

GRAPHITE CIRCUITS

Circuits don't have to be hard wired. You can draw your own! Use pencils to explore how you create a circuit to power a light.

Big Idea

Kids will explore simple circuits and electric connections.

Standards

IELDS 11.A.ECg Generate explanations and communicate ideas and/or conclusions about their investigations.	Students will communicate explanations and ideas about their investigations with the circuits.
NGSS 3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.	Students will plan and carry out tests with the different circuits they make using the battery and LED light and redesign their circuits to improve the brightness of the light.
NGSS 4-PS3-2. Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.	Students will make observations about how the energy was transferred from the battery to the light.

Materials

- Energy Sticks
- Thick graphite pencils; 9B and 6B
- Traceable drawing handouts (circles and stars)
- Paper
- 9 volt batteries
- LED lights with wires
- Clear tape to hold down LED light

Setup

At a table, place traceable drawing handouts and paper with a set of graphite pencils. On the side, have the battery, tap and LED lights.

Directions

1. Introduce students to circuits, closed paths or loops of energy, by showing them the energy stick. Using both hands, grip the stick with a hand on each silver ring. While holding the energy stick you can see flashing lights and hear a noise like a siren or a zombie. It changes pitch if you hold long enough, too.
2. Let go with one hand and notice that it shuts off. Grab the silver ring again and the Energy Stick goes off again. Have students try the energy stick using their hands or making a circle of hands. As students hold hands in the circle, open the circuit by letting go of the hand next to you. When I remove one of my hands the

electric current cannot flow continuously, until I hold onto each end with both hands. Human bodies are natural conductors.

3. Another conductor is graphite! Have students use a graphite pencil and trace a design on the paper. Tip: Make sure to create thick, bold, lines with the pencil.
4. In the drawings, have students leave at least a 1 cm gap on opposite ends of their drawing. Mark the positive and negative lines.
5. Once students are done with their designs, place the 9-volt battery on one of the gaps. Align the positive and negative ends with graphite lines.
6. Take an LED and tape the wire at the end of the lines across the other gap, aligning positive and negative wires. The wires should be in contact with the graphite lines. Tip: The longer side is the negative side.

*For younger participants they can create short circuits by connecting LED lights and the 3-volt batteries together. Older participants can draw an original graphite circuit design of their own! Tip: Simple drawings work best.

Investigation Questions: What happens when I let go of the energy stick? What do you notice inside the energy stick? How can we create a loop or circle in our drawing? What happened when you added the battery and light? Where did the energy from the battery go? What else could a circuit power? Where might we see a circuit? Do smaller or larger drawings make the light brighter? What do we need to make the light the brightest?