Navigate

With your class

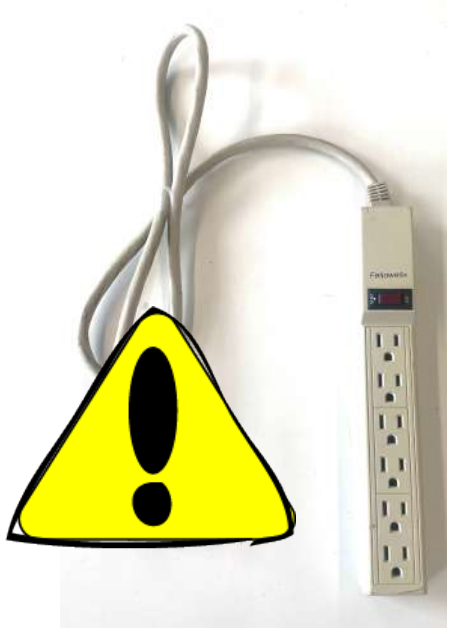
- What kinds of things did we take photos of that we can use to look for patterns?
- Why did we take photos of those things? What did we think they might help us figure out?
- What patterns do we notice across each of these types of things?

Identify Important Safety Precautions

Individually and as a class, we have an ethical responsibility to consider the possible personal, societal, and environmental impacts of any scientific investigation we plan or engineering solution we design.

With your class

Tinkering with a power strip would be **DANGEROUS** if it was hooked up to a wall socket. Why?



Slide C

Equitable Participation

On your own

What can we do to make sure everyone gets a chance to contribute their ideas?

Carry Out Investigation A

With your group

- Disassemble the power strip. DO NOT GET IT ANYWHERE NEAR A WALL OUTLET!
- Use the screwdriver to unscrew the power strip (turn screws counterclockwise). Save the screws in the bin to reassemble later.
- **What key structures and connections do you notice? LIST them in Part A on your handout.**

Carry Out Investigation B

- **Part 1:** Connect the power strip to the battery. Connect 1 bulb to the power strip so it lights up.
- **Part 2:** Connect 2 or more bulbs to the power strip so they each light up as brightly as the bulb in the **control condition**. You should be able to turn the lights on and off with the switch on your power strip.

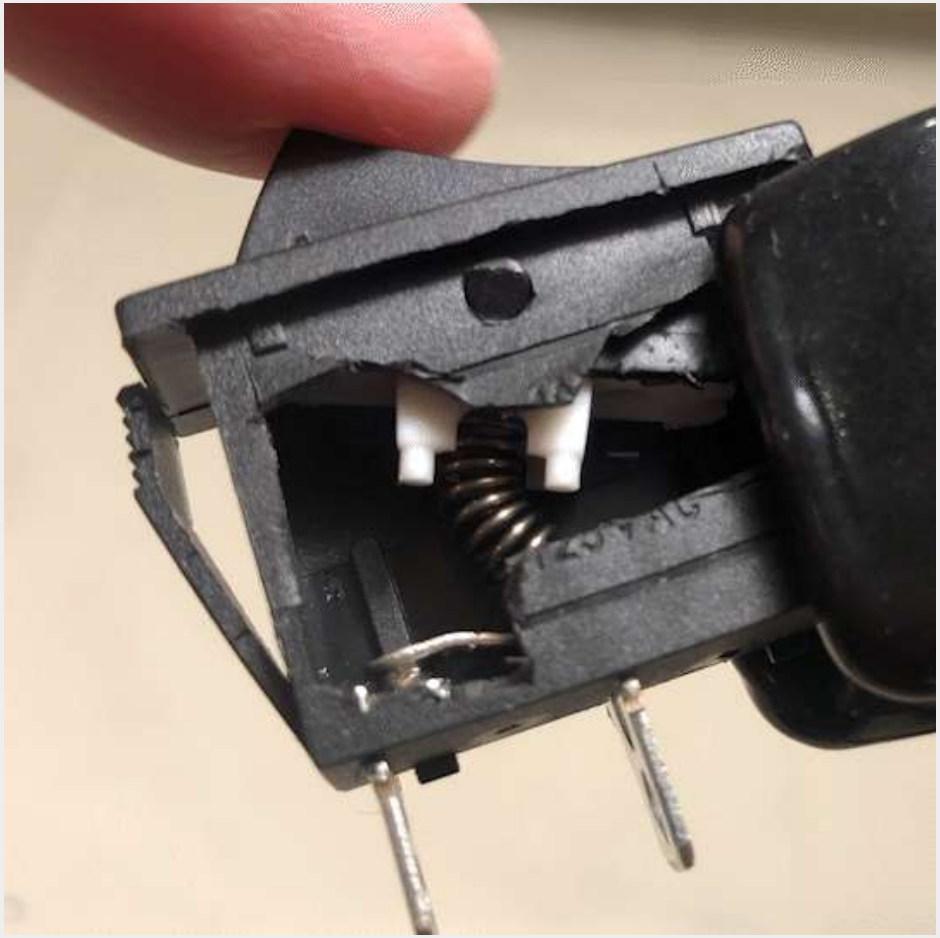
Safety: *If the battery starts heating up quickly, you have created a dangerous condition in the system called a* ***short circuit****. If this happens,* ***detach the wires from the battery*** *and call your teacher over to help debug the setup before continuing!*

➔ Continue to list key structures in Part A.

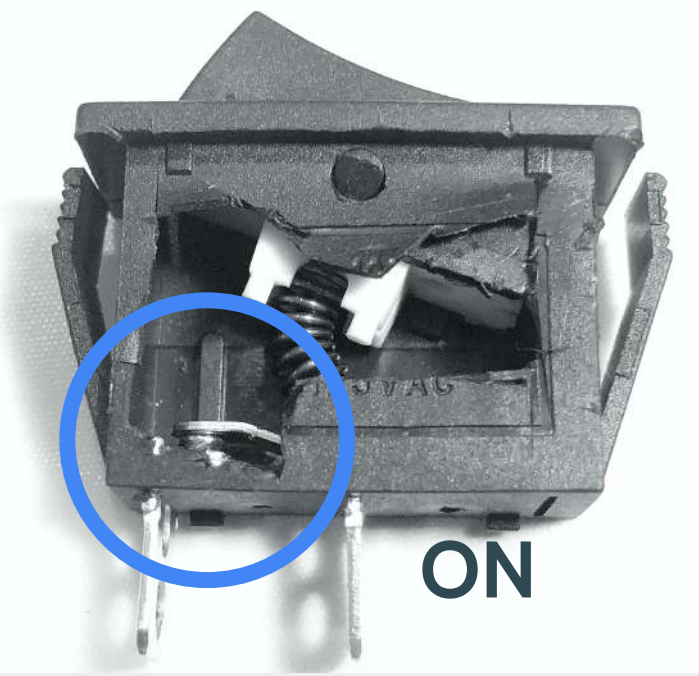
Analyze Structure and Function of Switch

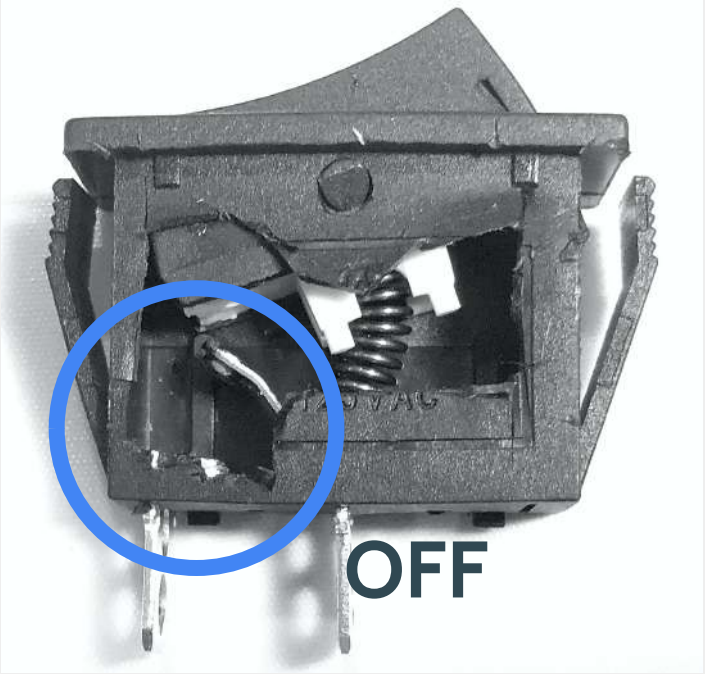
Turn and Talk

What changes in the switch's internal structure that helps explain how it functions?



Analyze Structure and Function of Switch





Turn and Talk

What changes in the switch's internal structure that helps explain how it functions?

Develop a Model: How the Power Strip Works

On your own

- In Part B on your handout, **draw and label a diagram** to help explain how the structures and connections in the power strip enable it to transfer energy from 1 source to multiple devices.
- **Label key structures** in the power strip, as well as the energy source and the devices.

→ Be ready to hand in this work at the end of class.

Rebuild and Return Your Equipment

With your group

(Split up these tasks.)

- Reassemble the power strip. Use the Phillips screwdriver to screw the power strip back together.
- Sort and return the rest of the equipment to the appropriate bin.

Bin A	Bin B
• Power strip (reassembled) • Screwdriver	• D battery • Tape • 4 small light bulbs and holders • All alligator clips

Reflect on Community Agreements

Exit Ticket

On the back of your power strip handout, respond to the following prompt:

- What things did you do today to support the Community Agreement that you selected at the start of class?

Navigate

The inner structure of the power strip allows it to transfer electrical energy to multiple outlets. This is similar to the structures in a building that transfer energy to multiple outlets from 3 wires coming into the building.

On your own

As you read the home learning, consider how the structure and safety features of a building compare to the power strip.

How can the power strip provide a physical model to help us understand electrical connections in the grid?

Navigate

With your class

- What questions did the investigations from our last class raise for you that the reading helped answer?
- What new ideas did the reading give you about how electrical energy systems function in our own communities, or about what might have happened in Texas?

Develop a Model

With your class

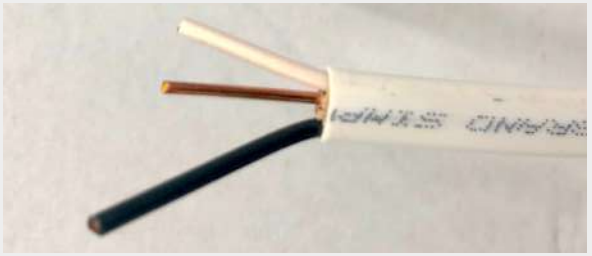
Develop a model for explaining how the structures and connections in the power strip enable it to transfer energy from 1 source to multiple devices.

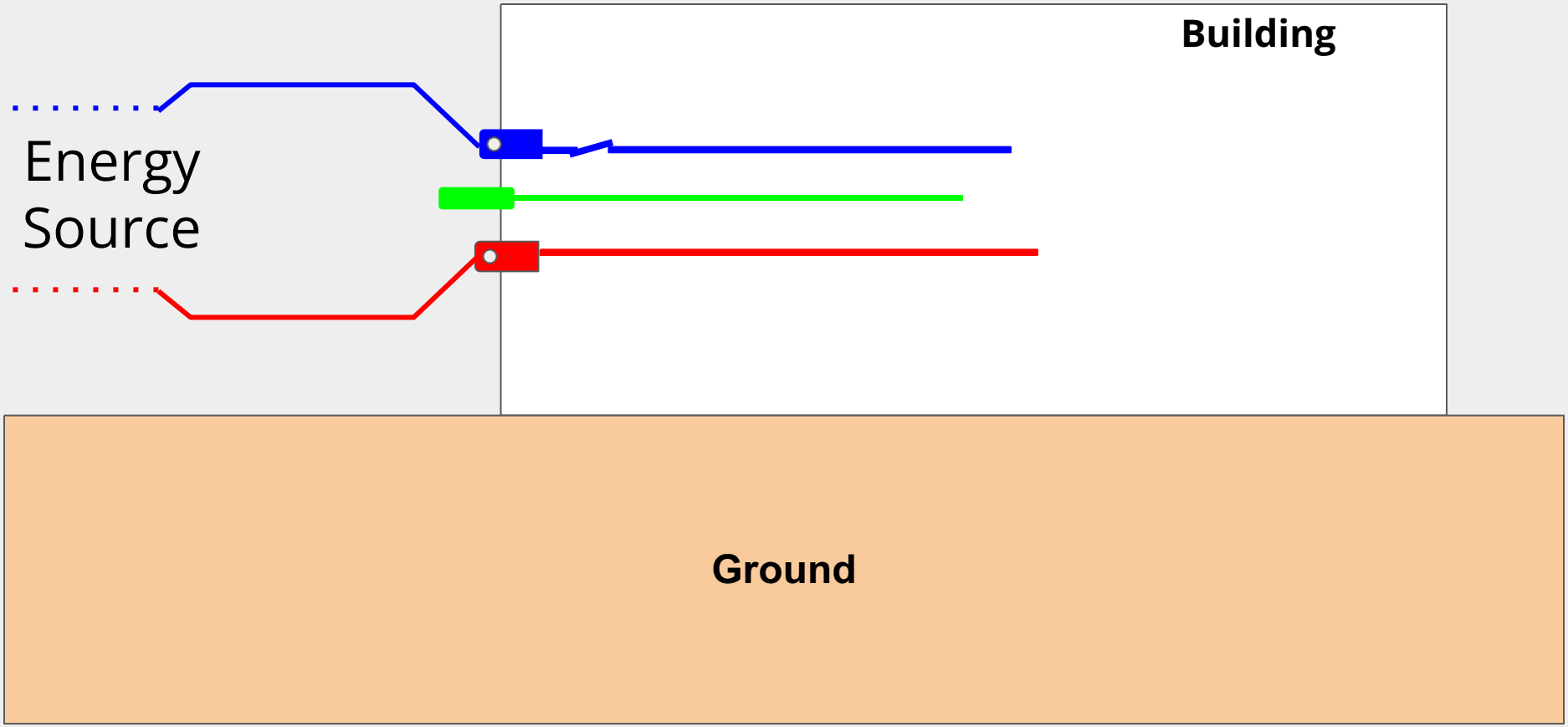
Develop a Model for Circuits in a Building

With your class

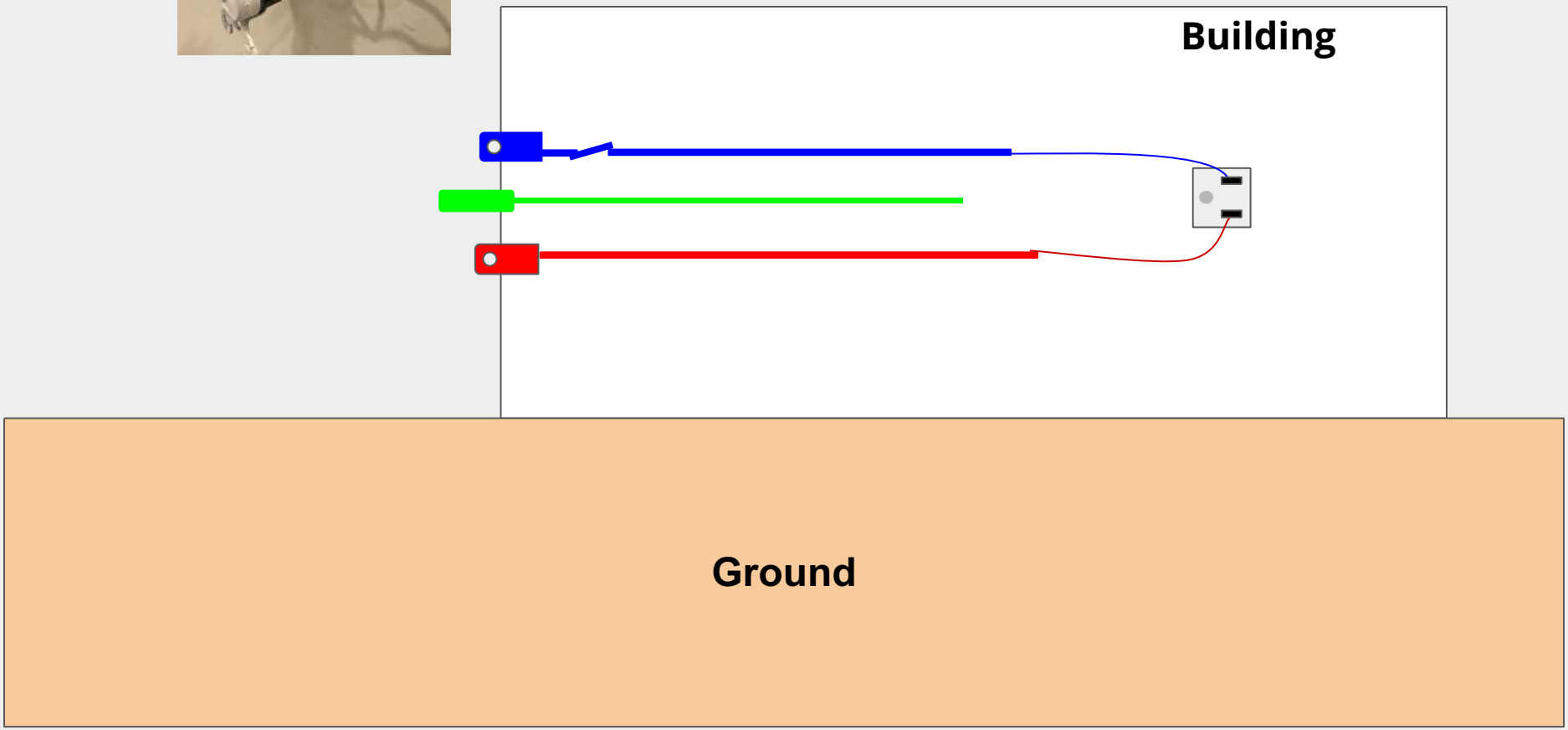
How is the structure of the power strip similar to how all the devices in a single building get electricity?

Develop a Model for Circuits in a Building

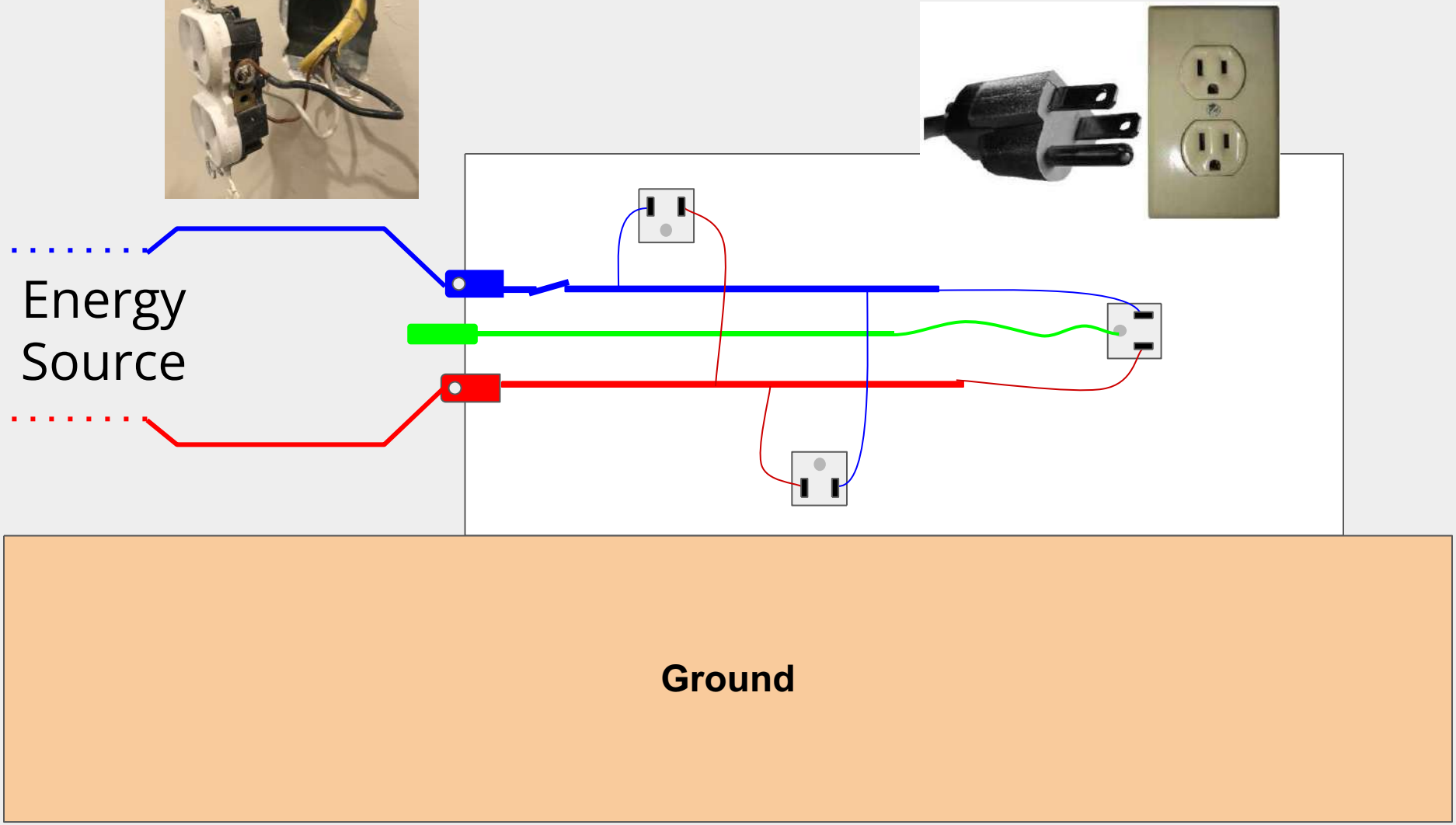




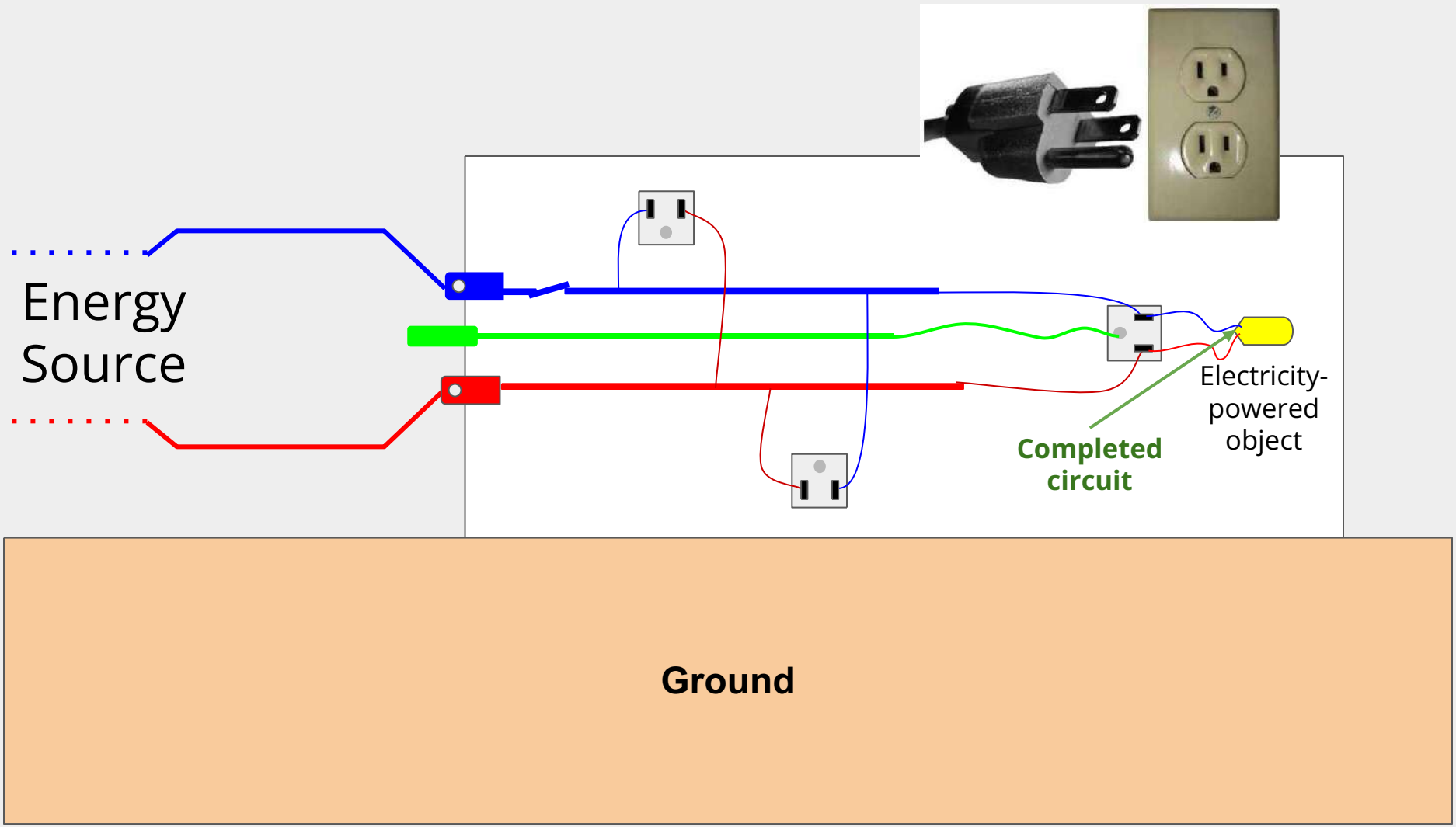
Develop a Model for Circuits in a Building



Develop a Model for Circuits in a Building

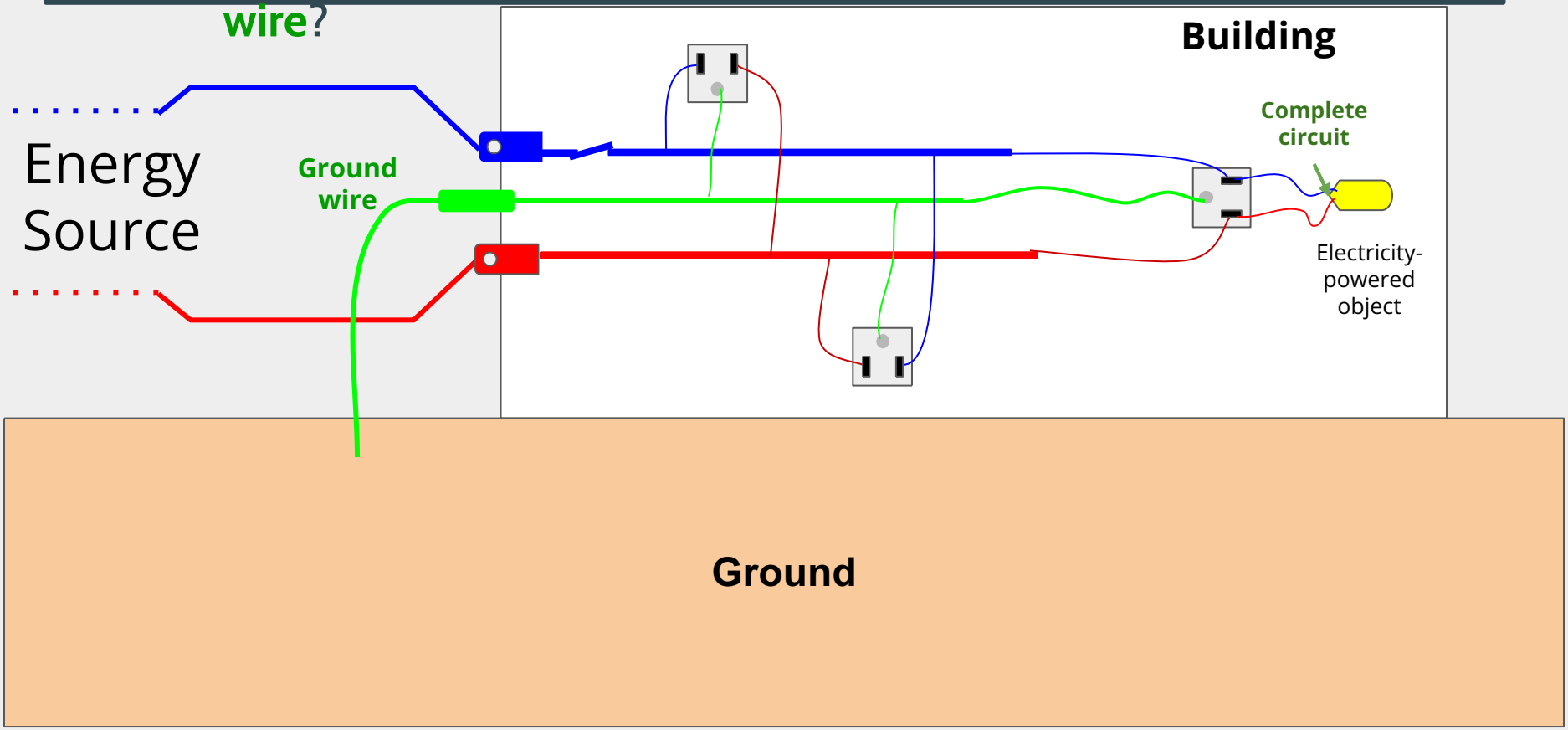


Develop a Model for Circuits in a Building



Develop a Model for Circuits in a Building

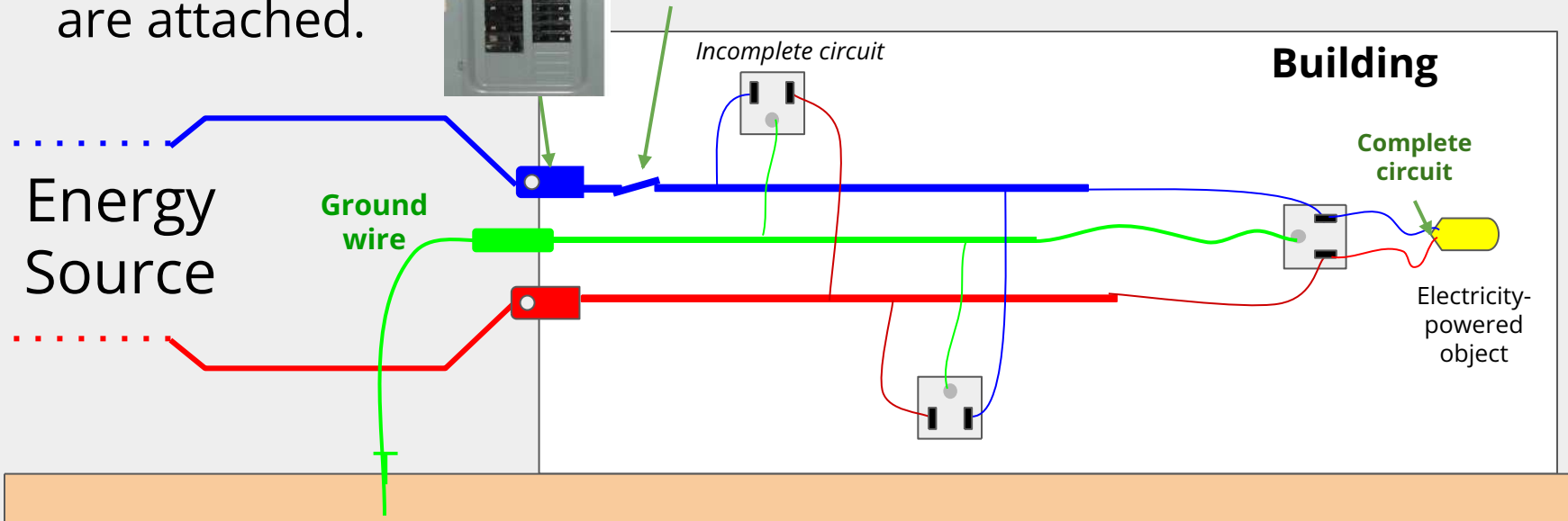
Turn and Talk: Some groups noticed that the green wire in the power strip seemed unnecessary. According to our reading, what is the function of the **round outlet hole** and the **ground wire**?



Develop a Model for Circuits in a Building

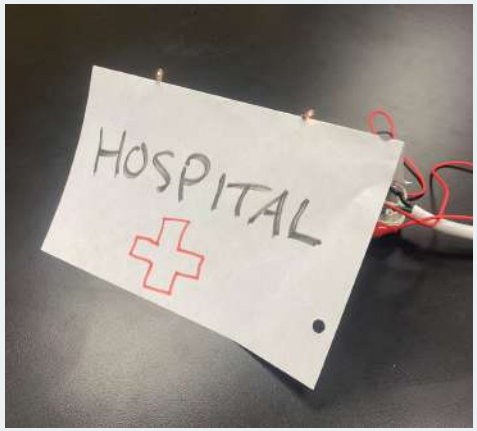
The *electrical panel* is where outside wires are attached.

The panel has *circuit breakers* in it that automatically switch off the circuit if there is excess energy in the system.



The ground wire gives electrical energy a safe place to go if there is excess electrical energy in other parts of the system.

Carry Out Investigation C



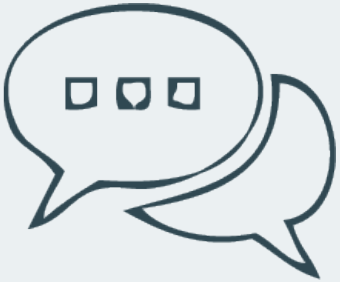
With your group

Use your power strip to model a building in a community. What types of buildings does a community need?

Design a paper tent to show **a building that people need**, and test your power strip in that building. The building should “turn on” when you connect to a battery.

When you’re ready, connect your building to your class substation.

Carry Out Investigation C



Turn and Talk

Explain how this model shows how multiple buildings in a neighborhood could get electricity from 1 energy source.

➔ Be ready to share your ideas with the whole class.

Carry Out Investigation D

With your class

There are 2 different ways that electrical energy transfer can be disrupted through some or all of the system due to a change in the wires. **How can we use our electric city to simulate:**

- a broken circuit?
- a short circuit?

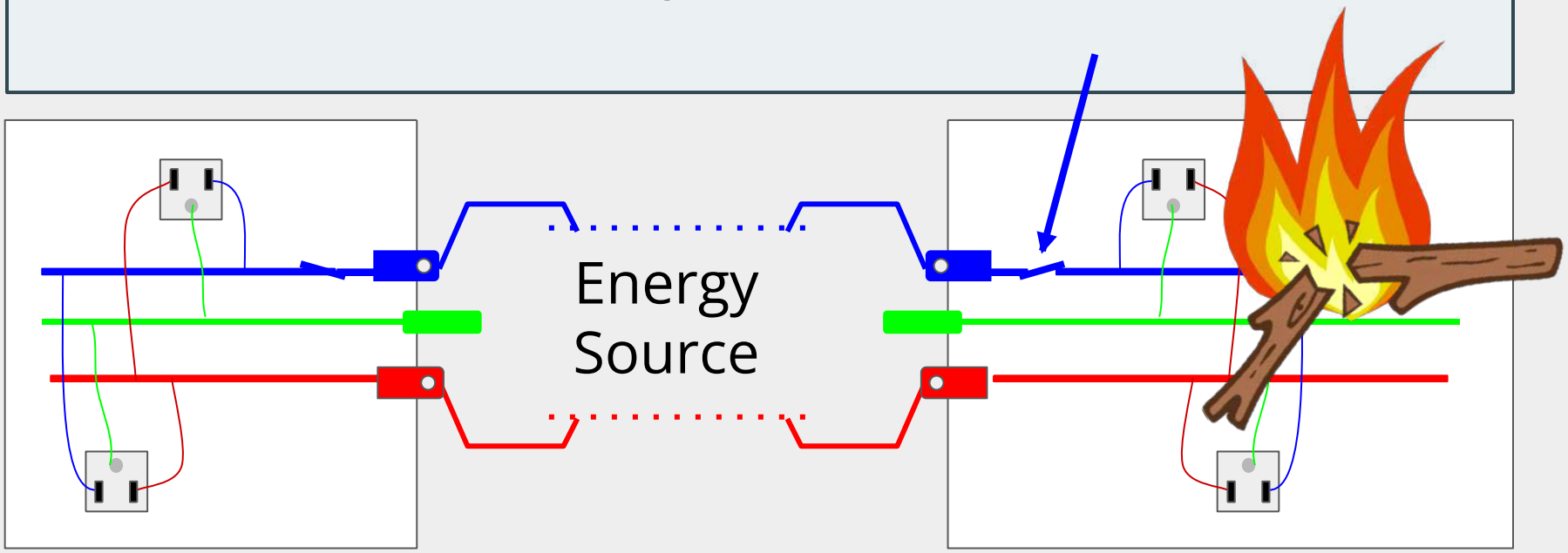
A **short circuit** occurs when there is a direct conducting path (a path with no usable devices) from 1 side of the energy source to the ground or to the other side of the source.

Circuit Breakers

Turn and Talk

How can a circuit breaker help limit the scale of a power outage due to a short circuit?

Who has experienced this?



Progress Tracker and Personal Glossary

On your own

- Add an entry to your Progress Tracker to keep track of new ideas about electricity and energy transfer.
- Add any new terminology we have co-developed or encountered in this lesson to your personal glossary.

Slide Z

Developing Community Agreements

Respectful

Our classroom is a safe space to share.

Equitable

Everyone's participation and ideas are valuable.

Committed to our community

We learn together.

Moving our science thinking forward

We work together to figure things out.

Turn and Talk

What does it look like in small-group work when (1) participation is *equitable* and (2) interactions are *respectful*?

Navigate

In this lesson we figured out how a circuit is needed to transfer energy from a source to electricity-powered devices.

Turn and Talk

What new ideas or new questions does this raise for you about our Texas case study?

➔ Be ready to share these with the whole class next time.

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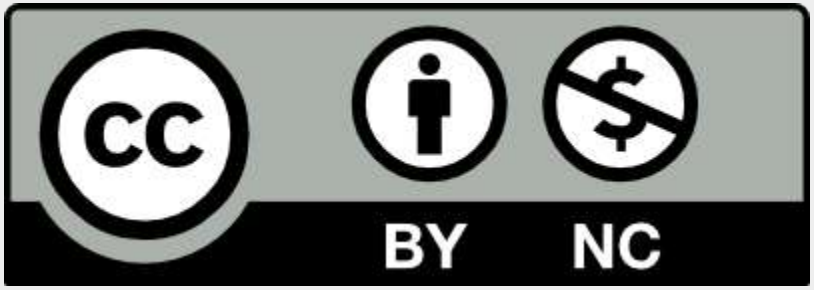

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