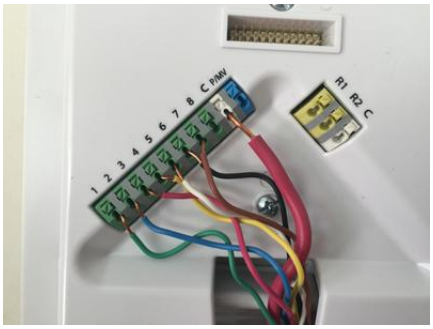
Circuits

Physical Science | Lesson Guide

Kindergarten

Photo Description



This image shows a green terminal block with numbered connections (1-8) and colored wires plugged in. A blue wire and colorful cables are connected to the terminals, demonstrating how electricity can travel through different pathways. There is also a yellow box labeled with connections on the right side, showing another way to control where electricity goes.

Scientific Phenomena

Anchoring Phenomenon: How does electricity move through wires to make things work?

This image illustrates electrical circuits and pathways. Electricity flows through the colored wires and terminal connections when they are properly linked together. The terminal block acts as a "hub" that allows electricity to travel from one wire to another. When wires are connected correctly, electricity can flow; when disconnected, the flow stops. This is the foundation of how everyday devices (lights, fans, toys) receive the power they need to function.

Core Science Concepts

* Electrical Pathways: Electricity travels along wires in a continuous loop called a circuit. It needs a complete path (with no breaks) to flow and power devices.

* Connections and Control: Terminal blocks and connectors let us choose which wires electricity flows through, allowing us to control which devices turn on or off.

* Safe Electricity Flow: Different colored wires help electricians and engineers organize electrical systems so electricity goes exactly where it's needed without danger.

* Energy Transfer: Electricity is a form of energy that moves through metal wires to deliver power to lights, motors, and other devices we use every day.

Pedagogical Tip:

For Kindergarteners, avoid abstract electricity concepts. Instead, use familiar analogy: "Electricity is like water flowing through pipes—it needs a complete path to travel, and we can turn it on and off at different points." Let students feel (safely!) the difference between a completed and broken circuit using battery-powered devices they can manipulate.

UDL Suggestions:

UDL Strategy - Multiple Means of Representation: Provide both visual (diagram of circuits) and tactile (battery holders with real wires they can connect) explorations. For students with visual impairments, allow them to feel the smooth terminals and thick wires while you verbally describe the connections. For English learners, pre-teach color words (red, blue, yellow, green) in context before the lesson.

Zoom In / Zoom Out

Zoom In: Atomic Level — Electrons Moving
Electricity is made of tiny particles called electrons that move through metal wires. When electrons flow in a loop (a circuit), they carry energy that makes lights glow and toys move. Kindergarteners can't see electrons, but we can see what they do—like a light turning on! Think of it like this: "Electricity is billions and billions of super-tiny pieces all marching through the wire together, like ants in a line carrying food home to their nest."

Zoom Out: Home and Community Systems
Every home, school, and building has electrical systems running through the walls—just like the terminal block in the photo. These systems power lights in classrooms, refrigerators at home, computers, and heating systems. Electricians design and fix these big circuits to keep our communities safe and comfortable. When you flip a light switch, you're controlling a circuit that connects to power plants miles away that generate electricity for your whole neighborhood!

Discussion Questions

1. "What do you think happens when we unplug one of these wires?" (Bloom's: Understand | DOK: 1)

2. "Why do we use different colors of wires—what could the colors help us remember?" (Bloom's: Analyze | DOK: 2)

3. "Can you trace the path that electricity takes from the battery, through the wires, and back again?" (Bloom's: Apply | DOK: 2)

4. "What would happen if we built a circuit that powers a lamp—would the light work if we removed one wire?" (Bloom's: Evaluate | DOK: 3)

Potential Student Misconceptions

Misconception 1: "Electricity is like magic and appears out of nowhere."
Scientific Clarification: Electricity is energy that has to come from somewhere (like batteries or power plants) and it travels through wires along a specific path. It's not magic—it follows rules! Electricity only works when there's a complete loop, and we can control it by opening and closing connections, just like turning a faucet on and off.

Misconception 2: "All wires do the same thing, so color doesn't matter."
Scientific Clarification: Different colored wires help people organize electrical systems and remember what each wire does. In real buildings, electricians use color codes as a safety system—for example, black wires often carry power and white wires return it. The colors act like labels on a toy box so electricians know exactly which wire does what job.

Misconception 3: "Electricity in wires is dangerous to touch, so all electricity is the same level of danger."
Scientific Clarification: The electricity in this terminal block (low voltage from batteries) is safe to touch when you follow rules. But electricity from wall outlets in homes is much more powerful and is dangerous. This is why we never touch outlets or plug in things near water. Different sources of electricity have different amounts of power—like how a tricycle and a car both have wheels, but one is much more powerful.

Extension Activities

1. "Build a Simple Circuit with Batteries" — Provide each small group with a AA battery, two wires, and a small LED light or buzzer. Guide them to connect the wires to complete the circuit and watch the light turn on. Ask: "What happens when we remove one wire?" (Emphasize: Never use household electricity.)

2. "Color-Coded Pathway Game" — Create a large floor circuit using colored tape (blue, red, yellow, green) arranged in a loop. Have students walk along the "electricity pathway," then stop when you remove one section of tape, demonstrating a "broken circuit."

3. "Conductor and Non-Conductor Sorting" — Provide safe materials (plastic straws, foil, wooden blocks, metal spoons) and ask: "Which ones could electricity flow through?" Group them while discussing why metals conduct electricity better than plastic or wood. (Use visual demonstrations only—no electrical testing for K students.)

Cross-Curricular Ideas

Math Connection: Counting and Patterns
Have students count the numbered terminals on the green block (1–8) and identify the pattern. Ask: "What number comes after 5? After 7?" Create a matching activity where students match the correct number of colored wires to numbered terminal spaces. This reinforces number recognition and sequencing in a hands-on way.

ELA Connection: Vocabulary and Storytelling
Read aloud a simple book about electricity, then have students create a "Circuit Story" with pictures. They draw the path electricity takes: "First, it leaves the battery. Then, it travels through the red wire. Next, it lights up the bulb. Finally, it goes back to the battery." This develops sequencing language and introduces temporal words (first, next, finally).

Art Connection: Color Mixing and Design
Use the colored wires as inspiration for an "Electrical Pathway Art Project." Students create circuits using colorful yarn or string taped to large paper, arranging the paths in loops and patterns. Discuss which color combinations are pretty and easy to follow. This connects to color theory while reinforcing the concept that circuits are looped pathways.

Social Studies Connection: Community Helpers
Introduce electricians as community helpers who keep our schools and homes safe by fixing and installing electrical systems. Invite a local electrician (or show a short video) to talk about their job. Students can then role-play as electricians, "fixing broken circuits" in a classroom activity, understanding how these workers help our community stay safe and comfortable.

STEM Career Connection

Electrician
Electricians are builders and fixers who work with electricity every day! They install wires in new buildings, fix broken circuits when lights don't work, and make sure electricity reaches homes and schools safely. They use tools to connect wires (like the terminal blocks in this photo) and follow special color codes to make sure everything works perfectly. It's like being a puzzle solver—you have to figure out how electricity should flow and connect all the pieces correctly.
Average Annual Salary: $54,000–$58,000 USD

Electrical Engineer
Electrical engineers are designers who create the plans for how electricity flows through buildings, computers, phones, and even cars! They use computers to draw diagrams (like a blueprint) that show where every wire should go. They think about big problems like "How do we get electricity to a whole city?" or "How do we make a toy that uses less battery power?" It's like being an inventor who solves puzzles with electricity.
Average Annual Salary: $104,000–$110,000 USD

Power Plant Operator

Power plant operators work at big facilities that make the electricity that flows through the wires in our homes. They run massive machines and monitor computers to keep electricity flowing safely to entire cities. It's an important job because without them, our lights, heaters, and computers wouldn't work! They're like the "captains" of a ship, making sure everything runs smoothly and safely.
Average Annual Salary: $78,000–$82,000 USD

NGSS Connections

Performance Expectation (K-PS2-1): Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.

Relevant Disciplinary Core Idea:
* K-PS3.A Energy can be transferred in various ways between objects and systems.

Crosscutting Concepts:
* Cause and Effect — Electricity only flows when there is a complete circuit; breaking the circuit stops the flow.
* Systems and System Models — A circuit is a system with inputs (power source), connections (wires), and outputs (devices that light up or move).

Science Vocabulary

* Circuit: A path that electricity travels along, like a loop that electricity follows to power lights or toys.

* Wire: A thin metal cord that electricity can flow through safely to reach devices.

* Terminal: A connection point where wires plug in, like a socket where electricity can enter or leave.

* Electricity: Energy that flows through wires and powers machines, lights, and devices in our homes.

* Connection: When two wires or devices are joined together so electricity can flow between them.

External Resources

Children's Books:
Electricity Everywhere* by Betsy Duffey (Simple introduction to where electricity comes from and how we use it)
Pop! Uses of Energy* by Rebecca Felix (Colorful photos showing energy in action, including electricity)
The Darkest Dark* by Chris Hadfield and Kate Fillion (Engaging story about light and darkness that introduces young learners to energy concepts)

Teacher's Note: This lesson is best scaffolded across 3–4 short sessions (15–20 minutes each) to maintain Kindergarten attention spans. Always emphasize electrical safety and keep all demonstrations controlled with low-voltage batteries only.