

Learning Goals

For this lesson, we want to introduce and solidify these concepts:

- Resistance (and resistors)
- Conductivity (and conductors)
- Designing before building (building their own circuit)

Worksheet

We'll be using a worksheet to learn and solidify an electrical engineering vocabulary, describe the circuits built today, and then plan one from scratch. Have the students start on the worksheet for the first five minutes or so. It's okay if they don't finish, they can work on it after they complete the rest of the lesson (and probably can't complete it without doing the rest of the lesson). Have them draw up the circuits as they build them for the second part of the worksheet.

Resistance Lesson

For this lesson, we'll be looking at projects 7-8 in the snap circuits manual. These are about LEDs, but also teach a lesson about resistance. **Make sure that students always use a resistor when using the LED component.** Before they put together any circuits, ask them questions like these:

- Do all electrical components use the same amount of current? Does a washing machine use just as much electricity as a tiny light bulb?
- What do you think happens if an electrical component gets too much current? LEDs like the one in the kit will break if they get too much current.
- Does anyone know what kind of electrical component we can use to reduce (or resist) current?

After asking questions, have the students to projects 7 and 8 (p. 11) about LEDs. They will also learn that LEDs only work in one direction because they are polar components.

Conductivity Lesson

For this lesson, we'll be looking at project 9 (p. 12) to learn about conductors. For this lesson, they will build an open circuit and then try to close it with different materials in order to learn about the importance of conductivity when building a circuit. Here are some example questions to ask before they start building:

- What does it mean when we say that something conducts electricity? (Wait for an answer) What do you think the word conductivity means when we're talking about an electrical circuit?

- What kinds of materials can you think of that are good conductors? Bad conductors?

After letting the students answer questions, have the students do project 9. You can let them test any materials that don't get the circuits messy and aren't other electrical components that might break the LED (not more batteries, for example).

Designing Your Own Circuit

For this section, the students can design their own circuit. This is an opportunity to teach two reasons that designs are important: so we can communicate our ideas to each other before building (they're working in groups) and so that we don't accidentally make things that break (a design with an LED and no resistor).

Have them fill out their circuit design (in pencil) on the worksheet. Let them design anything they want, but check it before they build it to make sure it won't break. Unless they short-circuit (no resistance in the circuit) or manage to build an amplifier with a transistor or forget a resistor, they probably won't be able to break anything.

Extra Time

If there's extra time, they can build any other circuit they'd like. The Flying Saucer lesson on p. 13 looks fun.