

## Photo Description



A person is using wires to connect a small light bulb to a battery. The light bulb is glowing, which shows that electricity is flowing through the wires from the battery to make the bulb light up. This is a simple electric circuit that demonstrates how electricity travels in a complete path.

## Scientific Phenomena

The Anchoring Phenomenon shown is a complete electrical circuit creating light energy. This occurs because the battery provides electrical energy that flows through the conducting wires to the light bulb. When electricity passes through the thin wire filament inside the bulb, it encounters resistance, which converts the electrical energy into both light and heat energy. The circuit must be complete (forming a closed loop) for the electricity to flow continuously from the positive terminal of the battery, through the wires and bulb, and back to the negative terminal.

## Core Science Concepts

1. Electrical Circuits - Electricity needs a complete path (circuit) to flow from the energy source (battery) through conductors (wires) to the device (light bulb) and back to the source.
2. Energy Transfer - The battery stores chemical energy that gets converted to electrical energy, which then transforms into light and heat energy in the bulb.
3. Conductors and Insulators - Materials like copper wire allow electricity to flow through them easily (conductors), while other materials like plastic coating on wires prevent electricity from flowing (insulators).
4. Energy Transformation - Energy changes from one form to another but is never destroyed, demonstrating the law of conservation of energy.

### Pedagogical Tip:

Have students physically trace the path of electricity with their finger along the wires to help them visualize the complete circuit concept. This kinesthetic approach helps solidify the abstract concept of electrical flow.

### UDL Suggestions:

Provide multiple ways for students to demonstrate circuit knowledge: drawing diagrams, building physical models with play dough and LEDs, or creating digital simulations. This supports different learning preferences and abilities.

## Zoom In / Zoom Out

1. Zoom In: Inside the light bulb, electrons flow through a very thin tungsten filament wire. As electrons bump into the atoms in the filament, they create resistance that causes the wire to heat up so much it glows white-hot, producing light.

2. Zoom Out: This simple circuit represents the same principles used in our homes' electrical systems, power grids, and even electronic devices like smartphones and computers. All electrical systems rely on complete circuits to function safely and effectively.

### Discussion Questions

1. What do you think would happen if we removed one of the wires from the battery? Why? (Bloom's: Analyze | DOK: 2)
2. How is the energy changing as it moves from the battery to the light bulb? (Bloom's: Understand | DOK: 2)
3. What other materials could we test to see if they conduct electricity like these wires do? (Bloom's: Apply | DOK: 2)
4. How does this simple circuit compare to the electrical system in our classroom? (Bloom's: Evaluate | DOK: 3)

### Potential Student Misconceptions

1. Misconception: Electricity gets "used up" as it flows through the circuit.  
Clarification: Electricity flows in a complete loop. The energy gets transformed (chemical to electrical to light/heat), but the electric current continues to flow as long as the circuit is complete.
2. Misconception: Electricity only flows in one direction from the battery.  
Clarification: Electricity flows in a complete loop - out of one end of the battery, through the circuit, and back into the other end of the battery.
3. Misconception: The wires contain electricity.  
Clarification: Wires are pathways that allow electricity to flow through them, like pipes allow water to flow, but they don't store electricity.

### NGSS Connections

- Performance Expectation: 4-PS3-2 - Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.
- Disciplinary Core Ideas: PS3.A (Definitions of Energy), PS3.B (Conservation of Energy and Energy Transfer), ETS1.A (Defining and Delimiting Engineering Problems)
- Crosscutting Concepts: Energy and Matter, Cause and Effect

### Science Vocabulary

- \* Circuit: A complete path that electricity follows to flow from one place to another and back again.
- \* Conductor: A material that allows electricity to flow through it easily, like copper wire.
- \* Energy Transfer: When energy moves from one object to another or changes from one form to another.
- \* Electrical Current: The flow of electricity through a conductor like a wire.
- \* Resistance: When a material slows down or fights against the flow of electricity passing through it.

### External Resources

Children's Books:

- Electricity and Magnetism by David Dreier
- Switch On, Switch Off by Melvin Berger
- Oscar and the Bird: A Book About Electricity by Geoff Waring

YouTube Videos:

- "Electric Circuits for Kids" - Simple explanation of how circuits work with animated examples: <https://www.youtube.com/watch?v=J4Vq3QVOhkQ>
- "Bill Nye the Science Guy: Electricity" - Engaging demonstration of electrical concepts and safety: [https://www.youtube.com/watch?v=v-HW\\_RKxuXs](https://www.youtube.com/watch?v=v-HW_RKxuXs)