**🎮 Final Challenge: Design a Circuit Game!**

**NGSS Standard: 4-PS3-4**  
**Goal:** Create a simple “touch the target” or “match the wire” game that uses **light** or **sound** when players win.

**Materials Needed:**

* LEDs and/or buzzers
* Aluminum foil (for creating switches or contact points)
* Wires or paper clips
* Paper or cardboard (for the game board)
* Tape, scissors, glue
* Markers or crayons (for decoration)
* Battery pack (with batteries)

**Student Directions:**

**Step 1: Plan Your Game**  
Think of a game idea that uses a **circuit to signal success**. Choose one:

* **Touch Match Game** – Players touch two foil pads to complete a circuit and turn on the light/buzzer.
* **Wire Maze Game** – Players guide a metal loop along a wire path. If they touch the wire, the buzzer sounds!

**Sketch your game board idea on scrap paper or in your notebook.**  
Think about: Where will the switch go? Where will the foil be? Where will the light or buzzer be?

**Step 2: Build Your Game Board**

* Use paper or cardboard as your game base.
* Create your foil pads or maze using aluminum foil and tape.
* Decorate your board with colors, designs, or labels.

**Step 3: Build the Circuit**

* Connect the **battery**, **LED or buzzer**, and **foil/contact points** using wires.
* Make sure the **foil or wire maze is part of the circuit path**—it should only close the circuit when touched (or not touched, depending on the game).
* **Test each part** as you go. Does the LED or buzzer work?

**Step 4: Test & Improve**  
Try playing your game! Then answer the checklist:

✅ Does the **LED light up** when the player wins?  
✅ Does the **buzzer sound** when the player touches the maze?  
✅ Do any parts need fixing or re-taping?

Use trial and error to make the game more reliable and fun!

**Design Thinking Questions:**

1. **What part of the game triggers the light or buzzer?**  
   → \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. **What kind of energy is being used and changed in your circuit?**  
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**Wrap-Up Reflection**

1. **What did you learn about how electricity makes things work?**  
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2. **Which part was the most fun to build or redesign?**  
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3. **If you could make your game even better, what would you add or change?**  
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**✅ ITEEA STEL Standards – Elementary Level**

**STEL 1A** – *The study of technology uses knowledge and skills from other subject areas.*  
→ Students combine concepts from science, math, and engineering to plan and build a functional circuit-based game.

**STEL 2A** – *Technological systems are designed to meet needs and wants.*  
→ The game acts as a simple technological system that fulfills a user-centered goal (fun + feedback through light/sound).

**STEL 4A** – *Break systems into parts to see how they work together.*  
→ Students identify components (battery, foil, buzzer, wires) and see how they interact as parts of a complete circuit.

**STEL 8A** – *Design is a creative process for meeting human needs and wants.*  
→ Students use the design process to sketch, prototype, test, and improve a unique circuit game.

**STEL 9A** – *Modeling helps convey ideas and communicate solutions.*  
→ Game sketches and labeled circuit drawings help students share and explain their designs.

**✅ Common Core Math Standards – Elementary Level**

**CCSS.MATH.CONTENT.3.MD.C.5–7** – *Understand area and perimeter concepts.*  
→ Students apply measurement when creating game boards, designing foil paths, or spacing contact points.

**CCSS.MATH.PRACTICE.MP1** – *Make sense of problems and persevere in solving them.*  
→ Students identify and troubleshoot broken circuits or misaligned parts until their game works reliably.

**CCSS.MATH.PRACTICE.MP4** – *Model with mathematics.*  
→ Students sketch circuit paths, design layouts, and logically organize their circuit flow.

**CCSS.MATH.PRACTICE.MP5** – *Use appropriate tools strategically.*  
→ Students use scissors, tape, batteries, and wires appropriately to build a working game.

**CCSS.MATH.PRACTICE.MP6** – *Attend to precision.*  
→ Success requires accurate placement of foil pads, tight wire connections, and clean circuit paths.

**✅ Summary:**

This project-style challenge is a great capstone activity that integrates **engineering design**, **energy transfer**, and **creative expression**. Students demonstrate NGSS-aligned understanding of circuits and energy while also practicing **ITEEA systems thinking** and **Common Core math skills** in spatial planning, problem-solving, and modeling.