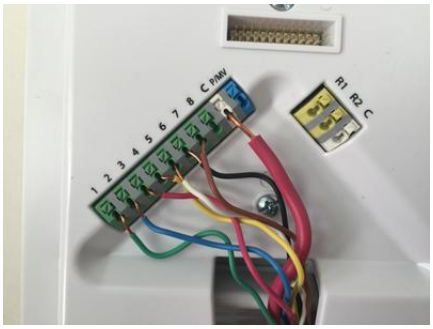
Circuits

Physical Science | Lesson Guide

1st Grade

Photo Description



This image shows wires of different colors connected to a green circuit board with numbered slots. The wires carry electricity through the board to make things work. You can see there is also a yellow box on the right side that helps control the electricity flow, like a light switch does.

Scientific Phenomena

Anchoring Phenomenon: How does electricity travel through wires to make things light up or move?

This image represents a simple electrical circuit—a complete path that electricity travels along. Electricity flows from a power source (like a battery) through wires and into devices that use that energy to do work (like lighting a bulb or making a motor spin). When the circuit is complete (all connected), electricity can flow. When it is broken (disconnected), electricity stops flowing and the device stops working. This happens because electrons move through the metal wires in a continuous loop when there is a complete path.

Core Science Concepts

1. Electricity needs a complete path to flow: Electricity is like water in a pipe—it needs a continuous route to travel through. If the path is broken anywhere, the electricity stops moving.

2. Circuits can be open or closed: A closed circuit is complete and allows electricity to flow (the light is on). An open circuit has a break in the path and stops electricity from flowing (the light is off).

3. Wires are conductors: Metal wires allow electricity to pass through them easily. Different colored wires help us organize and identify different parts of a circuit.

4. Energy transfer and transformation: Electricity is a form of energy that travels through wires and is transformed into other forms of energy like light, heat, or motion.

Pedagogical Tip:

For First Graders, use the analogy of a "circle game" where students hold hands in a circle—electricity flows around smoothly. When someone lets go (breaks the circuit), the flow stops. This concrete, kinesthetic understanding helps young learners grasp the abstract concept of circuits without overwhelming them with technical details.

UDL Suggestions:

Multiple Means of Representation: Provide physical manipulatives (pipe cleaners, batteries, bulbs) so students can build their own circuits while discussing the concept. Some students learn better through hands-on exploration than through images alone. Multiple Means of Engagement: Allow students to predict what will happen ("Do you think the light will turn on?") before testing circuits, building curiosity and ownership of their learning.

Zoom In / Zoom Out

Zoom In: The Atomic Level
Inside the metal wires, tiny invisible things called electrons are moving really, really fast! Think of electrons like a long line of kids passing a ball down the line—when one child pushes the ball, it travels all the way to the end. Electrons do the same thing in wires, and their movement IS electricity. When the circuit is complete, electrons can keep moving in a circle. When you break the circuit, the electrons stop moving and the electricity stops flowing.

Zoom Out: Home and Community Systems
Your whole house is filled with circuits! Think about it—circuits are everywhere: in the lights on your ceiling, the refrigerator in your kitchen, the TV in your living room, and the alarm clock in your bedroom. All these circuits connect to big power lines that run through your neighborhood, bringing electricity from power plants far away (sometimes miles and miles) to all the homes and buildings in your community. That's why when there's a big storm and the power goes out, many houses lose electricity at the same time—they're all part of one giant connected system!

Discussion Questions

1. What do you think happens when we unplug one of the wires from the circuit board? (Bloom's: Predict | DOK: 1)
2. Why do you think we need wires to connect all these parts together? (Bloom's: Understand | DOK: 2)
3. If the light doesn't turn on, what could be wrong with our circuit? (Bloom's: Analyze | DOK: 2)
4. Can you think of other things in your house that use circuits and electricity to work? (Bloom's: Apply | DOK: 2)

Potential Student Misconceptions

Misconception 1: "Electricity is used up like food, so it disappears from the wires."
Scientific Clarification: Electricity doesn't get "used up" and disappear. The same electrons keep traveling around and around the circuit. When we turn on a light, the electricity's energy is transformed into light and heat, but the electricity itself keeps flowing as long as the circuit stays closed.

Misconception 2: "Bigger wires make electricity stronger, and thinner wires make it weaker."
Scientific Clarification: The color and thickness of wires don't change how strong the electricity is. Different colored wires are just for organization and helping us see which wires go where. The strength of electricity comes from the battery or power source, not the wires themselves.

Misconception 3: "Electricity can leak out of wires if they touch each other."
Scientific Clarification: Electricity doesn't "leak out" like water from a pipe. However, if wires touch in the wrong way, it can create a short circuit, where electricity takes a shortcut and doesn't go where it's supposed to. That's why we're careful not to let wires touch in ways they shouldn't!

Extension Activities

1. Build Your Own Simple Circuit: Provide students with AA batteries, battery holders, LED bulbs, and pre-stripped wires in a kit format. Allow them to connect the wires and watch the light turn on and off by making and breaking the circuit. Have them draw pictures of what they built and color the wires to match the real colors used.

2. Circuit Hunt Around the Classroom: Take students on a "circuit walk" around the school or classroom to identify things that use electricity (lights, smartboard, fan, pencil sharpener). Discuss how circuits are inside these devices making them work. Create a picture chart showing all the things they found.

3. Open and Closed Circuit Game: Create large laminated cards showing open and closed circuits with simple diagrams. Students sort cards into two piles while a partner checks their work. Then, switch roles. This reinforces the vocabulary in a playful, kinesthetic way.

Cross-Curricular Ideas

Mathematics: Create a simple circuit counting game where students count the number of wires (5), the number of slots on the green board (8), or the number of colored wire pairs. Practice skip-counting by 2s if there are pairs of wires. Graph classroom objects that use circuits (lights: 10, fans: 2, smartboard: 1) and compare quantities.

English Language Arts: Have students write or dictate "If-Then" sentences about circuits: "If I unplug the wire, then the light turns off." Create a class book titled "Things That Use Circuits" where each student draws and labels one item from home. Read aloud "Electricity" by Sian Smith and discuss it in a story circle, acting out the role of electrons traveling through wires.

Art: Students create a colorful circuit drawing using colored markers or crayons to show wires, batteries, and lights. They can use the colored wires in the photo as inspiration. Make a tactile circuit poster by gluing yarn or ribbon onto paper to show the path electricity travels, then decorate it with cut-out pictures of things that use electricity.

Social Studies: Discuss community helpers who work with electricity (electricians, power plant workers). Take a virtual tour of a power plant or utility company to see where electricity comes from before it reaches homes. Talk about how electricity is shared across neighborhoods—a community resource—and why everyone needs to use it safely.

STEM Career Connection

Electrician
An electrician is someone who installs, fixes, and takes care of all the wires and circuits in houses, schools, and buildings. They use special tools to figure out when circuits aren't working and make them work again. Electricians keep lights on, help computers run, and make sure electricity stays safe. Average Salary: $58,000–$62,000 USD per year

Electrical Engineer
An electrical engineer is a scientist and designer who creates NEW circuits and electrical systems for all kinds of things—from smartphones to robots to video games! They draw plans, test ideas, and solve problems to make electricity work in new and cool ways. If you like building things and solving puzzles, this might be a job for you! Average Salary: $98,000–$105,000 USD per year

Solar Panel Installer
A solar panel installer helps capture energy from the sun and turn it into electricity for homes and buildings using special panels. This is like creating a different PATH for electricity to come from—instead of power lines, the sun makes the electricity! They work outside and help the community use clean energy. Average Salary: $48,000–$52,000 USD per year

NGSS Connections

Performance Expectation:
1-PS4-1: Plan and conduct investigations to provide evidence that vibrations make sound and that various materials can be used to block sound.

Disciplinary Core Ideas:
- 1-PS4.A (Sound is produced by vibrating materials; sound can make materials vibrate)
- 1-ETS1.A (Problems can be solved by applying ideas from prior knowledge of nature)

Crosscutting Concepts:
- Energy and Matter (Energy can be transferred in different ways)
- Systems and System Models (A circuit is a system with connected parts)

Note: While First Grade NGSS standards emphasize sound and vibrations, simple circuit exploration supports foundational understanding for future grades (K-2-ETS1, 2-PS1, 3-PS2) and aligns with inquiry practices and engineering design thinking.

Science Vocabulary

* Circuit: A closed path that electricity travels along to make something work.

* Electricity: A form of energy that flows through wires and powers things like lights and toys.

* Conductor: A material (like metal) that lets electricity pass through it easily.

* Open circuit: A broken or incomplete path that stops electricity from flowing.

* Closed circuit: A complete path where electricity can flow all the way around.

* Wire: A thin metal conductor that carries electricity from one place to another.

External Resources

Children's Books:
- Electricity by Sian Smith (DK Findout Series) – Clear, colorful photos and simple explanations ideal for First Grade
- Lights All Around Us by Mary Hill (National Geographic Little Kids) – Explores electricity and light in relatable, everyday contexts
- The Plug and Play Book by Kate Burns – Interactive lift-the-flap book about how electricity works in simple terms

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Teacher Tip: Start with exploration before formal vocabulary. Let students play with circuits first, then name what they observe. This builds genuine understanding and curiosity!