

Teacher Materials:

The Reversing Switch and Buggy program provides an opportunity for your students to think about the direction that current travels through a circuit and to analyze how that direction can be controlled with a switch.

The buggy's operation can be explained by three principles:

1. Electrons (or electric current) travel from the negative terminal of a battery, through a complete circuit, and back to the positive terminal.
2. The direction of the current (through which of the two wires the electrons enter the motor) determines the direction that a motor spins
3. We have created two new paths to the positive terminal of the battery and placed them on either side of the negative terminal so that the user can quickly change which of the motor wires is connected to the negative and positive terminals of the battery.

Using the student sheet with your students:

1. Review what they have learned about batteries and motors, using the diagrams at the top of the student sheet.
2. You may want to draw a sample diagram on the board, asking them to show how they could make a motor move in two opposite directions. You might want to model important aspects of a diagram, including:
 - It helps us to understand how something works by showing the most important parts.
 - It is a simple line drawing.
 - Important parts are labeled.
 - It is helpful to show what is happening inside the wires, in this case showing the direction of the current.
 - It is helpful to show the outcome, in this case which direction the motor turns.
3. Ask students, independently or with partners, to study their buggies and how they move. Then have them to draw diagrams and write a paragraph to explain how their buggy can move forward and backward.
 - Remind students of or brainstorm with them important components of the diagram (see above).
 - For most students, it will be most appropriate to draw the connections of the wires rather than the buggy and controller. It may be helpful to discuss with students why the wood parts are not needed. However, some students may appreciate the challenge of drawing the entire setup. Note that this is more challenging and that they will need to find ways to show the wires (using red and purple will be helpful).
4. A correct student response will include the following components:
 - An understanding that the wires from the motor are connected to the negative terminal and the battery and the foil connected to the positive side.
 - An understanding that for the motor to change direction, the wire touching the negative terminal of the battery must change.
 - An understanding that these configurations change the direction that current moves through the circuit and into and out of the motor.