Lesson Plan: The Power of Parallel Circuits

Materials Needed:

- 1 D-Cell Battery (or a 1.5-3V battery holder with batteries)
- 3 Small light bulbs (1.5V to 3V) in bulb holders
- 6-8 Alligator clip wires
- A small buzzer or motor (Optional, for extension)
- Student notebook or a sheet of paper
- Pencil

Lesson Details

Subject: Science / Physics

Grade Level: 6th-7th Grade (Age 12)

Time Allotment: 60 Minutes

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1. Learning Objectives

By the end of this lesson, the student will be able to:

- **Define** a parallel circuit as a circuit with multiple paths for the electrical current.
- **Construct** a functional parallel circuit that lights up at least two bulbs.
- **Predict and explain** why the other bulbs in a parallel circuit remain lit when one is removed.
- **Compare** the brightness of bulbs in a parallel circuit to those in a series circuit.

2. Alignment with Standards

This lesson aligns with the Next Generation Science Standards (NGSS):

- **MS-PS2-3:** Ask questions about data to determine the factors that affect the strength of electric and magnetic forces. (This lesson provides a foundation for understanding how circuit design affects the flow of electricity).

3. Instructional Strategies & Lesson Procedure

Part 1: The Hook - A Real-World Puzzle (10 minutes)

1. **Ask the student:** "Have you ever seen a string of holiday lights where one bulb burns out, but all the others stay on? On older sets, if one bulb went out, the whole string would go dark! Why do you think that happens?"
2. Listen to their ideas without correcting them. This is to spark curiosity.
3. **Quick Review:** "Let's quickly build the type of circuit that would make the whole string go out." Guide the student to create a **series circuit** with the battery and two bulbs. (One single loop).
    - Ask: "What do you notice about the brightness of the bulbs?" (They might be a bit dim).
    - Ask: "Now, unscrew one bulb. What happens?" (The other one goes out). "This is a series

circuit. All the electricity has to flow through every single part, in one single path."

Part 2: Introducing Parallel - The River Analogy (15 minutes)

1. **Introduce the concept:** "The newer holiday lights use a different kind of circuit called a **parallel circuit**. The key difference is that a parallel circuit gives the electricity multiple paths to follow."
2. **Use an analogy:** "Imagine electricity is like water flowing in a river. In a series circuit, the river is one single stream. If you put a dam anywhere, the whole river stops. In a parallel circuit, the main river splits into several smaller streams, and they all join back together later. If you dam up one of the small streams, the water can still flow through all the other streams."
3. **Build It:** "Let's build one of these 'multi-stream' circuits."
    - Start with one bulb connected to the battery.
    - "Now, we want to add a second bulb, but we want it to have its OWN path back to the battery."
    - Guide the student to connect a new set of wires, one to each side of the *first* bulb's connections, and run these new wires to the second bulb. This creates a new, separate "branch."
    - Ensure the circuit works and both bulbs light up.

Part 3: Experiment and Discover (20 minutes)

1. **Make a Prediction:** "Okay, you've built it. Now, look at your circuit. In your notebook, write down a prediction: What will happen to Bulb #2 if you unscrew Bulb #1?"
2. **Test It:** Have the student unscrew the first bulb. (The second bulb should stay lit).
3. **Analyze the Result:** "Was your prediction correct? Why did the second bulb stay on?" Guide them back to the river analogy. The electricity still has a complete, unbroken path through the second branch, even though the first branch is open.
4. **Observe Brightness:** "Compare the brightness of these two bulbs to the brightness of the bulbs in the series circuit. What do you notice?" (The bulbs in parallel should be brighter because each receives the full voltage from the source, unlike in a series circuit where the voltage is shared).

4. Differentiation and Inclusivity

- **For Extra Support:** Provide a clear, simple diagram of the parallel circuit for the student to copy exactly. Work alongside them, building the circuit together step-by-step.
- **For an Advanced Challenge (Extension):**
    - "Can you add a third bulb in parallel on its own branch?"
    - "Can you add a switch that controls *only one* of the bulbs, leaving the others on?"
    - (Optional) "Let's replace one of the bulbs with this buzzer/motor. Does the circuit still work? What does this tell you about how your house is wired?"

5. Assessment Methods

- **Formative (during the lesson):**
    - Listen to the student's prediction and their explanation after the experiment.
    - Observe their ability to construct the circuit and troubleshoot any issues (e.g., loose connections).
- **Summative (at the end of the lesson):**
    - Ask the student to draw a diagram of their parallel circuit in their notebook.
    - Below the diagram, ask them to write two sentences answering:
        1. What is the main advantage of a parallel circuit?
        2. Why are the rooms in our house wired in parallel and not in series?

6. Closure and Real-World Connection (5 minutes)

Discuss where we see parallel circuits in real life. Reinforce the main idea: "So, the reason you can turn off the light in your bathroom without the whole house going dark is because your house is wired in parallel! Every light, every outlet, is on its own branch of the circuit." This solidifies the relevance of the lesson and connects it directly to their daily experience.