TECHstyle TALES

Make. Learn. Share.

DAY 3: MAKING CONNECTION

Inputs, Outputs & Sewn Circuits

Families reflect on stories, use visual literacy skills to interpret the meaning of an artifact, learn about inputs and outputs, practice coding with sensors and motors, create a simple circuit schematic and sew a circuit using conductive materials.

badges

materials

- Light meal, disposable cutlery, drinks with lids
- Session 3 Slide Deck
- "Base" textile for all (bags, aprons, etc)
- Sewing kits
- Read-aloud books
- Paper
- Pens, pencils, crayons
- Sticky notepads
- CPX and cables, laptop, sewable LED (at least 1 per family)
- Optional: The Clapper
- Optional: posters or examples of woven artifacts

workshop day

1. WELCOME & SHARING

Meal time & story idea sharing
Sewing practice

2. STORYTELLING

Share a story
Weaving stories

3. EXPLORING

Inputs & Outputs on the CPX:
Information in & creating reactions
Inputs: Capacitive touch sensor
Project planning

4. ACKNOWLEDGING

Badges & reflection

MEALTIME & SHARING

30 minutes

Welcome families as they arrive. This time is for eating together and socializing. Invite them to practice sewing when they are finished eating.

Mingle and chat with families as they are eating. Join them for the meal at their tables and help them practice sewing. This is a good time to ask families about the stories they have chosen about their important places.

Make sure the daily schedule is posted prominently in the room:

- Welcome & Sharing
- Storytelling
- Exploring
- Acknowledging

materials

Meal & servingware
Daily schedule
Session 3 slide deck
Sewing kits

Optional: Books, or additional information

background info

- Remember that families may not be able to arrive exactly on time.
- Each day follows the same structure, so feel free to reuse the daily schedule for other sessions. You may also want to write the dates of the workshops on the schedule.
- This time is designated for general sewing practice in preparation for sewing circuits eventually.
- Request that families use the sewing kit included in their backpack, and supplement missing items as needed.
- **Basic Sewing Skills Required:**
  - Thread a needle
  - Tie a starter knot
  - Basic running stitch
  - Tie a finishing knot

SHARING A STORY

15 minutes

After the story is shared:

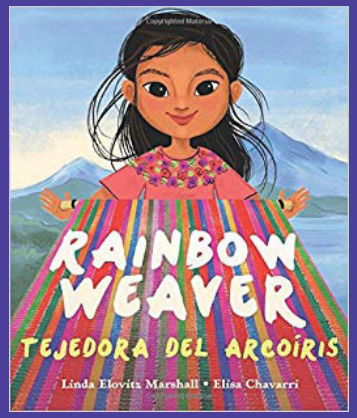
Use this time to ask follow up questions about the story, such as:

- What did the story mean to you?
- What details did you notice that you thought were interesting?
- How might the story be different if there weren't words?

materials

- Space to gather to hear a story
- *Optional: Video Projector & Sound*

Suggested read aloud book:
Rainbow weaver
Tejedora del arcoíris
by Linda Elovitz Marshall
(in English and Spanish)



background info

- Invite a visiting storyteller, scientist, artist, or even a participating family member to come and share an oral story. A story on the importance of place, community or family building, learning in everyday life, systems thinking, or embracing failure will support the themes in TechStyle Tales.
- Other options include reading aloud a thematic picture book or a short inspirational video.
- Families may want to listen to stories while sewing, playing with circuit blocks, or doodling while the story is being told. Sitting still and looking forward are not the only signs of paying attention. In our workshops, children who did not appear to be listening often had insightful questions about the story later.

WEAVING STORIES

15 minutes

Textiles and fabrics have been used to tell stories, just as a book or an oral story can.
Instead of hearing words or reading the story, you are looking for visual details in order to understand the story.

Project the image of a single tapestry, quilt, or basket on the screen, or hold up or pass around the object and prompt reflection questions.

ASK
In your families, look carefully at this image. Talk about the details that stand out to you. Step back and talk about how the details work together in a system to tell a story. There are no right or wrong answers when it comes to interpreting a story.

Provide a few minutes for this activity.

Questions:

- What do you notice in this object?
- What story is it telling?
- What can you tell about the place that it is depicting?
- What is interesting to you about this object?

ASK:
Would you share what you noticed about the tapestry? What story is it telling? What clues tell you more about the place it's depicting?

materials

Session 3 slide deck OR
printed poster of tapestry
OR
tapestry or pictoral basket

Scratch paper
Pens, pencils, markers, crayons

background info

- We would like families to understand that textiles (baskets, tapestries, etc) can be used to tell stories, and that our relationships to places are important to our identities as families. Sharing and analyzing objects will get the conversation started.
- Another option is to share a story that depicts basket weaving, such as ***i-i-esh,*** a story from the Yakama Nation as told by Roger Fernandes, or tapestry-weaving as storytelling.

EXPLAIN:
The artist of this textile used visual symbols to convey meaning. We may not know what they were thinking when they created this, and we may not know exactly whom it was created for. We do get a sense of place when we look at the symbols.

Share some background about the textile piece. The image included in the slide deck is a different and fairly recent style of Navajo weaving known as the Pictorial. Just as it sounds, the weaver incorporates images from things around them into the piece. This pictorial piece depicts Window Rock, Shiprock and Monument Valley as the focal points along with a strong Storm Pattern element. Angel Lena Jackson of the Sweetwater Area wove this brightly colored piece. Cultures around the world sew and weave artifacts that have cultural, familial, or personal significance. In many cases, the place where the object was made is infused in the design of the object, whether by the materials they used to create it, the intended use of the object, the decorations, or all of the above.

In this workshop series, we're going to keep coming back to this idea of place, and how places can shape who we are. This textile art may be an inspiration to you to tell your family story about an important place to you using electrical circuits. Please be thinking about your project decisions with your family as we move into learning more about programming and circuitry.

Harriet Powers, born a slave in Georgia in 1837, created this quilt after she was emancipated. She made use of appliqué techniques and storytelling often found in the textiles of Western Africa. While these textiles had typically been created by men, once the tradition was picked up in the United States women became the primary creators.

The panel in the center depicts a real event from November 13, 1833, in which falling stars made people fear that the end of the world had arrived.

https://www.artstor.org/2017/07/07/the-enduring-significance-of-harriet-powers-quilts/

Harriet Powers. Pictorial quilt; detail. 1895-98. Museum of Fine Arts, Boston

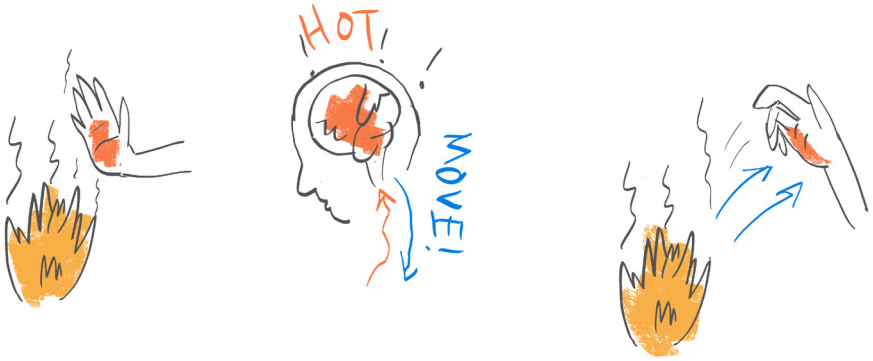
INPUTS & OUTPUTS

15 minutes

An important distinction to keep in mind is the difference between outputs and inputs. The CPX is has processing power and it has built-in inputs and outputs right there on the board.

Let's think about inputs and outputs in the natural world:
If you touch something hot, your skin senses the heat and pain and sends signals to your brain. Your brain tells you to move your hand away to protect yourself from harm and more pain. You move your hand away. This all happens in an instant. Your skin senses information being input (the heat), your brain tells you how to react, and your hand moves away in reaction (output).

Robotics often follow this pattern: *They sense, they think, then they act.*



materials

- Session 3 Slide Deck
- Optional: Clapper, light/ sound configured with Clapper

background info

- Outputs:The microcontroller send electrical signals to these various components (LEDs light up, motors spin, buzzers beep, etc.)
- Inputs: Take information from the outside world and send that to the microcontroller (switches and various types of sensors)
- The Clapper is a sound-activated on-and-off switch for appliances. See "more resources" for more infomation.

An **input**, like the word suggests, is a component that takes in information from the world, or senses things. It takes that information and sends it to the brain, or microcontroller, which has code telling it what to do with that information. Then, it sends a signal to an output that acts on that information in some way.

DISCUSS:

- **What are some components on the CPX that might be outputs?**
  Possible responses: Outputs are things like LEDs that light up, speakers that play sound, motors that spin, or buzzers that beep. Be prepared to think aloud together what the differences may be.

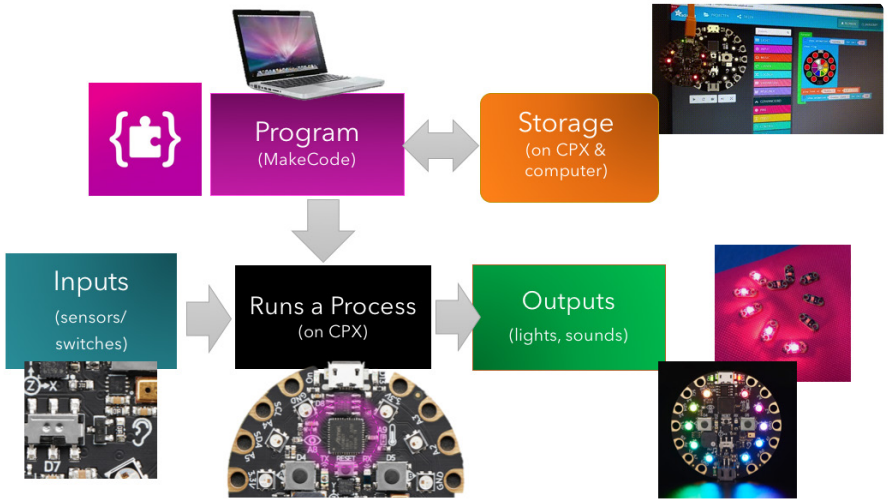
- **What components might be inputs?**
  Possible responses: The buttons and the switch are both inputs that we used last session. We also used the motion sensor, or accelerometer, when we programmed the CPX to do something after shaking it. There are many other inputs on the CPX such as the light sensor, distance sensor, microphone (sound sensor), temperature sensor, or infrared sensor.

- **Where do you think you encounter sensors in your daily life?**
  Possible responses: Motion-sensor lights, infrared sensors in remote controls, RFID sensors (like in some library books!), card readers, smoke detectors, etc. Be prepared to share some examples from your own life.

- **Does anyone remember the "Clapper"? How do you use one? What happens?**
  If you have an actual "clapper" configured, you may demonstrate it now. It senses the sound of a clap, or two quick claps, and turns on your light! Compare this to using the CPX microphone to turn on the light ring (see the tiny ear icon on CPX)

Share a slide of the computer system used with the CPX Systems of the CPX & Inputs, Outputs.

You, the programmer, write code on the computer that is saved on the computer, and is uploaded to the Circuit Playground's microcontroller chip. The CPX runs this process, which receives input from sensors or switches, and/or controls output components like lights and buzzers.



Together they all work together as a **system**. This is an example of an electronic system controlled by the microcontroller.

There are other types of systems in the world, such as ecosystems, that include many different processes working together that affect each other in some way.

EXPLORING INPUTS: CAPACITIVE TOUCH

30 minutes

In this section, families will follow a step-by-step introduction to programming the touch sensors on the CPX.

Last sesson we programmed one of the pins, or pads, to send electrical signals out. We were using the pin in that instance as an output - telling it to send a signal to the light to turn it on or off.

We can also use these pins as inputs, taking in information from the world. We're going to program it to react to our touch, a useful and fun feature to incorporate into your projects.

ASK

What are some electronics that respond to a light touch?

POSSIBLE RESPONSES

Touch lamps, smartphones, computer screens, any touch screens at all, etc.

EXPLAIN

Many modern electronics use a number of sensors to track your touch, including the type of sensing called *capacitive*. Capacitive touch sensing doesn't require any pressure to be applied to sense the touch.

The pins (or pads) on the Circuit Playground Express can work as capacitive touch sensors.

materials

- Session 3 Slide Deck
- CPX (1 per family)
- CPX USB cord
- Laptop and mouse (1 per family)
- Alligator Clips (2-4 per family)

background info

Capacitive Touch: the computer chip (microcontroller) is testing how much electricity can flow through to the pin. When you touch it with your finger (or other conductive material), this increases the capacity to conduct electricity. When it senses that change, a signal is sent to run your programmed action. It can detect and measure anything that is conductive or has a dielectric different from air (touchscreen phones, tablets, trackpads). If you're wearing insulating gloves, it won't sense your touch. This sensor only needs one point of contact to work. See the Resources section for more information.

Resistive Touch: These are the most basic and common touch screens, the ones used at ATMs and supermarkets, that require an electronic signature with that small grey pen. These screens literally "resist" your touch; if you press hard enough you can feel the screen bend slightly. This is what makes resistive screens work – two electrically conductive layers bending to touch one another. This is helpful when you use a stylus or another material that isn't conductive.

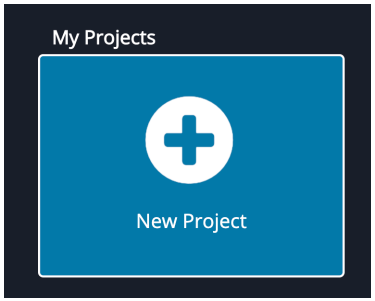
To try this out we are going to use an alligator clip, connected to one of the pins on the CPX (A7, for instance), to show you can touch the end of the alligator to get a reaction to occur in the CPX. When you are building your project, you can use a thicker area of conductive thread, aluminum foil, or any other conductive material as you capacitive touch "button."

Step-by-Step instructions

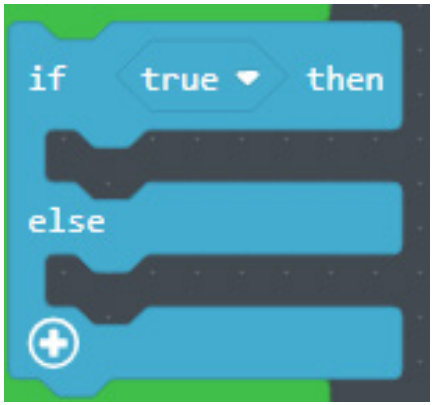
Instruct families to take out their CPX and laptops and connect them with the USB cable. They should open MakeCode in the app or in their browser. This demonstration should be done together. There will be time later for more exploration on their own.

EXPLAIN:

Click on **New Project.**

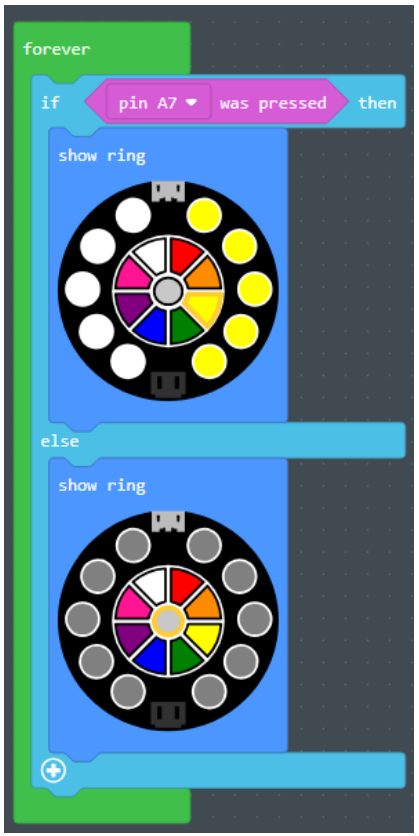


Find the IF/ELSE block in the LOGIC menu. Drag it into the workspace.



Under INPUT, look for the block BUTTON A WAS PRESSED and use the drop-down menu to change to the pin you've connected your alligator clip to (A7).

Drop it into the diamond shape of your IF/ELSE block where TRUE is to replace it.



We need a trigger to begin this program, so go into the LOOPS section and bring out the FOREVER block, wrapping around the other blocks.

Drag in other blocks to program an if/else reaction. For instance, the lights could turn one color if PIN A7 is touched, and show another color if it is not. You could program a sound to trigger instead. Whatever you choose. In this example, when the touch is sensed, the neopixels turn white and yellow. Otherwise, the neopixels turn off.

EXPLORING

Upload this program to your CPX. How did it go? Were you able to get this to work as you had planned?

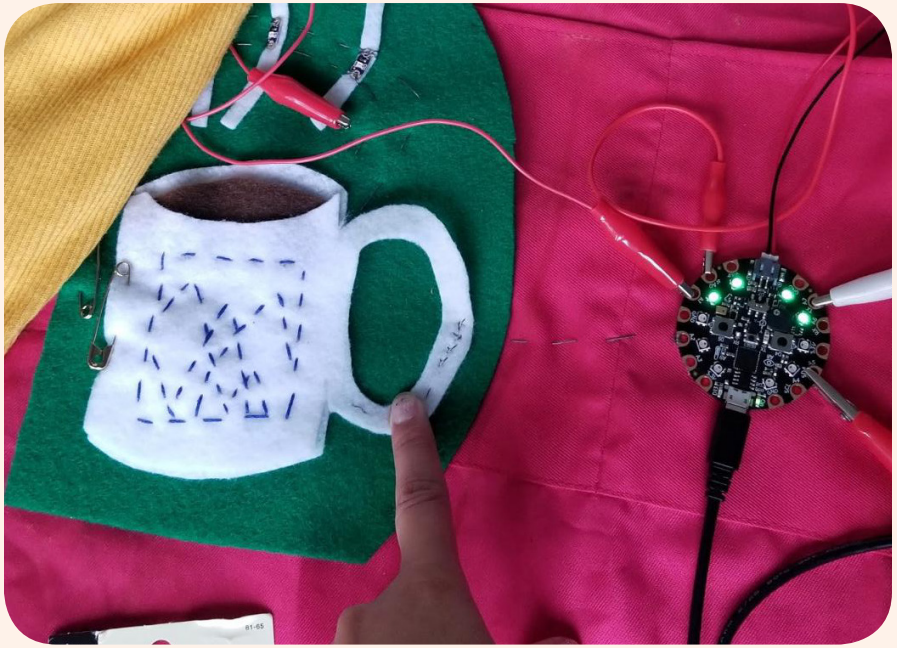
When you touch the metal end of the alligator clip connected to your CPX, the lights on the board should come on (or, whatever action family members programmed). If it didn't go as planned, below are some possible tips.

TROUBLESHOOTING

- Did your file upload correctly?
- Is the alligator clip securely connected to the right pin?
- Is the board getting power from the computer or the battery pack?
- Check the code: Double check your blocks. Is there another piece of code conflicting with your program?
- Make sure your CPX is not sitting on a metal surface as this can interfere with your electrical signals.

EXAMPLE

Tony sewed conductive Xs onto the handle of a coffee cup patch and sewed a trace to pin A7. When you touch the handle on the coffee cup, the Circuit Playground plays a "powering up" animation with the lights and a little tune. He did this to show that he feels powered up when he drinks from his coffee cup!



- You may use any conductive material to act as your button, such as a metal button, aluminum foil, copper tape, or anything else conductive. It just needs to be securely connected back to the CPX with conductive thread.

PROJECT PLANNING & ROLE SHARING

20 minutes

This is a chance to revisit our project prompt and do some more brainstorming that we did earlier.

ASK

Now that you know more about what the CPX can do, what ideas do you have about how you can incorporate it into your family project?

EXPLAIN

(*Revisit a completed example of an e-textile.*) This person chose a place that is important to her family and they created different pieces that work together to convey her feelings about that place.

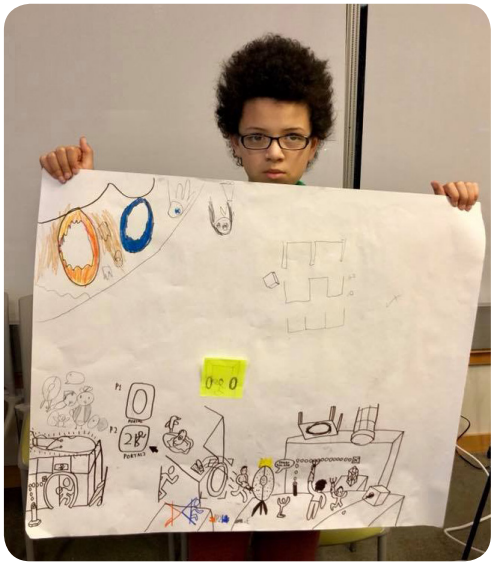
Work with your family to choose a place, if you haven't already do so, and use the sticky notes or scratch paper to sketch or write your memories or impressions of that place. Put everything up on your family's large piece of paper.

This shows that one place is made up of many parts that work together in a system. All together they represent your family's relationship with the place you've chosen.

You should also think about what your want to use as your 'base' material (aprons or bags) and select this piece today. Selecting this piece will help you visualize how everything will come together.

materials

Large paper
Sticky notes
Markers, pens, or pencils
Crayons



CLEAN UP & BADGES

15 minutes

REFLECTION

Invite families to choose their base textile piece. Encourage families to continue planning their e-textile as a family.

Leave some time to distribute, or for familiies to choose their "base" textile piece on which they will sew their projects.

Thank you all for your work today. We have a lot of fun designing, sewing, and programming ahead of us! You can choose to award badges to yourself, and to others. What did you or they do that fits the role on the pins?

Let us know if you have any questions and we'll see you next time!

materials

Session 3 Slide Deck
"Base" textile for all (bags, aprons, etc)
Badges

background info

45 minutes before the end of the session, talk with everyone in each family (depending on seating configuration and size of family). For example, you may talk with both adult and child in pairs. With families of multiple children you can talk with them all at the same time and then speak to the caretakers separately. Typically, the family members in workshops were sitting close together so it was easy to speak to the family all at once.

Recall activities that individuals completed or you saw them doing to build connections between the activities they did in the workshop and the activities and characteristics typical of each of the roles.

Ask participants...
What was most challenging for you?
How did you overcome that challenge?
Did you try something you've never tried before?

Purpose
Prompting participants to reflect on what they are learning may influence how they participate in the remainder of the program, including making connections between learning about themselves and their family through e-textiles.

SESSION 3 BADGES: TRYING NEW THINGS

- The purpose of badges in session 3 is to talk with participants about new activities and tasks they've tried.
- During this workshop participants explore new materials as well as starting to develop details of their storyline (and perhaps how their story will manifest itself through e-textiles). There is opportunity for moms to try programming or kids to take the lead in design. Most importantly, it is an opportunity for families to remember together different times together and how those times made them feel.
- As the families learn to work together and learn new material ask them questions that prompt them to reflect on their own learning.

RESOURCES

How do touch-sensitive lamps work? (How Stuff Works)
https://science.howstuffworks.com/innovation/science-questions/touch-sensitive-lamp.htm
The word "capacitance" has as its root the word "capacity" -- capacitance is the capacity an object has to hold electrons. The lamp, when standing by itself on a table, has a certain capacitance. This means that if a circuit tried to charge the lamp with electrons, it would take a certain number to "fill it." When you touch the lamp, your body adds to its capacity. It takes more electrons to fill you and the lamp, and the circuit detects that difference.

The Clapper
https://www.acehardware.com/departments/lighting-and-electrical/switches-outlets-and-plugs/switches/3016433
https://home.howstuffworks.com/clapper1.htm

Stitching stars : the story quilts of Harriet Powers
https://www.worldcat.org/title/stitching-stars-the-story-quilts-of-harriet-powers/oclc/38176225