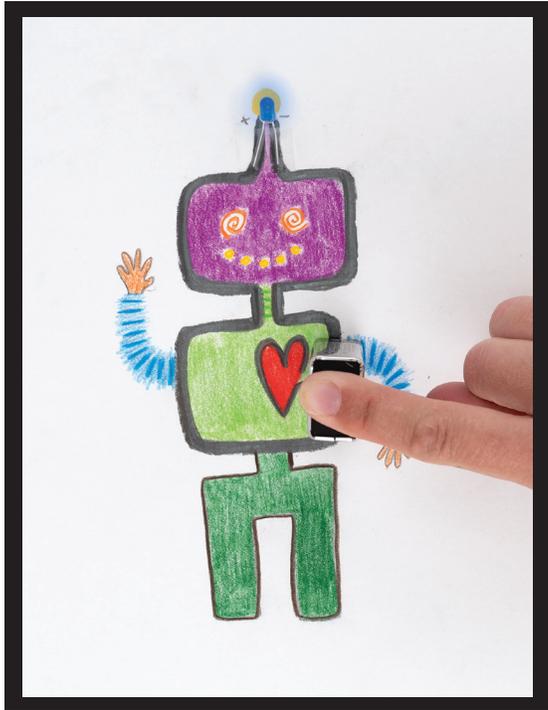


Graphite Circuit



Objective

Students will use critical thinking to apply what they know about electric circuits to design a piece of art through which energy can be transferred and light up an LED bulb.

Standards

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. Electricity flows from one place to another through a path.

Engagement

1. Begin by having a discussion with the class about electricity. Depending on students' understanding of electricity, describe how a basic circuit works and how energy can be transferred from one place to another. Here are some electricity basics that will be helpful for students to be exposed to before they create their own circuits:

- A circuit is a closed path from one place to another, like a loop.
- Graphite works as an electrical conductor, and can be the pathway for the energy to travel along.
- When you place a battery on the graphite, energy flows through the graphite path, through the LED wires, and back to the battery to make a complete circuit.
- Graphite is low in conductivity, meaning it can only carry a small amount of electrical current. The best conductor is a metal.
- The further the energy must travel along the graphite path, the dimmer the light will be. Therefore, success of lighting up your artwork today will depend on the length, thickness, and amount of graphite on the paper. Shorter paths are better, since electricity will naturally choose the path of least resistance.

Grade Level

4th Grade

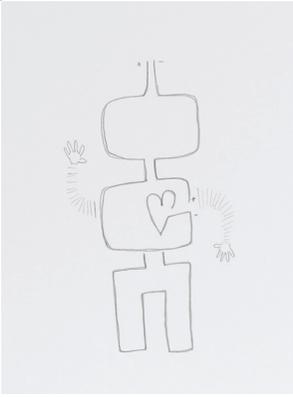
Key Vocabulary

- Electrical Circuit
- Conductivity
- Positive (+) and Negative (-)

Materials

- Ticonderoga® Yellow #2 Pencil, X13806
- Lyra® Graphite Crayons, Water Soluble, L5630102
- UCreate® Mixed Media Paper, P4831
- 9V batteries
- Mini LED lights
- Tape
- Creativity Street® Modeling Dough, PAC4095 (optional)
- Creativity Street® Modeling Clay, PAC4080-01 (optional)
- Wires for extension activity (optional)

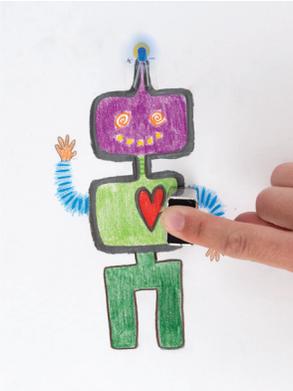
Step 2



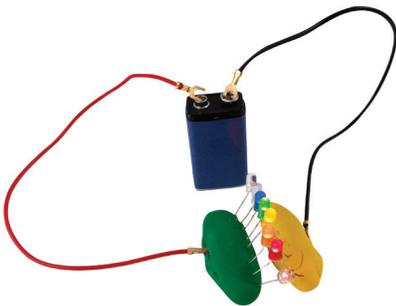
Step 3



Step 5



Extension (optional)



Activity

1. Sketch out circuit design ideas on a piece of scratch paper. Consider which design would be best for an electrical current to flow through, considering what we know about the way electricity behaves. Students need to ensure their designs allow for two openings—one for the positive and negative ends of their LED, and one for the positive and negative ends of their battery. (If students can use multiple batteries and lights, their designs can be more complex.)
2. Sketch the final shape outline on the mixed media paper, leaving two one-eighth inch openings at each end of the shape. Using what they know about the flow of energy, students should mark positive (+) on one side of each opening, and negative (-) on the other side of each opening.
3. Have students color or decorate their design, and then color a thick border with the graphite crayon along the path the energy will flow.
4. Place the 9V battery on one of the openings. Align the positive and negative ends with the graphite lines.
5. Bend the bottom ends of the wires on the LED bulb. Tape the wire ends of the LED across the gap that is marked with a positive and negative (the longer side of the LED wire is positive). Make sure the wire ends are in contact with the graphite lines and the LED is standing upright. Press the battery down on the lines and watch the LED light up the artwork!

Assessment

Students designs should be assessed for their ability to create a simple circuit that lights up an LED bulb. Students should be able to trace the path the energy is following on their design.

Extension

Encourage students to think about other art supplies that may conduct electricity. Give them a couple additional art supplies such as crayons, markers, and modeling dough and modeling clay. Have students test each material and see if it will conduct electricity to light up an LED. Students should discover the modeling dough conducts electricity (because of its salt content). Encourage students to create a design with the modeling dough that will light up an LED bulb.

(Hint: using modeling clay, which does not conduct electricity, as an insulator between layers of modeling dough will help create artwork that won't short-circuit).

Open  and tap  for ideas

