TECHstyle TALES

Make. Learn. Share.

DAY 4: INPUT IDEAS, OUTPUT INNOVATIONS

Designing and Creating

Families will share their stories and project ideas with another family, carefully plan out their CPX interactions and connections on paper, consider and delegate necessary project roles, and begin building their e-textile.

badges

materials

- Meal and servingware
- Books or storytelling materials
- Session 4 slide deck
- Family Guide booklets
- Base material pieces
- Alligator clips
- Computers
- CPX kits
- LEDs (2-3 per family)
- Needles (1 per person)
- Conductive thread
- Cloth, felt, decorations
- Scissors, chalk, thread or embroidery floss
- Glue, safety pins, tape
- Optional: beeswax

workshop day 4

1. WELCOME & SHARING

Share a meal
Learning check in

2. STORYTELLING

Share a story
Family story sharing

3. EXPLORING

Sewing a simple circuit
Project work

4. ACKNOWLEDGING

Badges & clean up

MEALTIME & SHARING

30 minutes

Welcome families as they arrive. This time is for eating together and socializing.

Invite them to finish sewing their bags from Session 2, or continue laying out their designs when they are finished eating. Walk around and chat with families as they are eating.

LEARNING CHECK IN

5 minutes

Check in with the group about their project. You may want to do this with each family, or as a whole group.

Families will spend most of this sesson finishing up their designs and starting to sew them together. Remind participants that they only have this session and one more to work on their projects together. Setting goals and identifying places where they may need help will make the work go smoothly.

ASK

- What questions do you have so far?
- What challenges do you need help with?
- What is something new you learned?
- What do you hope to accomplish today?

materials

Meal & servingware
Daily schedule
Session 4 slide deck
Sewing kits
Projects in progress

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 can also be designated for families to practice sewing, design their projects, or practice with the CPX.
- Request that families use the sewing kit & materials included in their backpack and from Session 3. Supplement missing items as needed.

SHARING A STORY

15 minutes

You may invite a visiting storyteller, scientist, artist, or even a participating family member to come and share an oral story. A story that has to do with the importance of place, community or family building, learning in everyday life, systems thinking, or embracing failure will support themes in TechStyle Tales.

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?

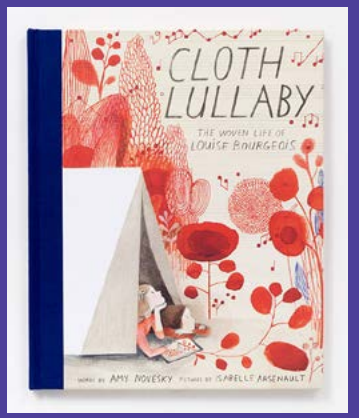
materials

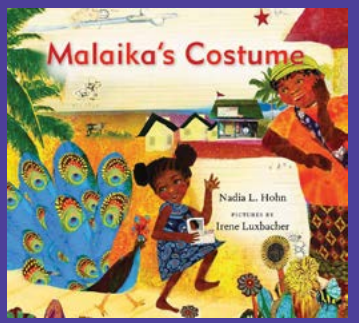
- Space to gather to hear a story
- *Optional: Video Projector & Sound*

Suggested read aloud books:

Cloth Lullaby, The Woven Life of Louise Bourgeois
Words by Amy Novesky, Pictures by Isabelle Arsenault

Malaika's Costume
By Nadia L. Hohn





workshop day 4

FAMILY STORY SHARE

15 minutes

The past few sessions were focused on how to use the CPX, and MakeCode. Families will now revisit the project prompt and think more deeply about the stories they have about the place chosen as a family.

Pair up families to share their stories and descriptions of the places they've chosen. They will explain their connections and memories to this place to people who don't yet know what that place means to them. Encourage families to think about how they can bring them into their experiences with that place, and feel free to jot any ideas down during this chat.

Here are some ideas to spark your thinking as you are talking with your partner family:

- Share a memory you have in (or about) that place.
- Describe the sights, sounds, smells, tastes, and feelings of that place.
- Try to capture that place in one or two words (in your preferred language).
- What symbols or images could you use to convey your memories of this place?
- What will you do with your finished project? Keep it, wear it, give to someone, display it, something else?
- How do you intend to use the CPX to share this place in your project?

materials

Session 4 slide deck
Scratch paper

Pens, pencils, markers, crayons

background info

This activity provides an opportunity for families to articulate the feelings, memories, and sensations they have about the place they've chosen.

Hopefully, in describing this to another family, they can think carefully about how to communicate what's important to them.

set up

Pair up families at tables, or where they are comfortable, such as sitting on the floor or with chairs circled up.

DESIGNING & SEWING A SIMPLE CIRCUIT

30 minutes

Recall in session 2 we made a simple circuit with an LED and the CPX using the Ground Pin and and an output pin (e.g., A7). Now families will use this knowledge to sew their first LED onto their projects.

DRAWING YOUR CIRCUIT

You may want to review slides from session 2 to refresh everyone's memory first. Once everyone is comfortable, have families take out their designs from last session's design time, and lay out their base piece, CPX, and an LED.

materials

Session 4 Slide Deck
Family Guide booklet
Project materials: base material, felt, etc.
Alligator clips
Sewn circuit kit:
CPX
LEDs (2-3 per family)
Needles (1 per person)
Conductive thread (1-2 spools per family)
Scissors (1 per family)
Chalk (1-2 per family)
Thread or embroidery floss
Glue, safety pins, tape
Optional: beeswax

background info

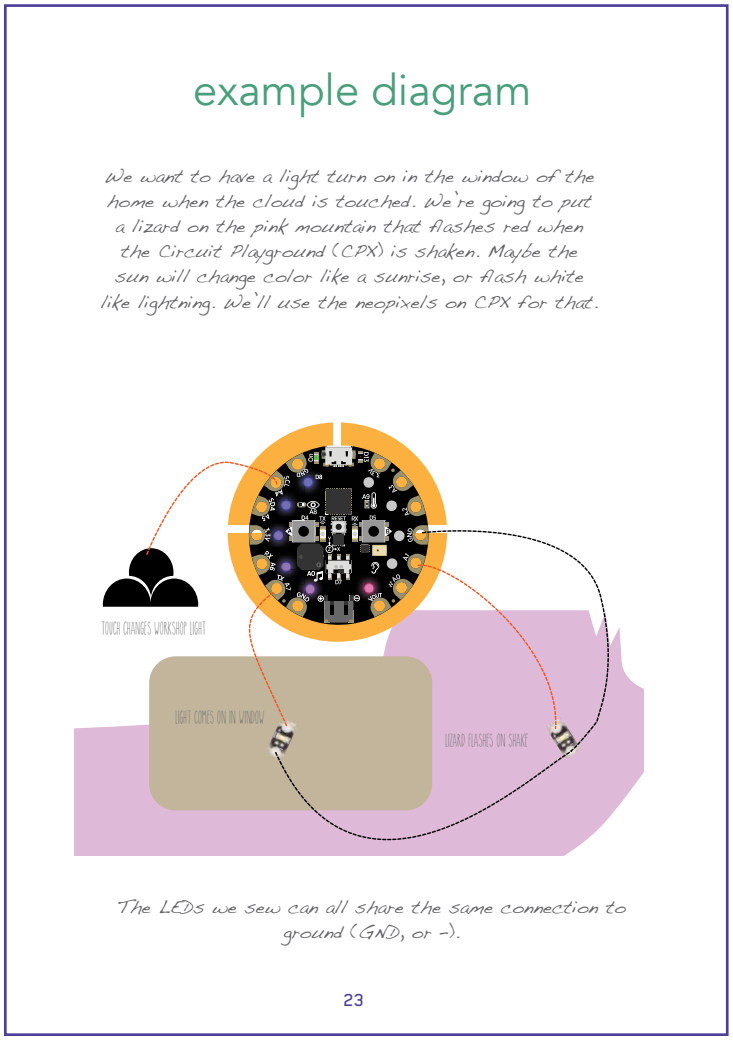
Encourage participants to help one another. Ideally, all participants will have had some experience sewing a running stitch by now. Those who already know how to sew can assist peers who lack sewing experience; likewise, participants with knowledge of electronics can share their expertise.

This activity is an excellent opportunity for families to embrace failure and to problem-solve.

Test, test, test with alligator clips. Something as simple as flipping an LED can cause the whole circuit to fail, so it's best to double check before sewing. This is also a good tool for testing connections and locating disconnects.

LEDs, batteries, and boards can also burn out or malfunction even when the circuit is all sewn correctly. This is why we always TEST as engineers to find the cause of the issue.

Reminder: do not place CPX on metal surfaces while it is on to avoid creating interference that can harm the board.

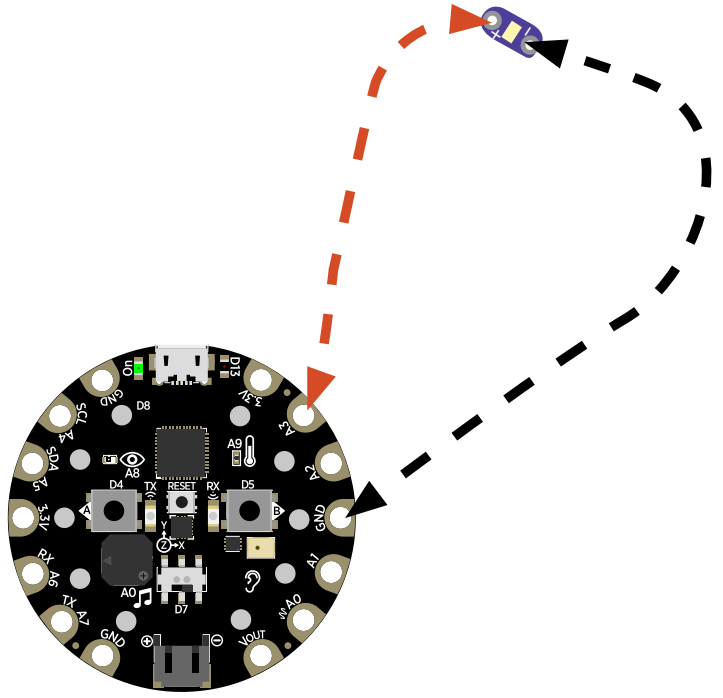


Page 23 of the Family Guide shows an example of a design with the circuit diagram drawn in. This includes other design elements like landscape pieces, an interactive touch sensor, and a written idea of how they want to use the Circuit Playground Express. Sewing the circuit for the lizard LED would be the simplest place to start in this example.

ON PAPER

The structure of a circuit is very important, so it is wise to start by sketching the circuit design on paper. Families should consider where they want to place their LED and how they plan to connect the LED to a CPX pin without crossing any threads.

Because we are working with conductive thread, which does not have a plastic coating like the alligator clips, families have to take care not to cross their positive and negative threads at any point.

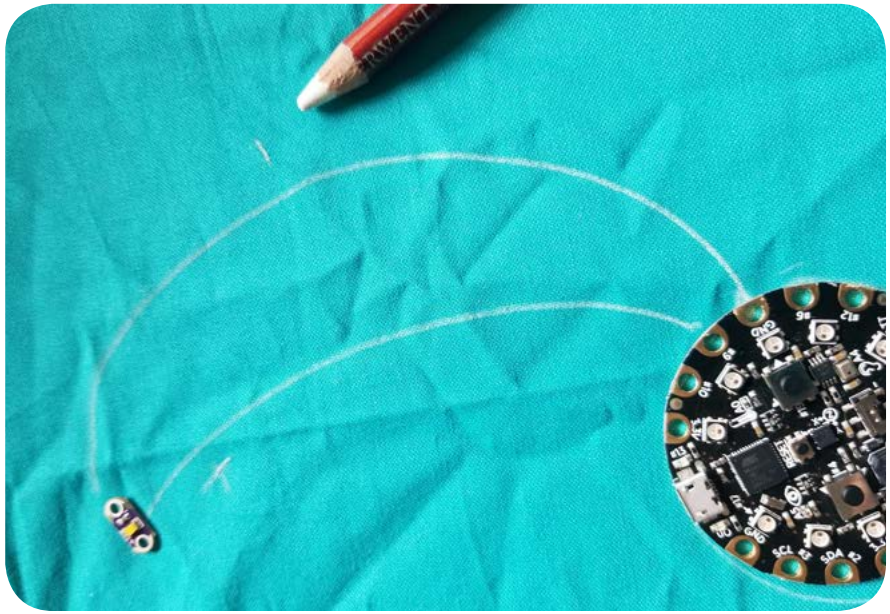


Example diagram of an LED connected to pin A3, using different colors for the positive and negative connections.

ON YOUR FABRIC PIECE

Instruct families:

- Choose the color of LED you want to sew onto your project
- Place your LED where you want it on your base material
- Place your CPX where you want it
- Draw lines on your cloth with chalk or pencil from a GND pin on the CPX to - of your LED, and from an A pin to the + side. Take note that the lines don't cross. You might want to use the conductive thread lines (electrical traces) as design elements (like the stem of a flower, for example).
- Tape or safety pin both pieces down, or stick the LED on with a little dab of glue on the back (pay attention to + and –)



These photos show the Circuit Playground Classic, which may look slightly different, but the concepts are the same for whatever sewable PCB you are using.

SEWING

When you sew your circuit, you will use one length of thread for the positive side; then you will cut a separate length of thread for the negative side in the same way that you used a separate aligator clip wire for each side of your circuit.

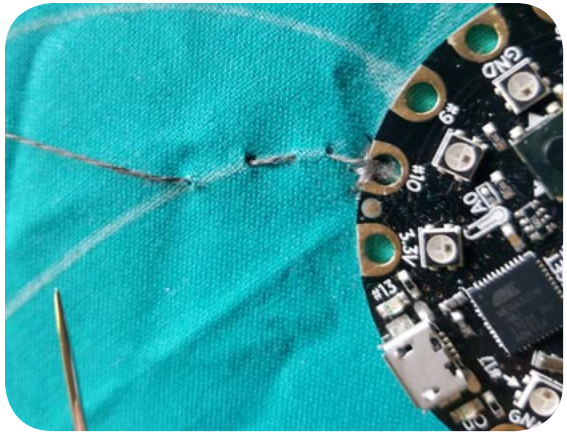
Circuit Sewing Basics

There are a few things to pay attention to when you are sewing with electrical components that are different than sewing with regular thread:

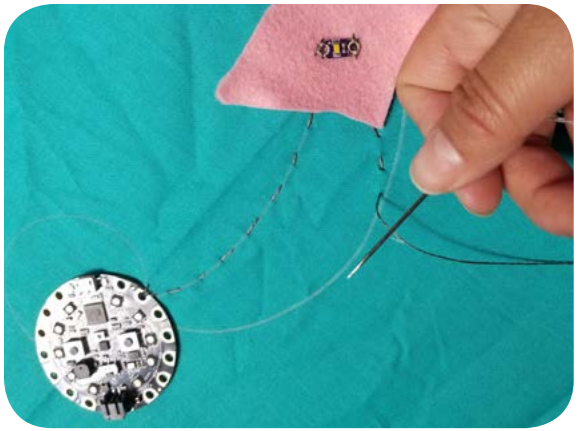
- Use separate lengths of thread for the positive (+) and negative (-) sides. Connecting them in the back will cause the electricity to skip your LED and create a short!
- Never cross your positive (+) and negative (-) threads: This creates a short!
- Stitch with a single thread; avoid doubling your thread when stitching
- Make your stitches are short and tight to keep them from snagging or getting caught on other things
- When sewing to the pads(pins), loop your thread at least 3 times into each pad (hole) of the LED and the CPX
- Clip extra thread off your knots to avoid accidental short circuits

For more information, see the Sew Electric guide for troubleshooting electrical problems: http://sewelectric.org/troubleshooting/electrical-problems/

EXPLORING

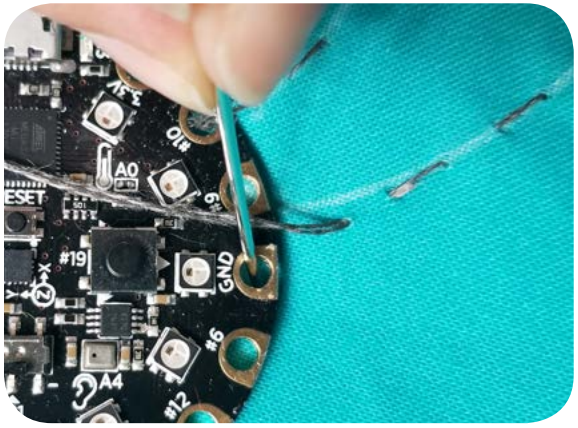


Looping through the pin (pad) several times to create a tight connection before starting the running stitch to the LED

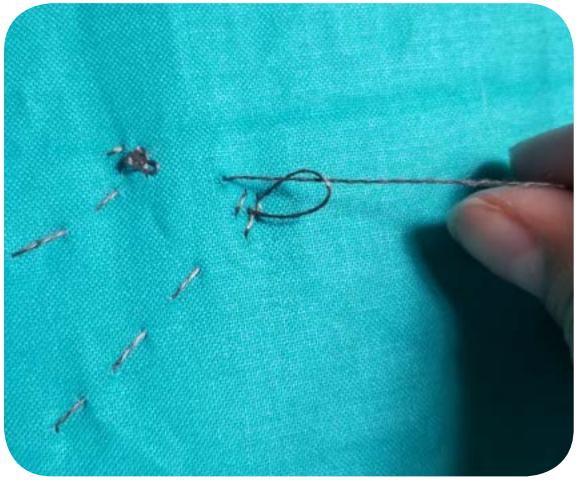


Sewing from the negative side of the LED to GND

Sewing a running stitch from the CPX to the positive side of the LED

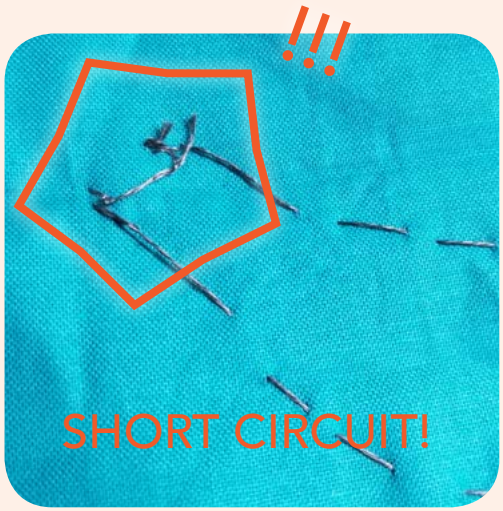


Back side of the stitch, tying off the end with a tight knot



Tying a finishing knot on the back side of the fabric before clipping the end short

Watch for any loose ends touching other parts of the circuit!



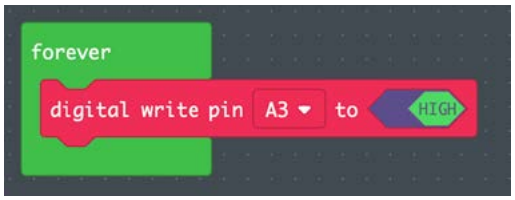
Adding a dab of glue or clear nail polish to knots can help secure them after the ends are cut close.

If you have accidentally sewn across a component, cut the thread and glue each side down with a small piece of fabric.

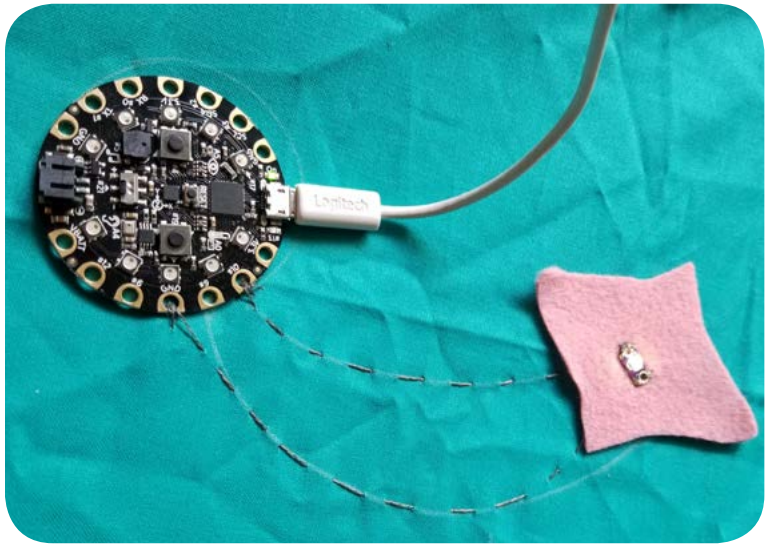
Diagrams from www.sewelectric.org

PROGRAMMING

Without programming a signal from the pin you're connecting your LED to, you will find there is no electricity flowing through your circuit! Let's quickly program this light to turn on. You may change your program later.



- Open the ADVANCED blocks menu
- Find the digital write pin block under PINS
- Change the pin number to the pin you have sewn to (in this case, A3)
- Set the signal to HIGH (on)
- To keep this light on continuously, wrap it in a FOREVER LOOP
- Connect your CPX to the computer with the USB cable and upload your program.



PROJECT BUILDING

50 minutes

Families can go directly from planning to production. Facilitators should check in on families to make sure that the plans look solid and to answer any questions along the way. Encourage families to cross-share as they work.

Family members may use the chalk (or a marker or pen) to draw your connections directly on the fabric. This will guide them as they sew, and may help to avoid crossing positive and negative threads. They can also use safety pins to temporarily secure different components before sewing or gluing.

Sewing is mostly an individual endeavor, but there are several roles family members can take on as they build their projects. Cutting out fabric pieces, programming the CPX, planning and testing the circuitry, and choosing the imagery and colors to use are all equally important to the work.

Visit with families as they are working and notice if anyone is left out. You may offer to help with particularly difficult tasks or help brainstorm ideas about how to create their designs. Referring to the badges may give you more ideas about types of work family members can participate in.

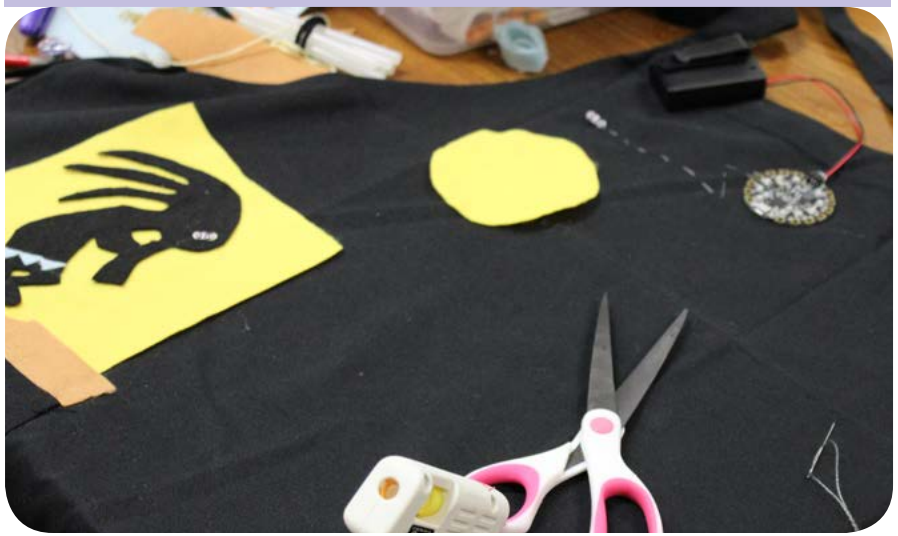
materials

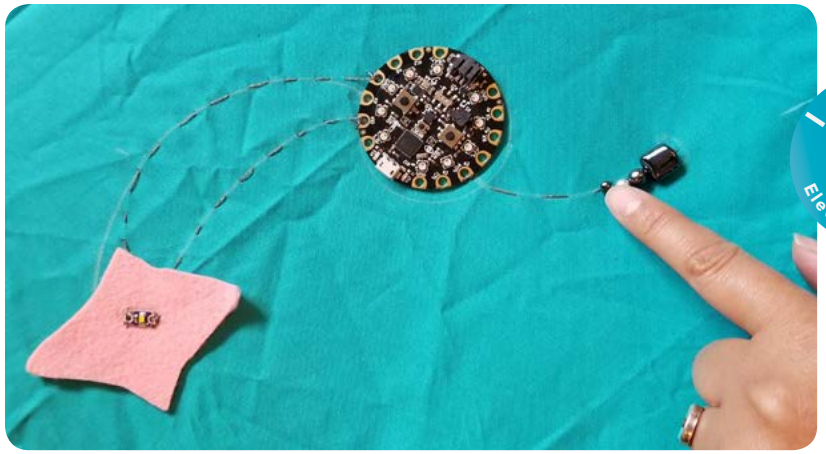
- Session 4 Slide Deck
- CPX (1 per family)
- CPX USB cord
- Laptop (1 per family)
- Mouse
- Projects in progress
- Sewing materials
- Sewing kits
- Sewn circuit materials
- Fabric, felt
- Alligator clips
- Tailor's chalk
- Hot glue gun & sticks
- Miscellaneous decorations

background info

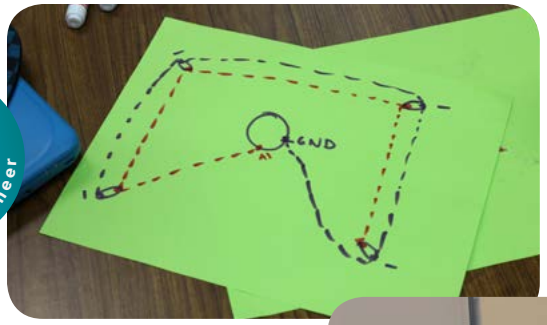
Families can bring their own decorative elements from home to add, if they choose.

Offer the option for folks to use glue rather than sewing everything for faster or simpler results. Use caution with hot glue guns to avoid burns!



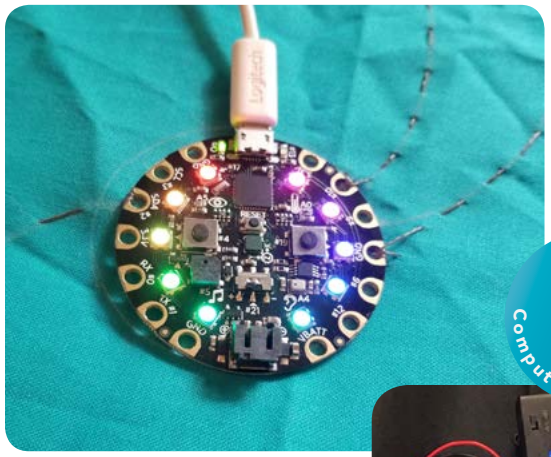


This design uses metal beads as a touch sensor

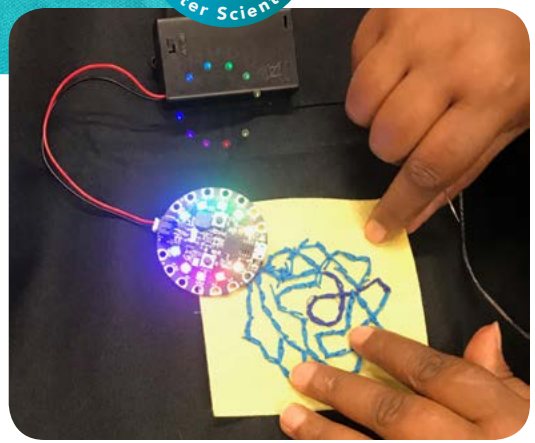


Drawing out circuit plans

Hot gluing pieces of fabric together carefully



Using the CPX animations as reactions to sensors



Consider where the battery pack should go

Researching design references

CLEAN UP & BADGES

15 minutes

Thank families for all for their work today. You will have one more session to finish up family projects. In between sessions, families should feel free to continue working on their projects at home. There will be plenty of time next session to work.

Since Session 5 is a celebration, participants are welcome to invite other family members or friends to come for the presentations.

materials

Session 4 Slide Deck
Badges
Extra sewing materials to take home

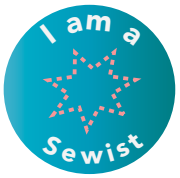
background info

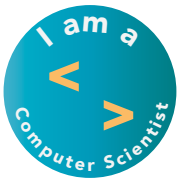
Ask family members

- What did you learn about yourself?
- What did you learn about your family?
- Who took on which role and why?
- Did you switch roles? Why or why not?
- Can you imagine using things you've learned in the future?
- Do you recognize things you've done in the past that you didn't realize qualifies as (computer scientist, electrical engineer, artist)?

Purpose

These questions should prompt participants to reflect on the work as a whole and hopefully nudge them towards thinking of their skills, both reflectively in a new light and forward thinking in potential future circumstances.





SESSION 4 BADGES: SYSTEMS & TEAMS

- The purpose of badges in week four is to help illustrate the complexity of coordinating teams (and the skills developed to manage that) and thinking of their story and e-textiles as a system.
- When issuing badges in week four, participants should have a solid idea of the interchangeability of skills across roles. They have discovered that creating and following complex sewing patterns is a lot like organizing code. It is not necessary to bridge single actions to roles but best to pull back and reflect on their work as a whole, and what got them to where they are now (and how are they going to finish in time!).

RESOURCES

***Wearable Tech: Electronics Meets Fashion*, by Sophy Wong**
Hackspace Magazine, March 2018
https://hackspace.raspberrypi.org/features/wearable-tech-projects

E-textiles resources from Sparkfun
https://sparkfuneducation.com/lilypad/
https://sparkfuneducation.com/video-resources/electricity.html

Sew Electric: Troubleshooting electrical problems
http://sewelectric.org/troubleshooting/electrical-problems/

Exploring CS: Stitching the Loop Technical guide (PDF)
http://www.exploringcs.org/wp-content/uploads/2018/12/Stitching-the-Loop-Technical-Guide.pdf