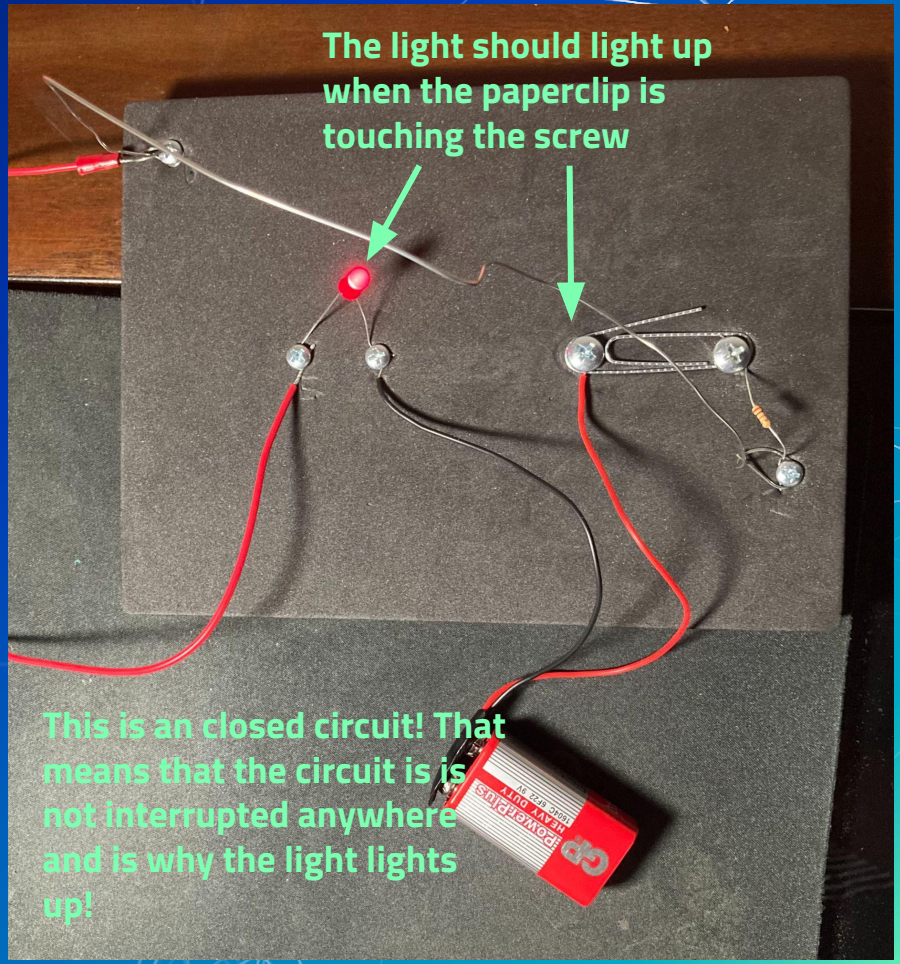
After building the entire thing, you can disconnect the circuit by bending one end of the paperclip so that it can swivel to not touch the screw. This creates an open (interrupted) circuit!

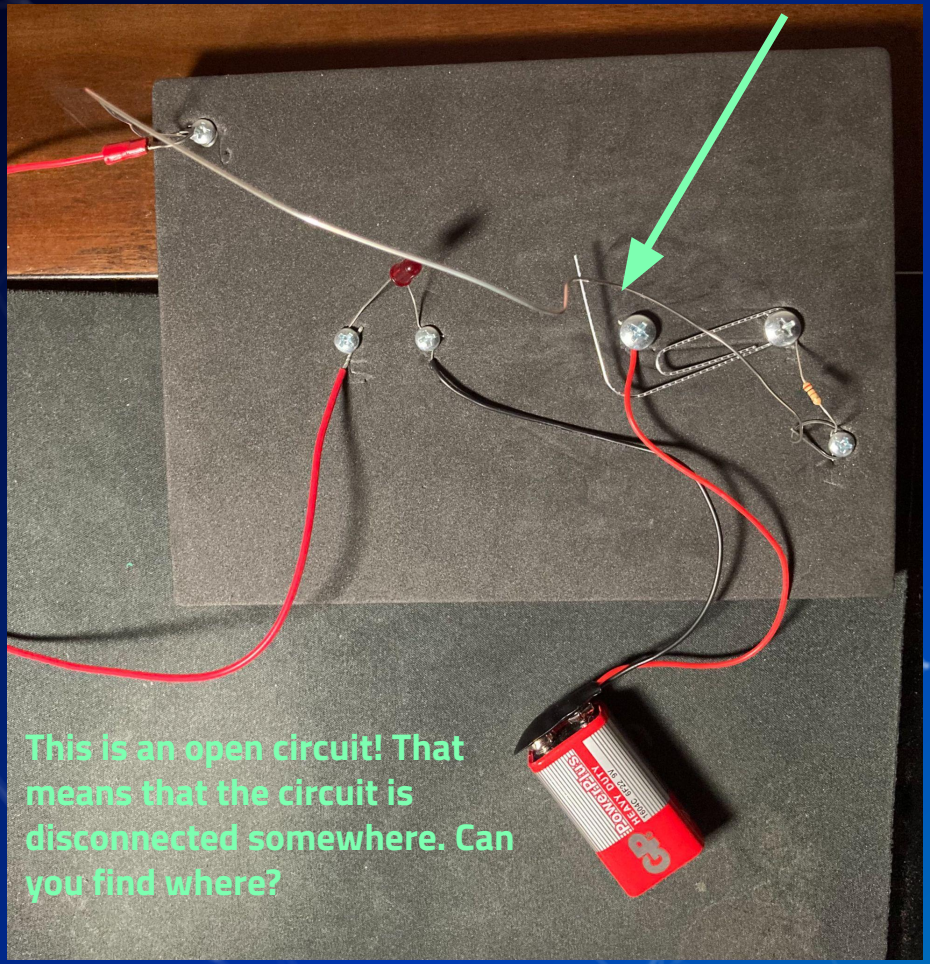
Just remember that if you want to reconnect the circuit, the paperclip needs to be touching the screw.

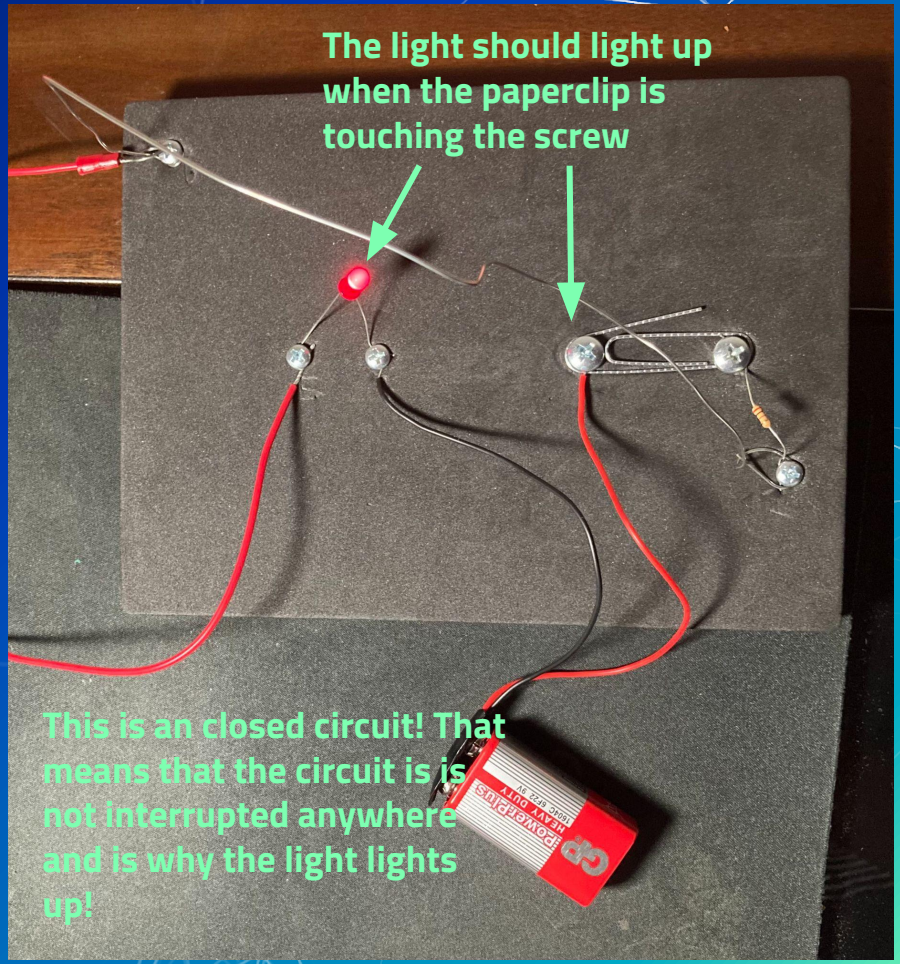
In this game, the paperclip acts as a switch of sorts, allowing us to turn the circuit on and off.




This is an open circuit! That means that the circuit is disconnected somewhere. Can you find where?


The light should light up when the paperclip is touching the screw
This is an closed circuit! That means that the circuit is is not interrupted anywhere and is why the light lights up!


This is an open circuit! That means that the circuit is disconnected somewhere. Can you find where?


The light should light up when the paperclip is touching the screw
This is an closed circuit! That means that the circuit is is not interrupted anywhere and is why the light lights up!

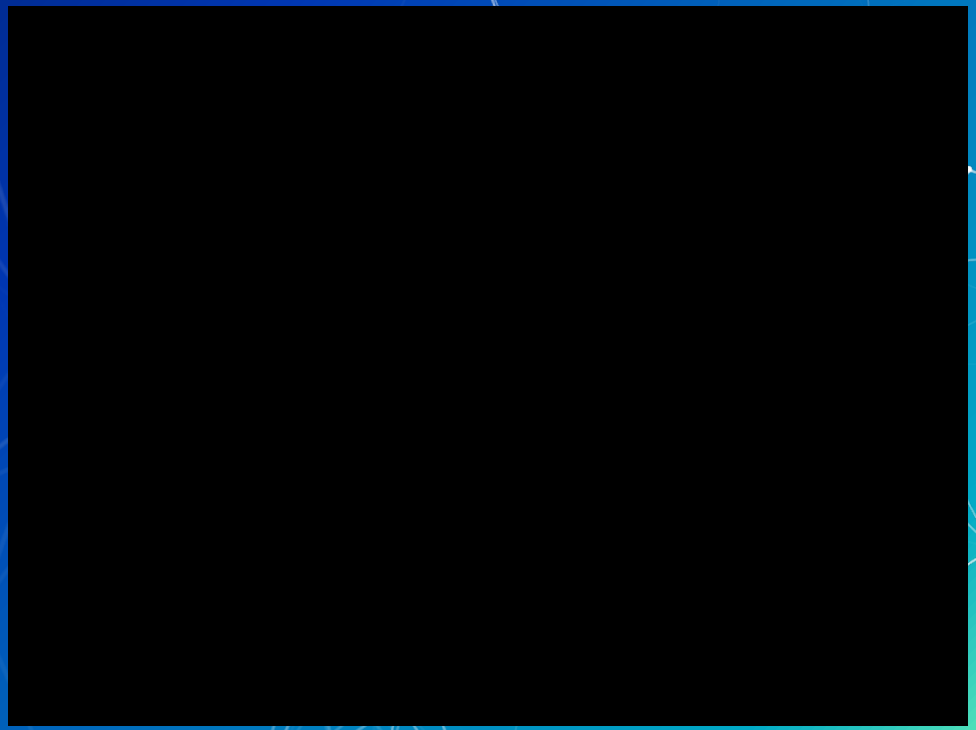
Finally, take the velcro pieces in your kit. Put one on your battery and the other on a spot of your choosing on the foam board. This will make the project easier as you won't have a loose battery hanging around.

You can also peel off your Steady Hand Game sticker and put it anywhere on your foam board!

End result

Congratulations, your steady hand game should be working now. If you want an additional challenge, you can form the wire into awkward shapes to make it harder to get to the other side.

Good job on making this game!



Troubleshooting

An important part of the scientific process is to **troubleshoot** when your project isn't working. If your light does not light up, there could be a few places where errors occur.

Check each of the holes to make sure the wires are all touching each of the screws as shown. Any disconnect will create an open circuit and the light will not work.

Send us a video of your Steady Hand Game!

Send us a video of you playing your game and we will randomly pick a winner to get a small gift card!

Email us the video at:
togetherabovealllofficial@gmail.com