

ILLUMINATING FASHION  
**Hand Sewn  
Applique**  
Leader Guide



*Fashion*  
through science

WITH THIS ACTIVITY

- Handout
- At-a-Glance
- Circuit Card



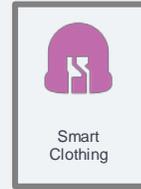
We are  
Engineers!



Movement  
Improvement



Marvelous  
Materials



Smart  
Clothing



Patternmaking  
Tools n' Tech

## Big Picture

Young designers will make a light-up applique that they can attach to clothing.

## What's the goal?

By the end of this activity, young designers will understand how to create a working parallel circuit and incorporate electronics into fashion design.

## Prerequisite Activities

- Gremlin Pin Hand Sewing
- Introductory & Advanced Space Dough
- Circuit Card
- DIY Wrap Skirts or DIY Bags n' Totes

## Grouping

Each young designer completes the activity individually: one leader per five designers.

## Materials

### What they need: (per person)

- Handout
- Garment or accessory to put applique onto
- Craft felt or printed upholstery fabric cut-out motifs for applique (8"-10")
- Several buttons (assorted sizes)
  - Hand sewing thread
  - Hand sewing needles
  - 3-5 mm LEDs, up to 6 per designer
  - 1-2 Battery holder(s)
  - 1-2 3V Coin-cell battery (CR2032)
  - Marking chalk/ disappearing ink pens

...Materials continued on next page

**Preparation Time: 30 Minutes**

**Activity Time: 2 Hours**

**Difficulty: Level 3**



## Preparation

### Create a Battery Pack for Each Designer

- Cut 2 x 15" lengths of conductive thread per battery holder
- Pull a conductive thread length through one end of the battery holder -try a needle threader- and knot it close to the battery. Repeat at the other end. Put a drop of fabric glue on each knot to make it extra secure.



## Materials (Continued)

### Supplies to Share

- Needle nose pliers
- Fabric glue
- Small scissor/ thread snips
- Sewing machines (for sewing appliques on)
- Decoration materials (ribbons, felt, glitter, sequins, artificial flowers, fabric paint) - **optional**

### What you need: (per leader)

- Conductive Thread
- Needle threaders
- Extra supplies
- Hot glue gun

Prepare appliques (if using home interior fabric stitch around the outside of each applique to control fraying). Keep them less than 8 inches in diameter. Example of an applique cut from upholstery fabric:



## Tips

- Extra adult helpers are essential for this activity if you have more than 5 young designers.
- Conductive thread: sew with only one ply of thread – doubled thread will create a short circuit. If needles keep coming unthreaded, make a knot in the thread with the tail right behind the needle head. It should still pass through the fabric.
- Make sure positive and negative lines are about 1/2” apart at points where LEDs are to be attached. Remember, the positive and negative lines cannot cross! Straight lines are easiest to sew. See sample circuits below.
- Remember **polarity**! Having the young designers keep the positive line always on top and the negative always towards the bottom as they sew can help keep this straight.

### VOCABULARY

**Polarity:** Batteries have a positive and negative terminal. Electricity flows from the positive terminal to the negative terminal. Some components, like LEDs, also have positive and negative sides. You can identify the polarity of an LED easily, as the positive leg is longer than the negative leg.

- More than 6 LEDs on one battery may cause the LED's to be dim or not light at all.
- LED tails are somewhat fragile, so try not to manipulate them too much or too roughly.

## Let's get started!

1. Introduce the activity, the electrical components, and the tools. Refresh designers about the features of a **parallel circuit**.

### VOCABULARY

**Parallel Circuit:** A parallel circuit is one in which all components are connected directly to positive and negative battery lead. Electricity flows through all the components in parallel.

2. Have the young designers use the handout to plan their design placement on the applique, the location of **LED's** and **battery**, the **circuit** paths, and to mark the **polarity**. Sample layouts are below and on the handout. Remind them that they will need two **parallel** lines of stitching, one a positive path and the other negative, about half an inch apart, but not touching or crossed. Check their finished circuit plans.

### VOCABULARY

**Circuit:** A path for an electrical current to flow.

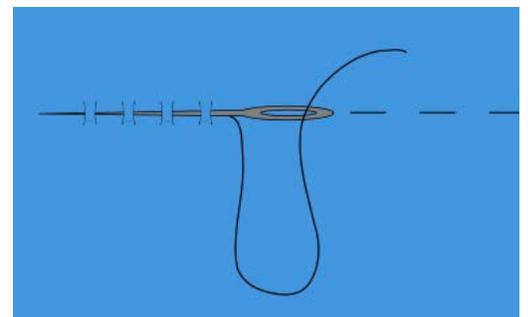
**LED:** Light-emitting diode

3. On the backside of the applique, have designers redraw their plan using chalk (or pencil if it does not show through to the front), including location of LED's and battery holder and the positive and negative sewing lines.
4. Tell them to place the battery holder in position on the back of the applique and secure it by sewing through the fabric and over the

knot of conductive thread several times with **regular** sewing thread. There is no need to sew through the very small hole in the end of the battery pack. Or, secure with hot glue.

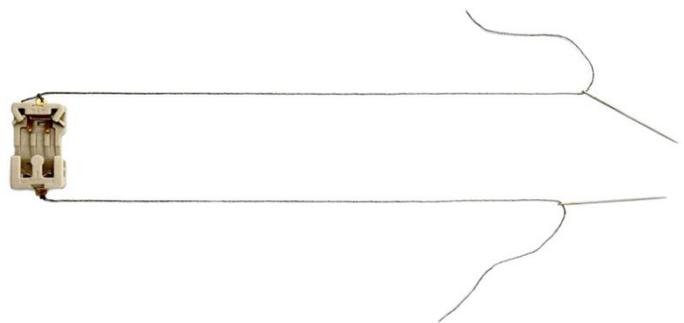
5. Thread one of the conductive threads from the

### Running Stitch



battery holder onto a needle. Using a running stitch, sew along one of the marked circuit lines. Keep stitches short. At the end of the line, knot the thread on the back side of the fabric - same as the battery pack - and trim close to the knot. Repeat for the second line of stitching, beginning at the other end of the battery holder. See image below. For help sewing, review the Circuit Card or the Gremlin Pin Sewing Activity instructions.

Make sure they understand that they must sew the conductive thread with just one ply of thread to avoid short circuits.



### VOCABULARY

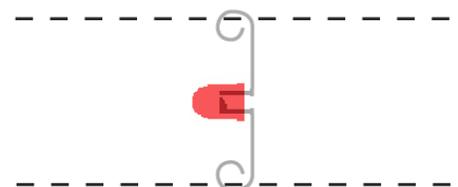
**Short Circuit:** A high-conductivity connection between positive and negative is a “short circuit”. Usually caused by a positive and negative line of conductive thread touching.

6. Have the young designers check the battery holder to identify the positive side (the one with 3 plastic prongs, as in the illustration). Suggest they put a small chalk mark on the front side of the fabric to indicate the positive line of stitching.



**Positive side**

7. On the front side of the applique, young designers should insert the LED legs under the conductive thread, but not through the fabric. The longer LED leg connects to the positive trail and the shorter leg connects to the negative trail. Curl each leg using needle nosed pliers so that



it looks like the illustration. If it wobbles, use **regular** sewing thread to secure it.

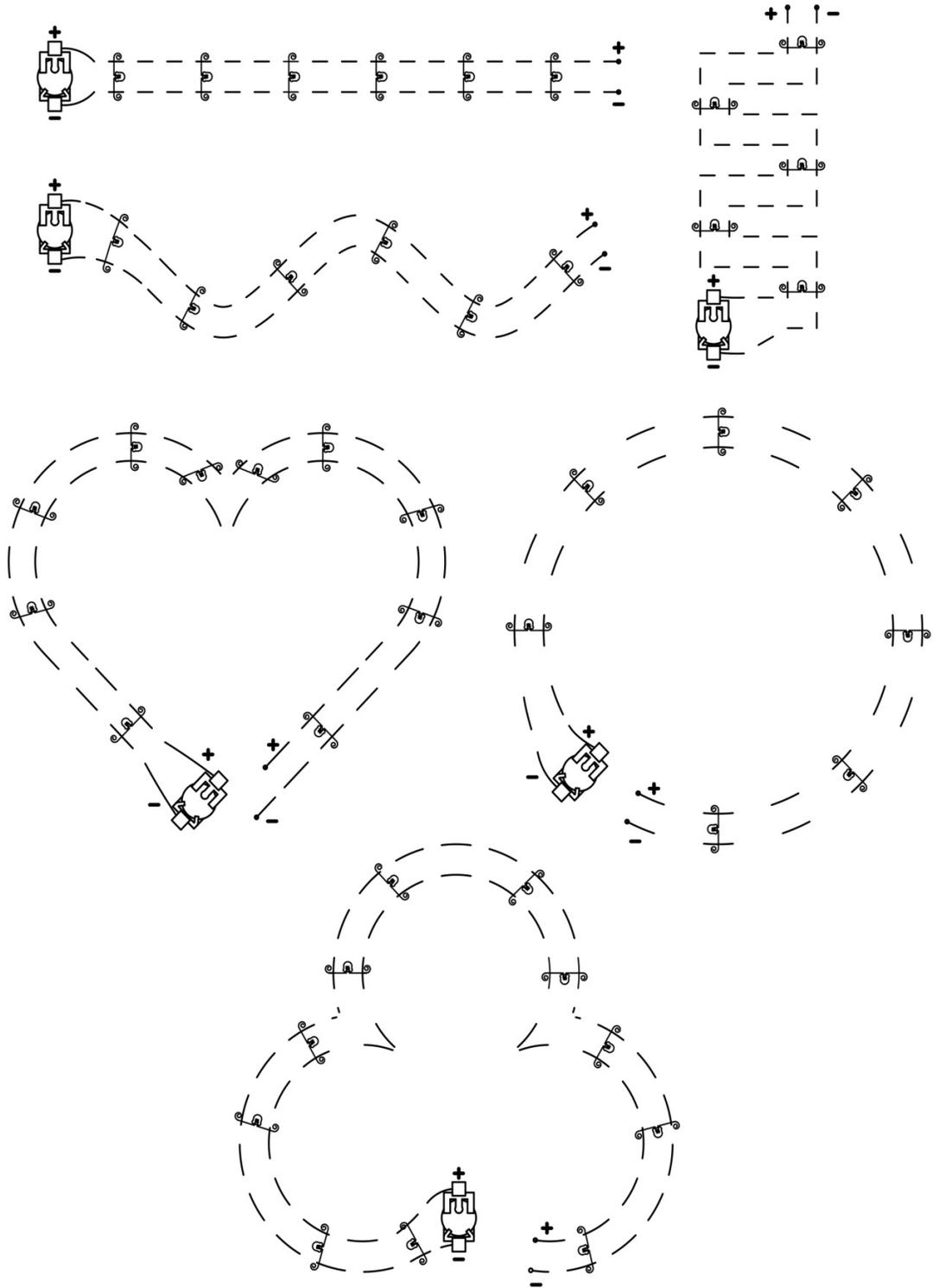
8. Insert the coin cell battery with the + symbol facing upwards and check LED function. Troubleshoot non-functioning LEDs using the At-a-Glance document.
9. Decorate appliques with ribbon, sequins, etc., as desired.
10. Attach the applique using safety pins, buttons, or a sewing machine (in this case be sure to leave an unsewn area for battery removal and insertion so the skirt can be laundered).

**Instructor Extra:** If you want to use the button-on method, have the designers mark applique placement on the garment and handsew on a button(s). Mark the button location(s) on the applique, and cut a slit big enough for each button(s).

## Take it further

- Try adding other simple components, like switches and color changing LEDs!
- Use multiple batteries to make designs that are very long or that require more than six lights.
- Check out these cool sites for more inspiration:
  - AdaFruit: [www.adafruit.com/category/65](http://www.adafruit.com/category/65)
  - Makers Shed: [www.makershed.com/Intro\\_Electronics\\_s/49.htm](http://www.makershed.com/Intro_Electronics_s/49.htm)
  - Spark Fun: <https://learn.sparkfun.com/tutorials/ldk-experiment-1-lighting-up-a-basic-circuit>

# Sample Circuit Stitching Patterns



## Supply Specifics

Component	Description	Picture	Suggested Sources
Coin Cell Battery Holder	<ul style="list-style-type: none"> <li>Battery holder for 3V, CR2032, 20mm coin cell battery, for sew-on use.</li> </ul>		<a href="http://www.digikey.com">www.digikey.com</a> <a href="http://www.sparkfun.com">www.sparkfun.com</a>
Coin Cell Battery	<ul style="list-style-type: none"> <li>3V, CR2032, 20mm</li> </ul>		<a href="http://www.digikey.com">www.digikey.com</a> <a href="http://www.amazon.com">www.amazon.com</a>
LEDs	<ul style="list-style-type: none"> <li>3mm or 5 mm, 2,2 volts or less, round (note that different colors may have different voltages)</li> </ul>		<a href="http://www.digikey.com">www.digikey.com</a> <a href="http://www.sparkfun.com">www.sparkfun.com</a> <a href="http://www.adafruit.com">www.adafruit.com</a>
Conductive thread	<ul style="list-style-type: none"> <li>2 ply for sewing. May be stainless steel or silver coated nylon. Lame Lifesaver sells a large spool, so is most economical. Other suppliers sell it by the bobbin.</li> </ul>		<a href="http://www.adafruit.com">www.adafruit.com</a> <a href="http://www.sparkfun.com">www.sparkfun.com</a> Lame Lifesaver, <a href="http://members.shaw.ca">members.shaw.ca</a> (allow extra time for Canadian shipping)