M.A.D.E.

INTERMEDIATE E-TEXTILES GUIDES

FOR MUSIC | ART | DESIGN | EXPERIENCES

CONCEAL / REVEAL

COMMUNITY MURAL PROJECT

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Please cite this work as Fields, D. A., Amely, J., Jayathirtha, G., Lindberg, L., Lui, D. & Kafai, Y. B. (2019). *M.A.D.E. Intermediate E-Textiles Guide: Conceal/Reveal, a Community Mural Project.* Available online at <u>http://exploringcs.org/e-textiles/modules</u>.

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Exploring Computer Science

What you need to know first:

This module assumes that users have basic experience with making lighting patterns in Arduino (i.e., with digitalWrite() and delay() commands). For more introductory material, see the Exploring Computer Science e-textiles curriculum unit, Buechley & Qiu's Sew Electric, or other introductory Arduino guides. Other ECS E-Textiles modules as well as supporting code samples that may be referenced in this text can be found through http://exploringcs.org/e-textiles/modules.

Abstract

In this project learners choose to reveal something often concealed beneath the surface of a community that they are a part of. This community might be a group of friends, their school, an arts club, a religious group, or even their family. They represent their chosen community by making an electronic textiles artifact that includes a visual image, lighting effects, and sound or musical effects. The artifact is designed to be *interactive*, using sensors such that viewers can trigger activities—for instance, by covering something with a hand (light sensor), speaking into the artifact (sound sensor), blowing on it (sound sensor), or uncovering a piece of it (light sensor). In the end all learners' work can be displayed together as a mural.

This project integrates computer science practices (coding music, lighting patterns, and interaction) with visual art principles, and it has been designed to support creative coding, reflective thinking, visual exploration, and interactive, interdisciplinary learning. By connecting lived experiences to a computing project, personal narratives are expressed in new mediums using music, light, design, and engagement.

We have provided an outline of steps to making the Conceal/Reveal Community Mural Project with photos of student work as examples. This is not intended to be a detailed guide or curriculum in order to support flexibility in implementation. We have provided links to more detailed guides on certain techniques or skills whenever relevant (e.g., coding RGB lights or music). We have also included reflection prompts that guide learners in thinking about interaction, audience, artwork, and reflection. Be creative in implementing this within your own community of learners!

Prerequisites

This project builds on prior work in e-textiles, such as a paper circuit, wristband, and mural project in the <u>ECS e-textiles curriculum</u>, or similar skills developed in prior projects. It is *not* designed to be an introduction to e-textiles but rather a more intermediate or advanced e-textile project building on prior work. It helps if you already have some experience with:

- Conductive sewing
- Creating simple, parallel, and computational circuit diagrams
- Coding simple lighting sequences and simple conditionals (i.e., if/else statements that work with a switch)

Materials

- E-textiles construction kit: microcontroller (i.e., Circuit Playground, LilyPad, BBC micro:bit), conductive thread, LEDs, sewing needles, micro USB cable, felt or cloth for decoration, scissors, etc. (see here for <u>examples of helpful e-textile</u> <u>materials</u>).
- Computers for coding on Arduino. See here for <u>coding platforms guide</u>.
- Canvas-style fabric (recommended: print a digital picture of design through <u>Spoonflower</u> on linen-cotton canvas or lightweight cotton twill ~\$10-12 per fabric piece)
- Stretcher bars & stapler (recommended 16" x 16" stretcher bars; other sizes are fine)

Programming	Sequences, conditionals, arithmetic and logical operators, for loops, variables to store pin numbers or sensor data, arrays, mapping sensor values	
Crafting	Sewing, framing, layering	
Circuitry	Computational circuitry (topographical), simple and parallel circuits	
Writing	Expressing thoughts and ideas	
Computational Practices	Debugging, iterating, thinking creatively, computational communication, interacting with data, interacting with a user	
Artistic Practices	Designing, planning, iterating, persisting through challenges of design and implementation, creating projects for an audience that expresses	

Skills/Concepts Learned

an idea or personal meaning, willing to engage in conversation with
peers about aspects of a project, reflection on process and product

Overview of Conceal / Reveal Community Mural Project

- 1. Choose a community in your life to reveal something about.
- 2. Create an image on fabric (draw/print/paint).
- 3. Plan your circuit and interaction.
- 4. Sew & craft.
- 5. Code light patterns.
- 6. Iterate.
- 7. Code music.
- 8. Code interaction.

Choose a community to reveal

- 1. What communities are you a part of? (Make a list or drawing.)
- 2. Which community is most important to you, or are you most interested in?
- 3. What are things about that community that people may not see from the outside?

Examples:

- sports group
- school club
- religious group
- family
- friend group
- ethnic heritage or history
- specific location
- after-school club
- academic discipline (computer science, art)
- online community (e.g., video game, fanfiction spaces)







Create an image & print/draw on fabric

- Use a picture or create your own image! What story are you trying to tell?
- Consider these visual art tips for creating/selecting/cropping images:
 - Think about where your electronics will go in the picture.
 - Pixels! Printed images need 300 pixels per inch. (Spoonflower uses 150 ppi.)
 - Start with a sketch—what do you want the focus of the piece to be?
 - Focus: Make sure the image is focused or intentionally blurry.
 - Composition: How will you fill the space? Don't make it too crowded; the viewer can tell what it is you want them to see.
 - Color: What color palette do you want to use (monochrome, black and white, color)? Bright/neon colors on a screen won't print super bright; black on grey will be hard to see.
 - Perspective: Which angle will the image be from?
 - Orientation: Will this be in portrait or landscape orientation?
- If printing a picture on fabric, see <u>this guide for using Spoonflower/PicMonkey</u> editing tools.
- Put your frame together and select the part of your fabric to frame this is the area you have to work with for your circuits.



Plan circuitry: Create your circuit diagram

Things to keep in mind as you plan:

- You may need to keep your microcontroller accessible if you use the sensors (light, sound, etc.) on it.
- Only certain pins on Arduinos fade: 3, 5, 6, 9, 10, and 11. Some microcontrollers do not have all of these pins available. (The same pins can be connected to a speaker as well.)
- Using a common ground (one line for multiple negative connections) can simplify your sewing.
- Need help? This Exploring the Circuit Playground short worksheet link helps introduce the concept of computational circuit design.



Plan interaction

- What kinds of emotions do you want people to have with your project? What kinds of interactions will help people experience your project that way?
 - Come up with three different ideas for your interaction. Maybe one is easy/approachable. One might be a stretch goal. Then choose one to work on first. (You can always add your stretch goal later if you have more time!)
- Explore the sensors: light sensor, sound sensor, others. What types of interactions can you design? *How can you make people act?*
- Draw out an interaction plan: Which actions will create which effects (light, sound, etc.)?
- Test your sensors: Which sensor ranges relate to the actions you want to stimulate?



opening the clam shell;

Cover the light sensor by

closing the clam shell

Clamshell is CLOSED; lights are

all OFF, digital ocean sounds

OFF

Sew & Craft

- Sew on your LEDs. Test them as you sew them! Each time you complete an LED circuit you have created a new version of your project.
- Debug as needed.
- Add any other decorative features you want. Some could even go beyond the canvas frame!



Code Lighting

- Check your interaction plan. What kind of lighting effects do you need?
- Code one lighting effect at a time (blinking pattern, fading pattern, twinkling, etc.). Once you have one lighting effect working, save a New Copy of your file as version 2 and add your next lighting effect. Each time you have a code succes, before starting on the next bit, Save A Copy so that you will always have a backup if things go wrong. You might end up with 8 versions of your program, like mylights_v8.ino!
- Need help with fading or with Neopixel (RGB) lights? See our Fading LEDs guide and our Neopixels guide.



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Code Music

- What music do you want to use?
- Choose (or create) a song. Pick a section(s) of it and code it. Test repeatedly!
- See our Music Module for a guide to help you code music if you need

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Code Interaction

- Revisit your interaction plan. What do you need to sense in order to trigger your lighting and music effects?
- Mapping sensor input to an output is one neat option. See our Mapping module for a guide on how to use the "mapping" functions.
- Creating ranges of sensor input to trigger output is another option (i.e., if a sensor reading is between two values, do ____). Information on coding sensor ranges can be found in the Exploring Computer Science e-textiles curriculum unit PDF (page E48: Human Sensor Project), or Buechley & Lui's Sew Electric.

Final Testing, Touch-ups & Framing

- Put all the pieces of your code together the conditions and the effects.
- Test it multiple times with multiple people. Remember to <u>save a copy</u> of your code and add the version number to it so you always have code backup. Each time you test it and update your code, you just made another iteration of your project that is better than the last version!
- Once you are sure that everything works, make a spot for your battery (a little pocket works well, or making a cut and threading it behind your picture).
- <u>Stretch and frame the fabric</u> and test it all again!

Artist Statement

- Write a short statement about what this mural means to you.
 - Introduce your artwork for the audience.
 - Explain your overall vision for the piece.
 - Share the sources for your artwork and inspiration.
 - Explain how the medium (lights, fabric, thread, etc.) support your vision.
 - Express how you expect your audience to react.
 - Address your role in this process—How does your role impact your community?
- Include any instructions viewers need to activate your special effects.
- Below is a sample poem you could fill in if you're stuck.

Sample Artist Statement Starter: This piece represents my experiences with by				
The lights show	to emphasize	in my		
The sound helps communicate community.		about my		
Interacting with this project was designed to make people				
a	ind experience	of my community		
Every day, I choose to reveal My choices conceal to	by from	 and allows me		

Sample Projects

Paloma's Project

Artist Statement

This piece represents my experience with computer science-based technologies combined with art by learning how to code in the computer language Arduino and sewing lights that carry electricity.

The lights show hope and a message to emphasize opportunities in my community. The sound helps communicate excitement of what you can find about my community. Interacting with this project was designed to make people see what I am capable of making and to see all the possible creations you can make.

So that people can experience a preview of my community.

Every day, I choose to reveal the process of what goes in when creating an interactive design by learning how to code a project people can interact with.

My choices conceal my troubles [and the] artwork allows me to feel happy.

Interaction: When a light shines on the light sensor on the Circuit Playground, the song "Mr. Blue Sky" by Electric Light Orchestra plays, and lights turn on.



Zoila's Project

Artist Statement

This E-textile piece represents my experiences with art influencing my life by bringing two talents I had together since childhood.

The lights show my passion for music, gaming, and art to emphasize the importance and love in my community.

The sound helps communicate the important connection that gaming [has to] my community [and my life].

Interacting with this project was designed to make people feel at peace and be entranced in imagination and experience the bond and love of my community with the experiences of my childhood.

Every day, I choose to reveal my creativity and passion by drawing and playing my trumpet and playing the video games that helped me through my dark times. My choices conceal the true meaning and importance of my talents from the love and vision of them which allows me to show and express my true self.

Interaction: When the light sensor on the Circuit Playground is covered, the "Kirby" video game theme song starts to play.



Debbie's Project (Debbie is an E-textiles instructor.)

Artist Statement

This project reveals the strength, joy, and artistry of women in my aerial arts community.

- Each silhouette was made from a picture of a different type of woman (personality, body shape, hobbyist/professional) in my community.
- The fabrics are made from actual aerial silks material used at my studio. I also included found objects from my home: extra striped fabric and an old knitting needle from my grandmother. Thus the materials add layers of meaning from different parts of my life.
- The song includes sections of "This Is Me" from *The Greatest Showman*, and expresses how we are each proud of who we are, embracing our different shapes, abilities, and talents.
- As you uncover the boring outside of the studio, the vibrant inside is revealed. First, the glowing heartbeat of each woman beats in time with the song. As the music builds, additional "computational glitter" emerges in the additional lights all over the fabric.

Interaction: When you pull back the front cover revealing the light sensor, the lights begin blinking in an intentional pattern and the song "This is Me" from the movie *The Greatest Showman* starts to play.

