**🔔 Station 4: Energy in Motion!**

**NGSS Standard:** MS-PS3-5
**Focus:** How does electrical energy turn into other types of energy?

**Goal:**

You’ll build simple circuits and test different output devices (a buzzer, motor, and LED). Observe how electrical energy changes into **sound**, **motion**, or **light**. You are exploring *energy transformations!*

**FOCUS:**

Energy Transformations – Observe how electrical energy changes into sound, motion, or light using different output devices.

**Materials:**

* Buzzer or motor
* LED (light-emitting diode)
* Arduino OR basic battery-powered circuit with a switch
* Breadboard or circuit base
* Wires and alligator clips
* Battery pack (AA or 9V)

**Student Directions:**

**STEP 1: Set Up Your Power Source:**

* + Connect the battery pack to the breadboard or Arduino.
	+ Be sure the power is OFF at the start.

**STEP 2: Connect Your Output Device:**

* + Choose one output (LED, buzzer, or motor) and connect it to the circuit.
	+ Make sure the polarity (positive and negative) is correct for the LED or motor.

**STEP 3: Test the Circuit:**

* + Flip the switch ON and observe what happens.
	+ What do you hear? What do you see? What do you feel?

**STEP 4: Repeat with Other Devices:**

* + Swap out the output device (try all 3: buzzer, motor, and LED).
	+ Turn the switch ON/OFF each time and record your observations.

**STEP 5:Observe and Record:**

* + Fill in the data table below. Think about what type of energy is produced and where it came from.

**🧠 Record It!**

| **Output Device** | **Type of Energy Produced** | **Energy Transfer (From → To)** |
| --- | --- | --- |
| Buzzer |  |  |
| Motor |  |  |
| LED |  |  |

**💡 Think About It:**

* What happened when you turned the switch on?
* What energy change occurred each time?
* Which device surprised you the most?

✍️ Write your reflection or explanation on the back of your worksheet or notebook.

**Station 4: Energy in Motion!** activity:

🔔 **NGSS Standard:**
**MS-PS3-5** – *Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.*

✅ **ITEEA STEL Standards – Middle School**

**STEL 1E** – *Technological systems use inputs, processes, outputs, and feedback to solve problems.*
→ Students explore systems by building and testing circuits with different outputs (sound, motion, light) and identifying energy input/output relationships.

**STEL 6F** – *Energy is the capacity to do work.*
→ The activity directly addresses energy transformations—electrical energy converted into light, motion, and sound.

**STEL 7F** – *Technological products and systems can be used to apply energy in a variety of ways.*
→ Students apply energy through different output components (motor, buzzer, LED), observing various effects.

**STEL 11F** – *Modeling, testing, evaluating, and modifying are used to transform ideas into practical solutions.*
→ Students test and observe different configurations, collect data, and reflect on energy transformation outcomes.

✅ **Common Core Math Standards – Middle School**

**CCSS.MATH.CONTENT.6.SP.B.4** – *Display numerical data in plots, such as tables, and describe the data.*
→ Students organize and interpret observations using the data table provided in the activity.

**CCSS.MATH.CONTENT.7.EE.B.4** – *Use variables to represent quantities in real-world problems and construct simple equations and inequalities.*
→ If extended, students can quantify energy input/output or voltage/resistance in more advanced setups.

**CCSS.MATH.CONTENT.7.RP.A.2** – *Recognize and represent proportional relationships between quantities.*
→ Observing how changing voltage or resistance impacts energy output could reinforce proportional reasoning.

💡 **Summary:**
This station-based activity helps middle schoolers understand and observe real-time **energy transfers** in circuits—turning **electrical energy** into **motion**, **light**, and **sound**. It supports cross-disciplinary learning between science, technology, and math, aligning with both **ITEEA’s STEL standards** and **Common Core Math** expectations.