Oregon State University Extension Service Washington County

4-H Investigators: Circuitry

Circuitry is all around us. Circuits can be found in your favorite video game console, toaster, phone, and even doorbells! Circuits are important because they help navigate the flow of electrons (electricity). In this kit you will learn about the different circuit types and use that knowledge to create 3 neat projects!

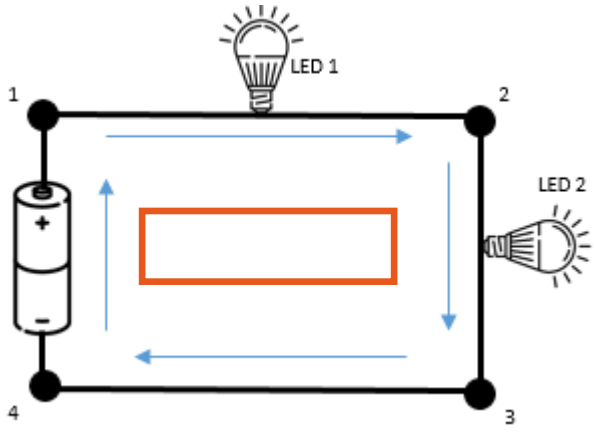
Activity 1:

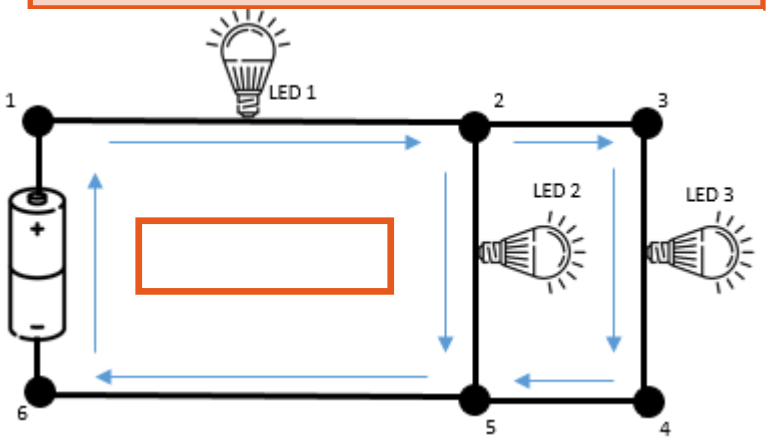
Watch the following video to label these 3 circuit types in the orange boxes and to learn more about them!

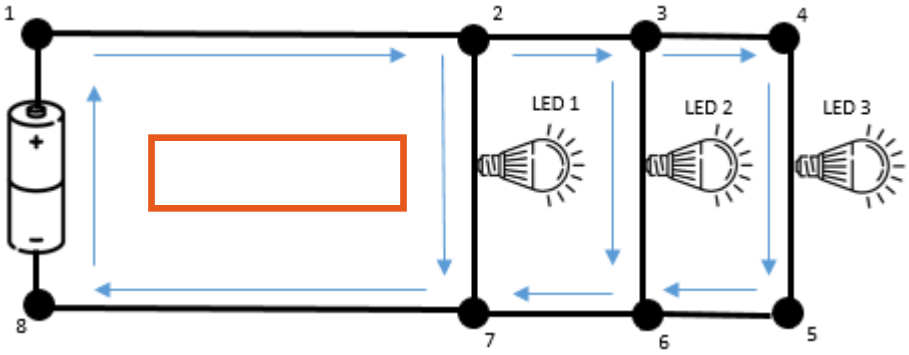
Video link: https://beav.es/Jq7

Key items to note in understanding these models

1. Electrons flow from positive to negative
2. The battery helps provide energy to move the electrons
3. A circuit must be closed (fully connected) so that the electrons can loop back







Word bank:

Series
Parallel
Series-Parallel

Fun fact: Your heart is able to pump due to the electrical signal that the SA node sends to your heart muscle to contract (squeeze) and push the blood though!

Try it!

Visit the University of Colorado's website to build your own circuits with the information above and in the video here: https://beav.es/JiN

Challenge questions: How many LED's can you put on a series circuit before it stops working? Why do you think that is? What happens if you change from a 3 Volt battery to a 9 Volt battery (to do this press on your battery and there should be a sliding scale in the middle bottom of the screen)? Besides wires what other items are conductive (allows electricity to pass through)? Can you make a light switch by adding only one more component to your circuit?

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Activity 2: Decorative LED

Video link: https://beav.es/Jq8

You will need

1. LED
2. Coin battery
3. Tape
4. Cardstock, felt, foam paper or anything else similar
5. Scissors
6. Pencil or pen

1. Think about what object you want to create and where the LED should be.
2. Draw an outline on your paper/felt and cut it out.
3. Take your pencil/pen and poke two holes where the LED wires will go.
4. Once you have placed the wires through the holes locate the longer wire (the longer wire is the positive end).
5. Take the coin battery and place the positive wire to the positive side and remaining wire on the negative side (if that doesn't work flip the battery).
6. Take two small pieces of tape and tape each side down.
(tip you can remove one wire from the battery to turn it off for later use)

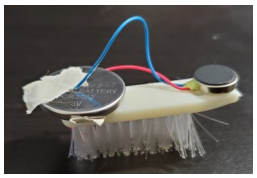
Activity 3: Bristlebot

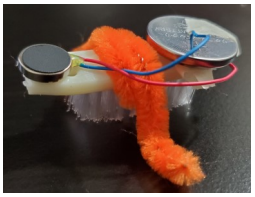
Video link: https://beav.es/JqX

You will need

1. Toothbrush head
2. Motor
3. Coin battery
4. Pipe cleaner (x2)
5. Tape

1. Attach your motor to one end of the plastic side of the brush (the motor in the kit has a white peel off sticker).
2. Take some tape and fold it on itself to create two sticky sides and attach to opposite end of the plastic side of the brush.
3. Place the red wire on the tape and place the negative side of the battery above of the wire.
4. Take a small piece of tape to adhere the blue wire to the positive side of the battery.
5. At this point you should have a working bristle bot! *If it falls over or only spins see below*:
6. To keep the bristle bot stable you can take the included pipe cleaners and fasten "legs" for your bot. Wrap (or tape) the pipe cleaner around the body of the brush and bend the ends of each side flat to hold stable.





Next Steps: A variable is something that can change or be changed that will have an effect on our outcome. What variables can you change on your bristle bot or it's environment to make it spin? Travel in a straight line? Travel sideways?

Fun fact: You just built a robot! How cool! You used a motor called an offset motor. These can be found in video game controllers and phones to provide feedback.

Challenge: Create a challenge course or maze for your bristle bot! Take some tape, scissors, and cardboard or cardstock to build a course for your bristle bot to navigate.

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Activity 4: Scribble Bot

Video link: https://beav.es/Jq2

1. Take 3 markers, your paper cup, and tape to attach the 3 markers on the inside of the cup. Make sure the markers are facing cap side down and equally spaced.

2. Place the two wires in each terminal of the motor and bend the wire on itself so it is secure (you will find the terminals on the bottom of the motor).

3. Next tape the motor on the outside bottom of the cup with the pointy side of the motor hanging off and away from the cup.

4. Tape the AA battery anywhere on the cup as long as your wires can reach both ends of the battery.

5. Take your popsicle stick and tape it to the pointy part of the motor. Make sure that one end of the popsicle stick is longer than the other (this weight instability is what will cause the robot to move) to test it out spin the popsicle stick by hand and reposition the motor as needed so that the popsicle stick doesn't hit the cup as it spins.

6. Place your large sheet of paper down.

7. Take two small pieces of tape and tape one wire end to the positive side of the battery and re remaining wire to the negative side of the battery. This will cause the popsicle stick to spin fast so be cautious.

8. Make any final adjustments as needed. To stop the motor simply take off the tape and move the wire away from either side of the battery.

9. When your robot is ready remove the pen caps, place it on your large paper, and enjoy the art show!

You will need

1. Paper cup
2. Wire (x2)
3. Tape
4. DC motor
5. Markers (x3)
6. Large paper
7. Popsicle stick
8. AA battery

Next Steps: See if changing anything in your design gives you a different drawing pattern. Be ready to share at our next zoom chat!

Want to explore more? Take a look at artist Sougwen Chung and how she uses robots and Artificial Intelligence in her work https://sougwen.com/

Question: Now that you made a robot that creates art do you think all art in the future will be robot made? Why or why not? This could be a great prompt to write about in your journal along with a sketch of what your scribble bot created!

Questions about these activities? Contact Tanya.kindrachuk@oregonstate.edu