**📍 Station 3: Light It Up!**

**Focus:** Energy Transfer & Circuits
**NGSS Standard:** **4-PS3-4**

### **Goal:**

Your goal is to **build a working circuit** using batteries, wires, and a lightbulb or LED to **transfer electrical energy into light**!

**Materials needed:**

 Battery pack (with 2 AA batteries installed)

 LED light or small light bulb

 Wires with alligator clips

 Paperclips or foil (for optional switch)

 Optional: Multimeter (to measure voltage)

**Student Directions:**

#### Step 1: Build Your Circuit

1. Connect one wire from the **positive (+) side of the battery pack** to one side of the **LED or bulb**.
2. Connect a second wire from the **other side of the LED/bulb** back to the **negative (–) side of the battery pack**.
3. When both connections are complete, the **light should turn on**!

➡️ If it doesn’t light up, check:

* Are the wires connected tightly?
* Is the LED facing the right direction? (Try flipping it—LEDs have polarity!)

#### 💡 Step 2: Test Energy Transfer

* Watch what happens when the circuit is closed (connected all the way).
* What do you **see**, **feel**, or **hear** that shows energy is moving?

#### 🧲 Step 3: Make a Switch (Optional)

1. Disconnect one wire from the battery pack.
2. Insert a **paperclip** or small piece of **aluminum foil** between the wire and the battery terminal.
3. Try **touching or separating** the foil to open or close the circuit—does your light now work like it’s on a switch?

#### 🔍 Step 4: Use a Multimeter (Optional)

* Connect the multimeter to the battery pack to see how many volts are being sent through the wires.
* Try testing the voltage when the light is **on vs. off**.

### 📝 Record It:

| **Observation Prompt** | **Your Notes** |
| --- | --- |
| 💡 Did your circuit work? | ☐ Yes ☐ No |
| ⚡ What materials helped transfer the energy? | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 🛠️ What could you improve or add to your design? | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 💭 What do you think would happen with more batteries? | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

### 💬 Discussion Prompts:

* What kind of energy did you start with? What kind did you end with?
→ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Why is it important for circuits to be closed (connected fully)?
→ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Where else do you see circuits or switches in real life?
→ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**🧠 Wrap-Up Questions (Discuss or Write):**

1. Why is it important to measure things in science?
→ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. What was your favorite tool to use and why?
→ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. What did you learn about magnets or circuits that surprised you?
→ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

### 🔌 Station 3: **Light It Up!**

**Focus:** Energy Transfer & Circuits
**NGSS Standard:** **4-PS3-4** – Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.

### ✅ **ITEEA STEL Standards – Elementary Level**

**STEL 1A** – Technological products and systems are created by designers.
→ Students construct circuits and modify designs to achieve working energy transfer systems.

**STEL 2A** – Systems are the building blocks of technology.
→ The circuit is presented as a system with components working together (battery, wires, light).

**STEL 4A** – Materials have properties that help determine how they are used.
→ Students explore conductive materials (wires, foil, paperclips) and how they influence circuit function.

**STEL 7A** – Energy can be used to do work.
→ Learners observe how electrical energy is converted into light energy.

**STEL 8A** – Design involves identifying a problem and creating a solution.
→ Students test their circuit and improve it if it doesn’t work—following a design thinking process.

**STEL 11A** – Describe and explain how information is collected and used to inform decisions.
→ Observations and optional voltage readings guide decisions about improving or altering the circuit design.

### ✅ **Common Core Math Standards – Elementary (Grades 3–4)**

**CCSS.MATH.CONTENT.3.MD.A.2** – Measure and estimate liquid volumes and masses of objects using standard units.
→ Optional extension if students measure voltage or use resistors.

**CCSS.MATH.PRACTICE.MP2** – Reason abstractly and quantitatively.
→ Students think through the function of the circuit system and reason about the flow of energy.

**CCSS.MATH.PRACTICE.MP5** – Use appropriate tools strategically.
→ Use of tools like wires, multimeters, and LED components for testing and measurement.

**CCSS.MATH.PRACTICE.MP6** – Attend to precision.
→ Precision in making electrical connections, polarity awareness for LEDs, and multimeter usage.

### ✅ Summary:

This activity integrates **science, engineering, and design**. Students build, test, and refine a working circuit that demonstrates energy transfer (electrical → light). It supports **NGSS 4-PS3-4**, aligns with **ITEEA STEL standards** for systems, materials, and energy, and connects with **Common Core Math** through reasoning, measurement, and tool use.