

LESSON

## ILLUMINATED CUFF BRACELET



### Overview

In this lesson, students will:

Humans have used weaving techniques to make tools and clothing for thousands of years. In this lesson, students will adapt this ancient art to create a very modern illuminated bracelet with a colorful fairy light strand woven through a leather cuff.

#### THE OBJECTIVE

- Explore the history of weaving as a construction technique
- Notice the basic steps which repeat to create a woven pattern
- Practice weaving with fairy lights and a leather cuff to create a modern fashion accessory

#### GRADE LEVEL:

5-8

#### DIFFICULTY

Medium

<b>SUBJECTS</b> Arts, Patterns	<b>DURATION</b> 45 minutes
<b>STANDARDS</b> N/A	<b>VOCAB</b> Weaving



## Supplies

### SOFTWARE:

- Glowforge App

- Bracelet design file to match the length of the fairy light strand:  
 - cuff\_1m\_LED\_strand.svg -or-  
 - cuff\_2m\_LED\_strand.svg

### MATERIALS & TOOLS:

- Humans have used weaving techniques to make tools and clothing for thousands of years. In this lesson, students will adapt this ancient art to create a very modern illuminated bracelet with a colorful fairy light strand woven through a leather cuff.

### RESOURCES:

- The History of Weaving:  
<https://quatr.us/clothing/history-weaving-early-hand-weaving.htm>

### DESIGN FILES:



## Description

### LESSON OUTLINE:

- Discuss weaving as a construction technique
- Print leather cuff pieces in the Glowforge App
- Weave the fairy light strand through the cuff bracelet to create an illuminated wearable accessory

### ASSESSMENT STRATEGIES:

**FORMATIVE ASSESSMENT:** Circulate the classroom and observe students at work, are they collaborating and/or using teamwork, and any other items you wish to assess.

**SUMMATIVE ASSESSMENT:** Use the [Magical Things Journal](#) to document student learning.

STANDARDS

 **Lesson Instructions****Step 1: SETUP**

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**Description**

For each bracelet, students will need a piece of Glowforge Proofgrade Medium Natural Leather and a strand of fairy lights.

**Step 2: INTRODUCTION TO WEAVING**

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Weaving is a technique which utilizes threads, or long string-like materials and interlaces them to create a structure that is stronger than the original materials themselves. Ask students if they can think of objects they've encountered that were constructed by weaving. (e.g. fabric, baskets, mesh fences)

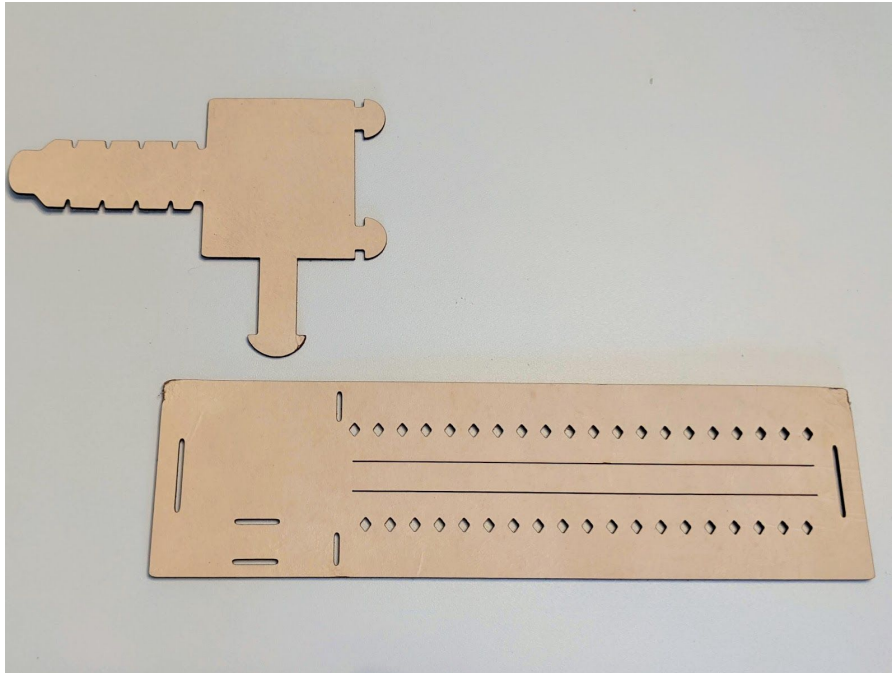
Many ancient cultures created woven baskets for utility and decorative purposes, and until the mid-19th century, all fabric was created by hand-weaving thread together on giant looms. As industrialization spread, people created machines to weave fabrics on automated looms with greater speed and precision than humans are capable of.

In this lesson, students will use a simple technique to weave two very different materials together. They'll be using fairy lights as a kind of thread to be woven through a leather bracelet base.

**Step 3: CONSTRUCT THE BRACELET**

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**CUT THE LEATHER PIECES OFF:**

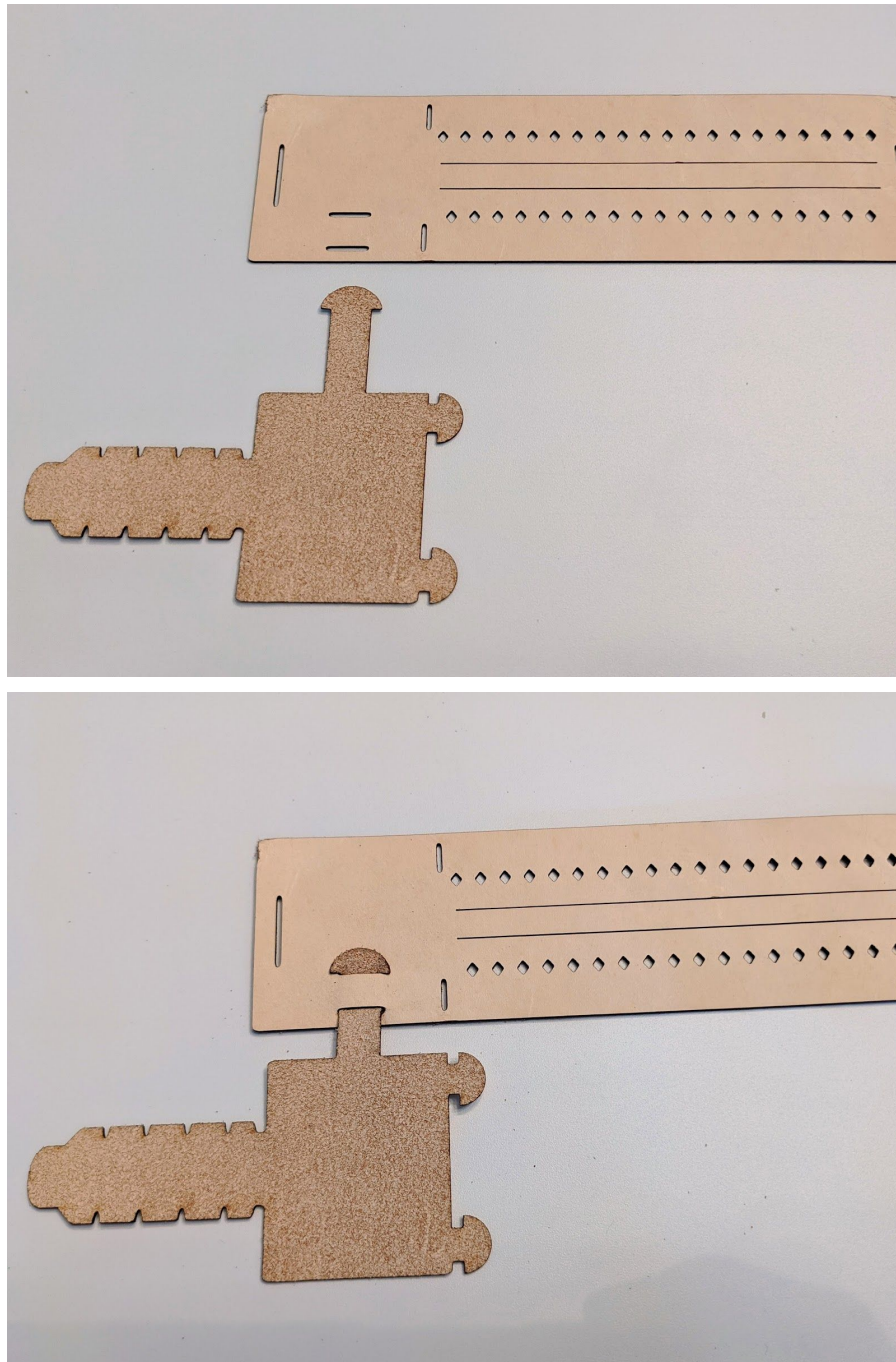


First, use the Glowforge App to cut the two pieces of the cuff from Proofgrade medium leather. There are two different design files for the cuff. Which one to cut depends on the spacing of the LEDs in the fairy light strand. For a 1m long strand containing 20 LEDs (5cm spacing between LEDs), use the file “cuff\_1m\_LED\_strand.svg”. If the strand has 20 LEDs in a 2m length, cut the pattern in the file “cuff\_2m\_LED\_strand.svg”. All lines in the file are to be cut.

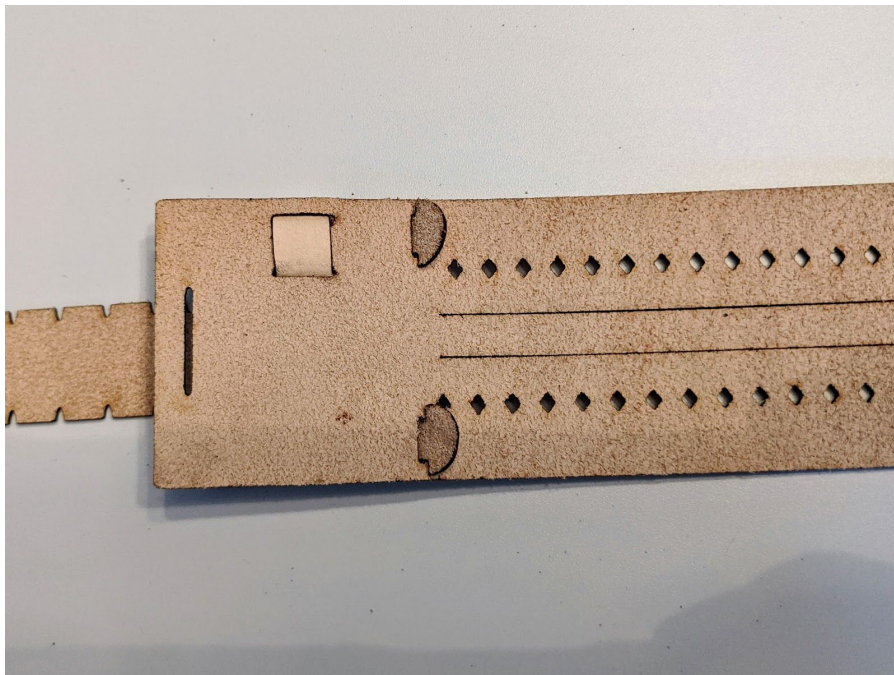
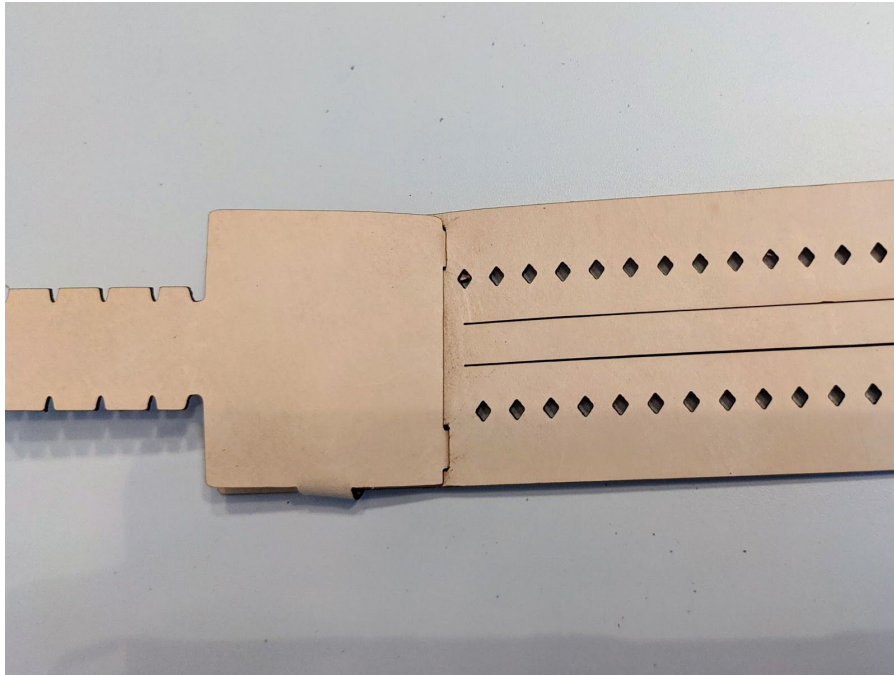
If students wish to personalize their bracelets, they may add score lines or small etched words/images around the top and bottom edges of their cuff, or on the pocket (the smaller piece) before cutting. After cutting the two leather pieces, peel off any protective paper that is still attached.

### Add the Pocket to the Cuff:

The smaller leather piece forms a pocket which holds the fairy light battery pack in place. The long, notched tab protruding from the pocket piece is the strap, which will fasten the cuff closed once it is finished.



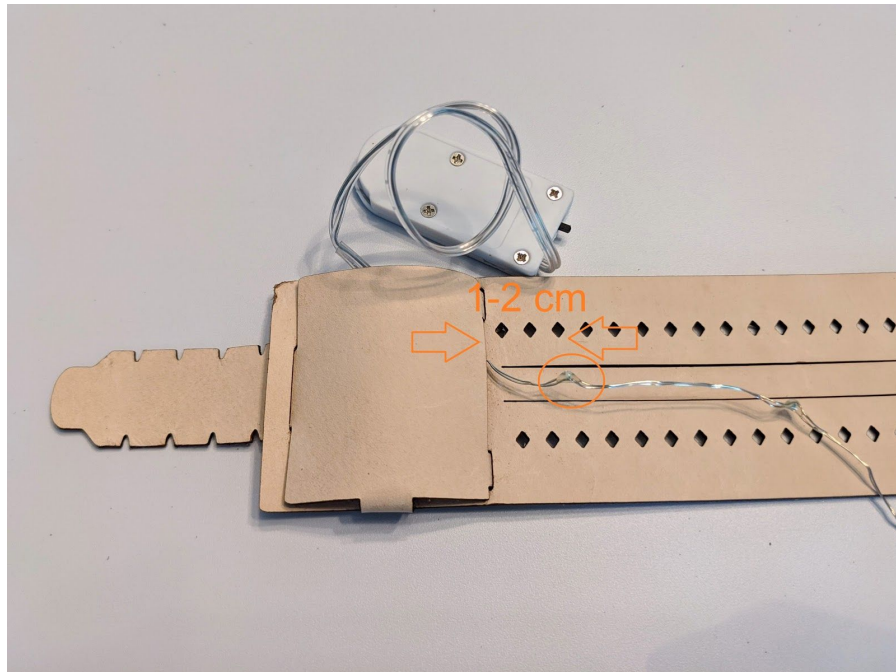
Lay the cuff and pocket pieces flat on a table as shown, with the pocket piece upside down. Insert the end of the long, mushroom-shaped tab through the two parallel slots near the bottom edge of the cuff, as shown.



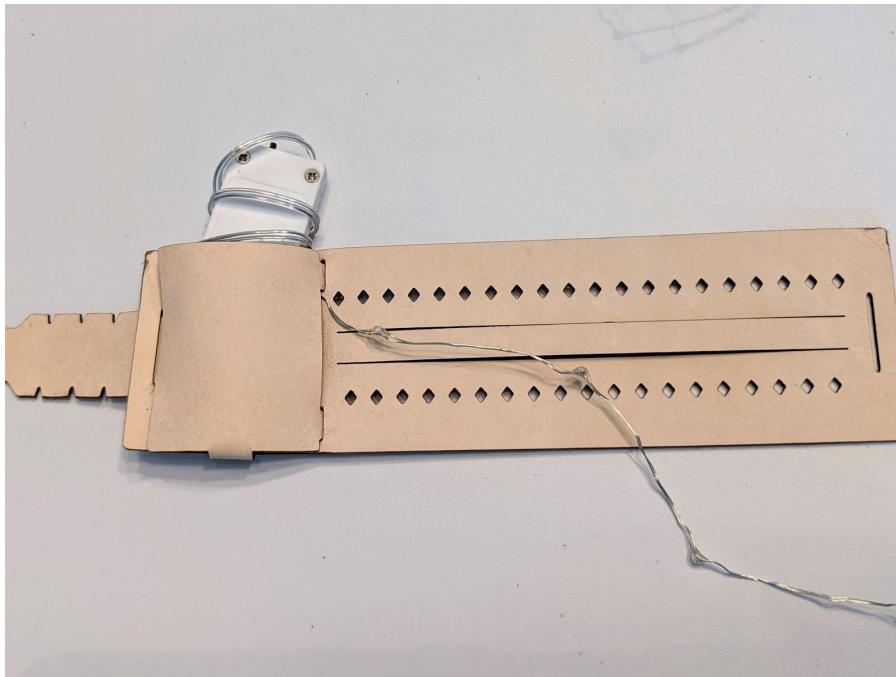
Next, fold the pocket up over the cuff, and insert the two remaining mushroom-shaped tabs through the two vertical slots in the cuff. The images above show both a front and back view of the cuff.

Slide the long notched strap through the final nearby vertical slot, and pull it gently all the way through to secure the pocket on three sides.

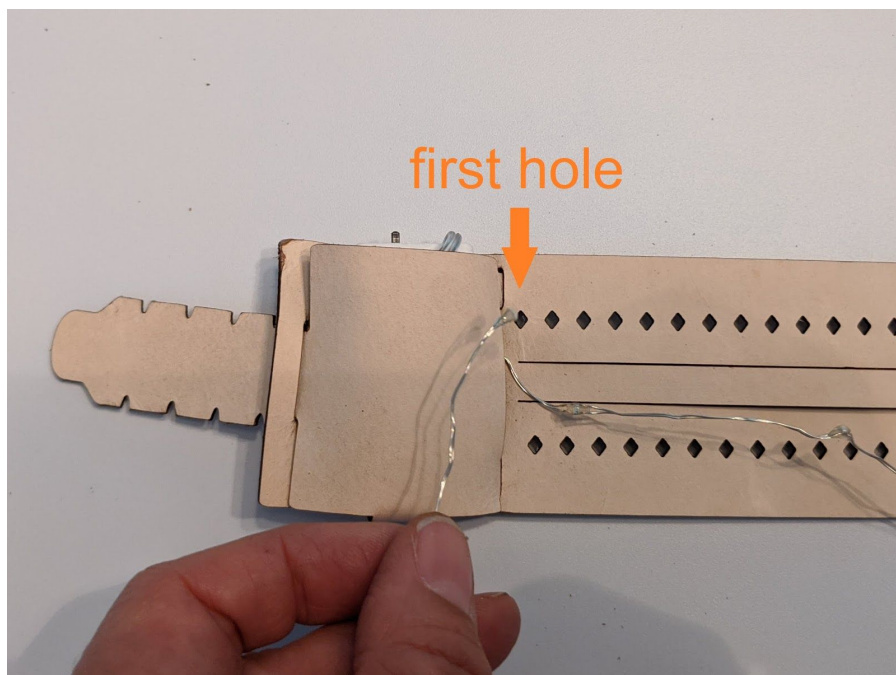
Add the Fairy Lights to the Cuff:



Unroll the fairy lights and insert the loose end of the light strand into the top pocket opening, then pull it out through the gap between the two side tabs as shown. Pull it all the way through until the last fairy light in the strand extends 1-2 cm past the pocket

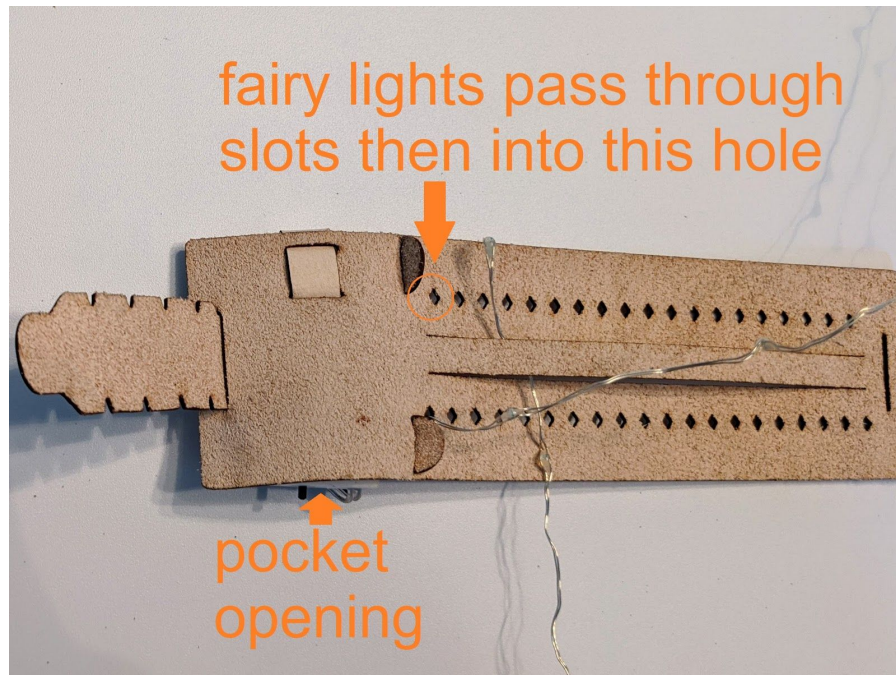


Next, wrap the battery pack in any excess wire, and tuck it into the pocket. If the wire won't stay wrapped around the batteries, secure it with a small piece of tape. Be absolutely sure that all 20 LEDs on the strand are visible outside of the pocket.

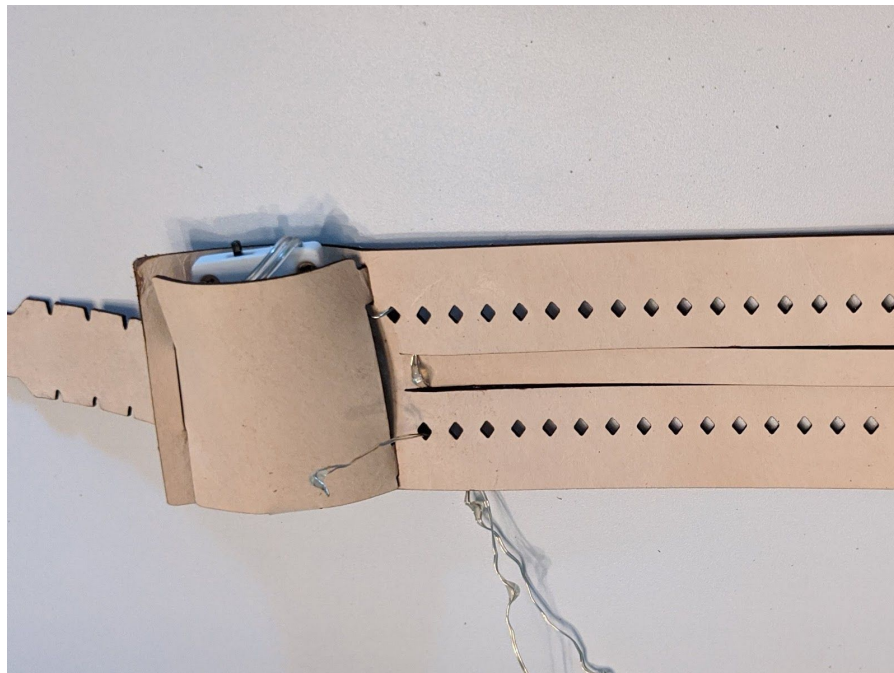


Now, we'll start to weave the fairy light strand through the holes and slots in the cuff. Take the loose end of the fairy lights and gently push it downward through the hole closest to the pocket opening as shown in the picture above. Gently push the wire from the front, then pull the wire through from the back side of the cuff until all LEDs have passed through the hole.





Flip the cuff over as shown in the picture above. Now the pocket opening is on the bottom edge of the cuff. Take the end of the fairy light strand and slip it through the two long horizontal slots in the cuff as shown. As seen from the back of the cuff, the wire passes underneath the middle section of the cuff. Gently pull the strand all the way through.. Next, thread the fairy light strand through the first hole on the opposite side of the slots. It will enter this hole from the back side of the cuff and exit through the front. Flip the cuff over again to view it from the front side.

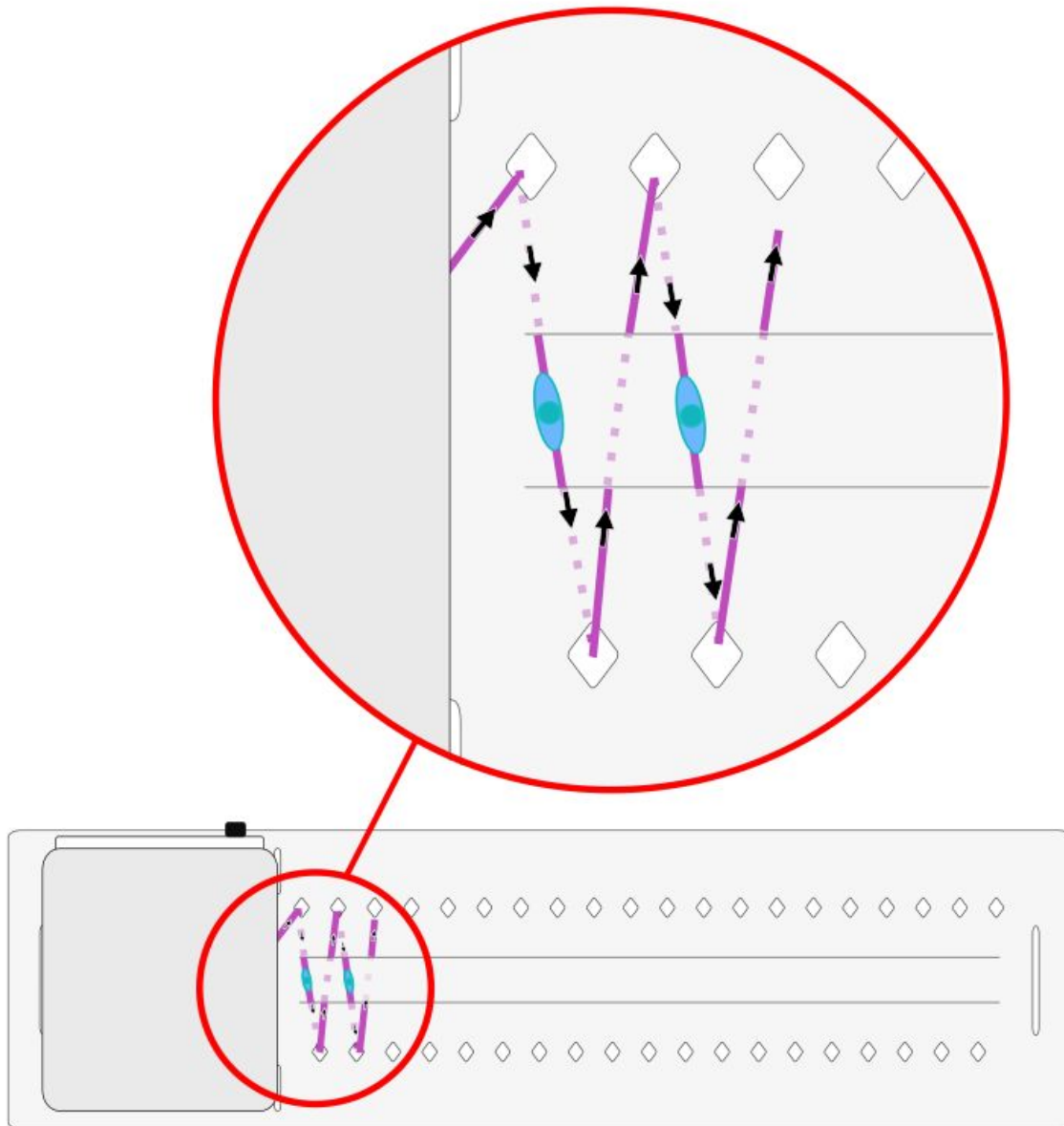


Pull the strand through the hole until it all passes through. You shouldn't need to apply a great deal of force. Be careful that the strand doesn't tangle or kink as it passes through the holes. Adjust the position of

the strand so that the first LED sits exactly between the two horizontal slots as seen above. The lights will look best if the curved side of the LED faces outward, so if the LED is not oriented correctly, gently twist the wire until it is.



After the first LED is in position, slide the end of the strand back upwards between the two long horizontal slots so that it passes underneath the middle section of the cuff, and pull it all the way through the slots. Once it is through, thread the end of the strand down through the next empty hole in the top row and pull it taut.

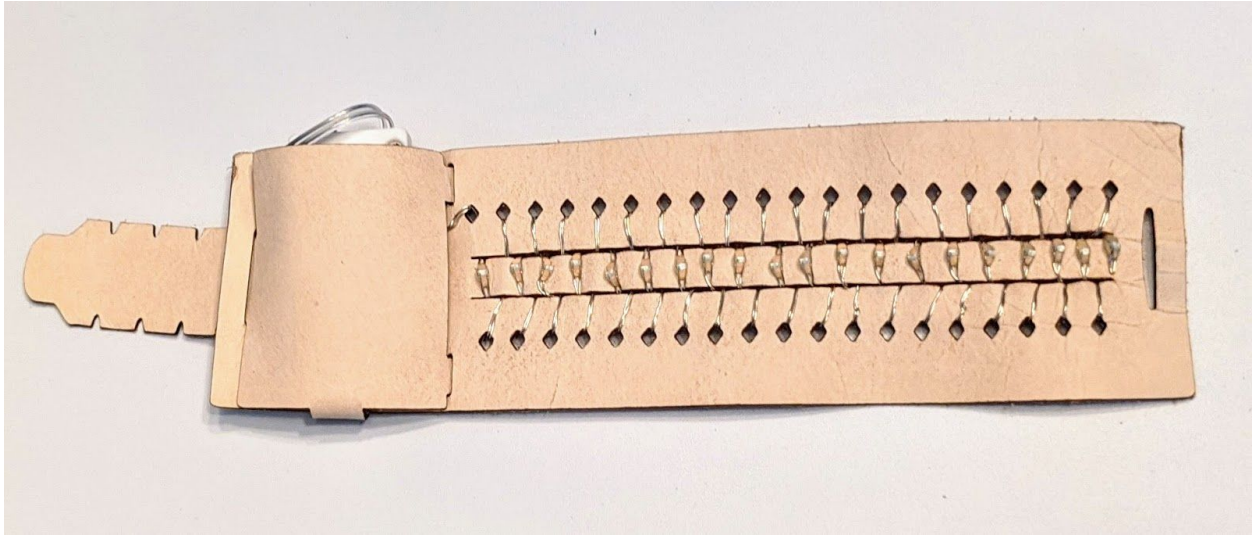


From here on out, weave the strand alternately upwards and downwards through the unused holes and through the slots. Each LED sits between the horizontal slots. You may have to fiddle with the position of the wire a bit to be sure the LEDs are aligned correctly.

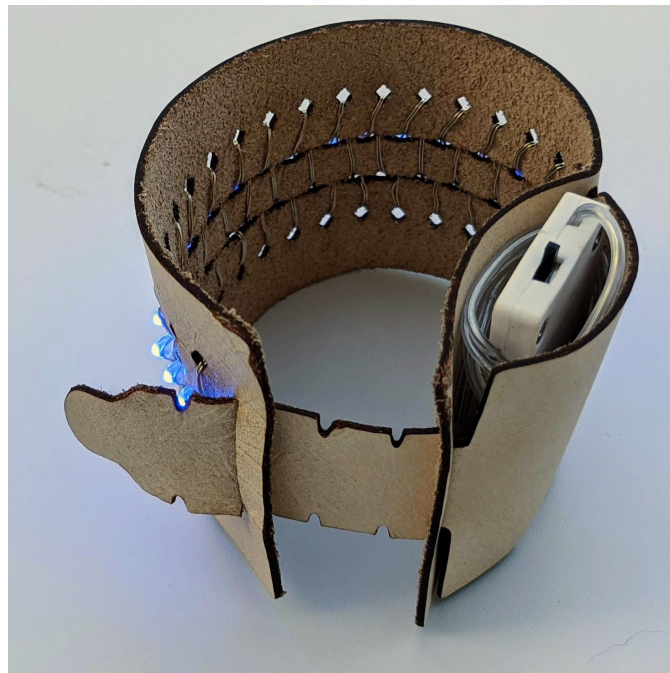
Repeat the woven pattern until the fairy light strand is finished, following the illustration above. In this image, the purple line shows the path of the fairy light strand. The dashed line indicates where the wire passes below the cuff and the solid purple line is where the wire sits above the cuff. The blue ovals show the placement of the LEDs. When finished, the wire will pass through each hole in the cuff exactly once, and the LEDs will line up along the center section of the cuff.

LED strands are fairly sturdy, but the wires can break if subjected to too much strain. It's a good idea to periodically turn the fairy light strand on during construction to make sure that the connections are good.

While they work, ask the students if they see the pattern they are creating. Can they identify the steps in the pattern which repeat over and over again? As they weave, they should notice that the LEDs in the fairy light strand all end up in a single row. Ask them if that would be true if the spacing of the holes in the leather cuff was a bit different. If they are interested in the specifics of the design, ask students to measure the distance between LEDs on the strand (5cm) and the distance between the two rows of holes in the cuff (2.5cm). The LED spacing on the strand is exactly twice the distance between the rows of holes. See if they can figure out why that causes the LEDs to line up exactly in a row.



When finished, the cuff will look like this.





To wear the cuff, wrap it around your wrist, then insert the notched tab through the vertical slot in the other side of the bracelet to secure it. The fit can be adjusted by sliding the tab through the slot to a different notch. All that's left to do now is turn it on and watch it glow!



### Step 4: EVALUATE

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Ask the students to look at the woven pattern they created. Did it turn out like they imagined it would? Ask them to imagine other kinds of patterns that could be created by weaving a string through lines of parallel holes, and how they might design such a pattern.