**🎮 Final Challenge: Build Your Own Mini Game Circuit!**

**NGSS Standards:**

* *HS-PS3-3 – Design a device to convert energy from one form to another*
* *HS-ETS1 – Engineering Design Process*

**🎯 Your Mission:**

Use what you’ve learned from all the stations to **design and build your own interactive game** that uses a working circuit! Your game should involve **energy transfer** (like from electrical to light, sound, or motion).

**FOCUS:**

**Energy Transfer & Engineering Design** – Use electric circuits to design interactive systems that transform electrical energy into light, sound, or motion while applying the engineering design process to create a working game.

 **Choose a Game Type:**

Pick **ONE** of the following mini game designs (or invent your own!):

 **Buzz Wire Game**

Guide a metal loop along a bent wire without touching it. If the loop touches, a buzzer goes off!

**🔦 LED Maze**

Create a puzzle path. When the player completes the correct route, it closes the circuit and lights up the LEDs.

**🟪 Pressure Pad Puzzle**

Use foil and foam to make a pad that only completes the circuit when weight is applied—triggering a light or buzzer.

**Available Materials:**

* Battery (9V or AA with holder)
* LEDs, buzzer
* Wire or copper tape
* Aluminum foil, foam board, cardboard
* Tape, glue, resistors, switches
* Scissors or paper clips

**Student Directions**

**STEP 1: Plan Your Game**

* Decide which game you want to build.
* Think about how a player will interact with it.
* Sketch your circuit and layout on the template below or on a blank page.

**STEP 2: Build the Circuit**

* Use wire, foil, or copper tape to create paths.
* Connect your components (LEDs, buzzers, switches) using a breadboard or alligator clips.
* Make sure your circuit **completes** only when a player makes the correct move.

**STEP 3: Test & Tweak**

* Try playing your game!
* Fix any parts that don’t work by checking your connections, battery, and component placement.
* Ask another group to test your game and give feedback.

**Sketch Your Game Circuit & Layout:**

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Which Energy Transfers Happen in Your Game?**

(E.g., Electrical → Light, or Electrical → Sound)
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**💬 Wrap-Up Reflection:**

**What surprised you most about how circuits work?**
→ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**If you had more time, what feature would you add to your game?**
→ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Which part of the challenge helped you learn the most?**
→ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

🎮 **Final Challenge: Build Your Own Mini Game Circuit!**

**NGSS Standards:**

* **HS-PS3-3** – *Design, build, and refine a device that works within given constraints to convert one form of energy into another.*
* **HS-ETS1** – *Engineering Design: Define problems, develop models, test and refine solutions.*

✅ **ITEEA STEL Standards – Middle School Level**

**STEL 1E** – *Technological systems use inputs, processes, outputs, and feedback to solve problems.*
→ Students create complete circuits that respond to user actions—defining inputs (switch, sensor), processes (circuit logic), and outputs (light, sound).

**STEL 2E** – *Technological systems are made up of interactive parts.*
→ Learners design complex systems (games) with multiple parts working together (switches, buzzers, LEDs).

**STEL 7F** – *Technological products and systems can be used to apply energy in a variety of ways.*
→ Students explore and apply different types of energy transformations: electrical → sound/light/motion.

**STEL 8F** – *Design involves a set of steps that can be performed in different sequences and repeated as needed.*
→ The build-test-refine loop during game construction mirrors the engineering design process.

**STEL 11F** – *Modeling, testing, evaluating, and modifying are used to transform ideas into practical solutions.*
→ Students sketch, build, test, and revise their own working circuit-based games.

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

**CCSS.MATH.CONTENT.6.SP.B.4** – *Display numerical data in tables and describe patterns.*
→ Students may collect and analyze data while testing their circuits (e.g., number of successful triggers, brightness/sound levels).

**CCSS.MATH.CONTENT.7.EE.B.3** – *Solve real-life problems using numerical and algebraic expressions.*
→ Optional: If students calculate resistance, voltage, or power, they can connect their real-world circuit building to algebraic reasoning.

**CCSS.MATH.CONTENT.7.RP.A.2** – *Recognize and represent proportional relationships between quantities.*
→ Energy output (e.g., brightness) can be connected to proportional voltage or resistance changes in circuit variations.

**✅ Summary:**

This culminating activity brings together engineering, energy systems, and problem-solving. It aligns with **ITEEA STEL standards** for systems thinking and the design process, and supports **Common Core Math** through data collection, proportional reasoning, and mathematical problem-solving related to circuits and game logic.