ILLUMINATING FASHION

Machine Sewn Applique

Leader Guide

Style Engineers

Fashion through science

WITH THIS ACTIVITY

- Handout
- At-a-Glance

MODULE


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 put on 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)
- Sewing machines (pre-thread the sewing machines with regular thread on top and conductive thread in the bobbin. Stitch length should be 6 to 8 stitches per inch)
- Ordinary sewing thread
- Conductive Thread (200 Yard spool wound onto bobbins)
- Hand sewing needles (Embroidery needles size 5 recommended to fit through battery holders)
- 3mm LEDs, white or colored, up to 6 per designer
- 1-2 Battery holder(s)
- 1-2 3V Coin-cell battery (CR2032)
- Marking chalk/ disappearing ink pens

Preparation Time: 30 Minutes

Activity Time: 2 Hours

Difficulty: Level 3

Preparation

- Prepare bobbins with conductive thread. Thread the upper part of the machine with regular thread. Set stitch length at 6-8 stitches per inch.
- Prepare the appliques. If using home interior fabric cut out the motifs and straight stitch around the outside so they do not fray.

Materials (Continued)

Supplies to Share

- Needle nose pliers
- Decoration materials (ribbons, felt, glitter, sequins, fake flowers, fabric paint)
- Fabric glue
- Small scissor/ thread snips

What you need: (per leader)

- Extra supplies
- Hand sewing needle/thread
- Hot Glue (optional)
- Hole punch
- Needle threaders
- Small thread snips

Tips

- Extra adult helpers are essential for this activity if you have more than 5 young designers.
- More than 6 LEDs per battery may cause the LED's to be dim or not light at all.
- 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.
- Loose components (LEDs, battery pack) may be secured with regular thread.
- 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.
- Don't squeeze the LED metal tails too hard or bend them back and forth too many times or they will break.

- Keep appliques about the size of your outstretched hand. If you are using upholstery fabric, sew around the outside to control fraying.

Example of an applique cut from upholstery fabric:

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 mark the polarity. The circuit itself can be part of the design, as in the examples on the last

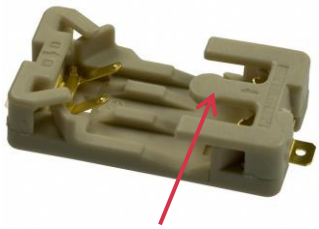
VOCABULARY
Polarity: Batteries have a positive and negative terminal. Electricity flows from the positive terminal to the negative terminal. Some components, like LEDs, also have positive and negative sides. You can identify the polarity of an LED easily, as the positive leg is longer than the negative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

page. Check the 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 draw their plan using chalk (or pencil if it does not show through to the front), including location of LED's and battery pack and the positive and negative sewing lines.

4. Instruct designers to place appliques into the sewing machine with the back side facing up. The conductive thread should be on the right side of the applique. Stitch along the positive chalk line leaving 8" tails at start and finish. Do not backtack. Stitch along the negative chalk line, leaving tails, and not backtacking.



Positive side

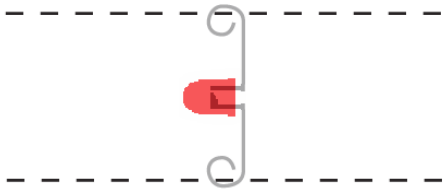
5. With a needle, poke the conductive thread tails to the back side of the applique. Line up the positive side of the battery holder with the positive sew line. The positive side has the three prongs (see picture). Next, they should insert the trailing ends of the thread through the battery holder and tie a knot at each end to hold it in place (no need for needles). Get the knot as close to the applique fabric as possible so that the components are secure. Trim the ends of the knots, so the tails do not cross and cause a **short circuit**. A drop of glue can help keep knots in place.

    - **Instructor Extra:** If the battery holder is not secure after tying it on with the conductive thread, use a regular needle and thread to secure. Be sure the head of the needle fits through the hole on the battery holder.

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. 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 leg connects to the positive trail and the shorter leg connects to the negative trail. Curl each leg using needle nosed pliers to secure it.



7. Insert the coin cell battery and check LED function. Troubleshoot non-functioning LEDs by using the At-a-Glance document.
8. Decorate appliques with ribbon, sequins, or whatever. Artificial flower petals will just fit over LED’s if taken off their stem.
9. Attach the applique using the sewing machine (change the bobbin to regular thread) (be sure to leave an unsewn area for battery removal and insertion for laundering), using safety pins, or using buttons sewn to the garment.
    - **Instructor Extra:** If you want to use the button-on method:
        - Find a place on the garment where the designers want to put their applique. Have the designers mark the location on the garment and hand sew on the button(s). Then, mark the location on the applique and cut a slit big enough for the button(s). They may need multiple buttons to secure the applique.

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
    - Makers Shed: www.makershed.com/Intro_Electronics_s/49.htm
    - Spark Fun: https://learn.sparkfun.com/tutorials/ldk-experiment-1-lighting-up-a-basic-circuit

Supply Specifics

Component	Description	Picture	Suggested Sources
Coin Cell Battery Holder	• Battery holder for 3V, CR2032, 20mm coin cell battery, for sew-on use.		www.digikey.com www.sparkfun.com
Coin Cell Battery	• 3V, CR2032, 20mm		www.digikey.com www.amazon.com
LEDs	• 3mm or 5 mm, 2,2 volts or less, round (note that different colors may have different voltages)		www.digikey.com www.sparkfun.com www.adafruit.com
Conductive thread	• 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.		www.adafruit.com www.sparkfun.com Lame Lifesaver, members.shaw.ca (allow extra time for Canadian shipping)

Sample Circuit Stitching Patterns