Don't Just Code It, Hold It.

Physical Computing with Circuit Playground Express & Code.org

NETA Conference 2026 | Session: Show & Share Presenter: Tiffany Lothrop | tiffanyl@creteschools.org

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Target Audience: Middle School (6-8) Teachers, Tech Coaches, STEAM Specialists

Session Description: Coding concepts like "events" and "variables" can feel abstract on a screen. Make them tangible! Stop by this interactive Maker Playground to see how the Circuit Playground Express (used in Code.org CS Discoveries) bridges the gap between block code and the real world. You won't just watch—you'll press buttons, trigger lights, and see how easy it is to manage physical computing in a middle school classroom. Walk away with a "Principal-Ready" shopping list, classroom management hacks, and a link to a free, standards-aligned unit you can start next week.

Participant Takeaways:

1. **Experience Physical Computing:** Hands-on interaction with the Circuit Playground Express to understand how it engages all coders.
2. **Curriculum Roadmap:** A clear guide on where to find the free, compatible lessons within Code.org CS Discoveries (Unit 6), Adafruit Learn,
3. **Management Survival Kit:** Strategies for organizing devices, managing student excitement, and troubleshooting common hardware issues.

Curriculum Roadmap:

Nebraska State Standards (CIS: Communication & Information Systems)

- **CIS.MS.CS.01 (Computing Systems):** "Design projects that combine hardware and software components to collect and exchange data."
- **CIS.MS.AP.02 (Algorithms & Programming):** "Create variables that represent different types of data and manipulate their values."
- **CIS.MS.AP.03 (Algorithms & Programming):** "Decompose problems and subproblems into parts to facilitate the design, implementation, and review of programs."

Nebraska Legislative Alignment

- **Nebraska Computer Science and Technology Education Act:** Your session directly supports the state mandate for districts to "include computer science and technology education in the instructional program of its elementary and middle schools."

ISTE Student Standards

- **1.5c Computational Thinker:** "Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving."

- **1.4a Innovative Designer:** "Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems."

💡 Why Physical Computing?

Middle school students struggle with abstract concepts like "events" and "variables" when they only exist on a screen. Physical computing bridges the gap.

- **Makes Code Tangible:** "If/Then" logic becomes "If I press this button, then the light turns red."
- **Instant Engagement:** Blinking lights and sounds hook students who might otherwise be bored by text-based coding.
- **Real-World Skills:** Introduces hardware concepts, circuitry, and debugging physical systems.

🚀 Try It Now: The "Lights and Images" Project

A project to show the board lighting up and changing images on the screen.

The Goal:

- Press Left Button for "Crete Cardinals" (cardinal image on the tablet and red/blue lights on the board)
- Press Right Button for "Spring" (spring images on computer and a range of colors on the board).
- Press the toggle switch open & closed to change the intensity of the color LEDs on the board

🛒 The "Ask Your Principal" Shopping List

Use this list to request funding. Prices are estimates.

Item	Why You Need It	Est. Cost
Circuit Playground Express (CPX)	The brain! Packed with LEDs, buttons, and sensors. No soldering required.	~$25.00 ea
Micro USB Cable	**CRITICAL:** Must be a **DATA** cable, not just a charging cable. Test them before class!	~$3.00 ea
Alligator Clips (Test Leads)	To connect external items (fruit, cardboard, foil) to the board pads.	~$5.00/pk
Battery Pack (3xAAA)	Optional: Lets projects travel away from the computer (e.g., wearables).	~$2.00 ea
Code.org Circuit Playground Express Educators' Pack	15 x Circuit Playground Express or Green Circuit Playground Express - Programmed with Firmata so it can be used with code.org out of the box 15 x USB cable - A/MicroB - 3ft 10 x Small Alligator Clip Test Lead (set of 12) 12 x Adafruit LED Sequins - Multicolor Pack of 5	~$350.00/pk

Where to Buy: Adafruit, Amazon, or educational resellers.

📚 The Curriculum: Code.org CS Discoveries (Unit 6a)

You don't need to invent lesson plans. Code.org has a free, fully integrated unit.

- **Unit:** CS Discoveries Unit 6 - "Creating Apps with Devices"
- **Platform:** App Lab (Browser-based, no software installation needed!)
- **Key Concepts:**
  - **Events:** `onEvent(buttonL, "down", function()...`
  - **Properties:** `setProperty(led, "color", "red")`
  - **Sensors:** Light, Sound, Temperature, Accelerometer (motion)

🛠️ 2 Teacher Survival Tips

1. The "Data Cable" Disaster:

- *Problem:* Many USB cables are "charge only" and won't let the computer "see" the device.
- *Fix:* Mark all good data cables with a piece of colored electrical tape (e.g., Blue = Good). If a student says "it's not connecting," check for the blue tape first.

2. Organize Everything:

- Use a silver sharpie or label maker to number every Circuit Playground and every cable. Assign specific numbers to students. This reduces lost equipment and ensures accountability.
- **Rainbow Photo & Craft Keeper by Simply Tidy™** - Found at Michael's.
    - Store each set (Circuit Playground and cable) in one box.

🔗 Resources & Links

1. Official MakeCode Curriculum (Best for Beginners)

Microsoft and Adafruit provide a comprehensive, project-based course that uses the MakeCode block editor. It's perfect for the classroom because students can see a simulator on-screen before downloading to the board.

- **Key Lessons:**
    - **Sensors & Inputs:** Using the light sensor, thermometer, and buttons.
    - **Variables & Logic:** Creating "if-then" statements (e.g., *if* it gets dark, *then* turn on the lights).
    - **Physical Projects:** Lessons on making Magic Wands, Clap Lights, and Metronomes.
- **Direct Link:** Adafruit MakeCode Course

2. Code.org: CS Discoveries

If you are a teacher, Code.org has integrated the Circuit Playground into their **Computer Science Discoveries** curriculum (Unit 6: Physical Computing).

- **What's inside:** Lesson plans, slides, and videos that explain circuits and logic.
- **The "App Lab" Connection:** It teaches students how to create an app on their computer screen that interacts directly with the physical board.

3. CircuitPython "Made Easy"

For those ready to move past blocks, CircuitPython is the most popular way to learn text-based coding on these boards.

- **Projects include:**

- **Beat Visualizer:** Using the microphone to make LEDs dance to music.
- **Fidget Spinner:** Using the accelerometer to measure rotation speed.
- **Reaction Game:** A two-player game testing who can press a button the fastest.