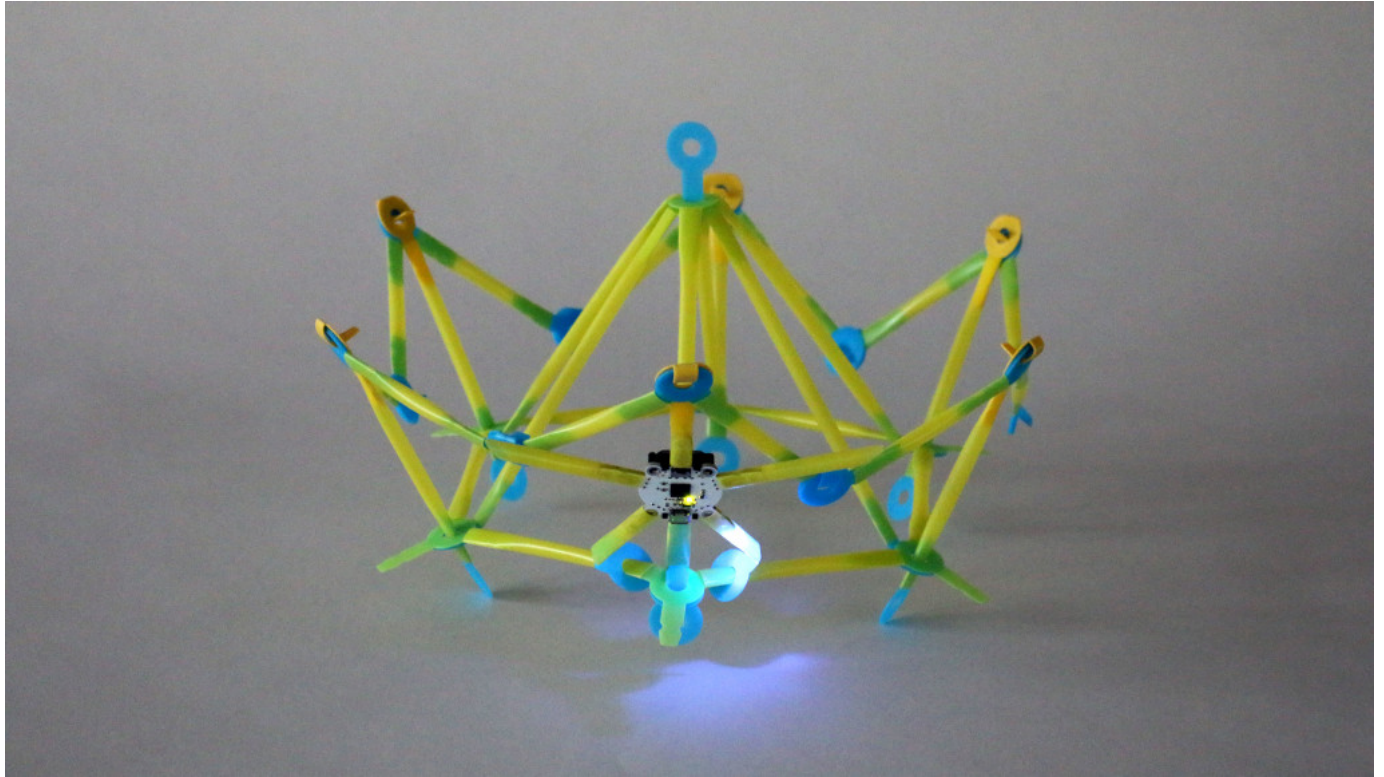


# Light-Up Wearables

Author Lindsay @ Strawbees



Incorporate LED lights to Strawbees program them to blink on wearables!

ART

ENGINEERING

PROGRAMMING

TECHNOLOGY

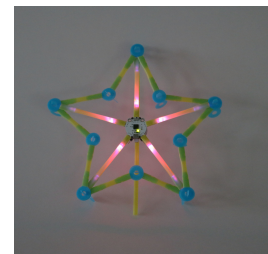
■ **Duration** 2 x 45-minute Periods

■ **Class Size** 30 Students

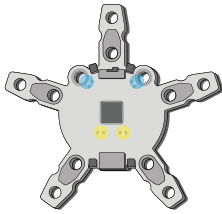
■ **Group Size** 2-3 Students

## ■ Overview

Learn the basics of flow programming with Quirkbot CODE and make an amazing blinking wearable adding on electronic LED lights. Students will design a simple Strawbees wearable during this lesson or can use a project from a previous lesson. Attach a Quirkbot with LEDs illuminating straws to enhance a hat, necklace, and anything else you can imagine!



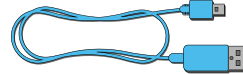
## ■ Materials



Quirkbot  
10



LED  
100



USB cables  
10



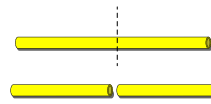
Scissors  
20



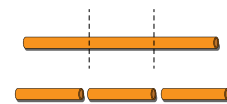
Computer  
10



Straws  
300



1/2 sized Straws  
200



1/3 sized Straws  
200



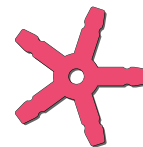
1-Legged Strawbees  
500



2-Legged Strawbee  
300



3-Legged Strawbee  
300



5-Legged Strawbee  
300

## ■ Modifications

### ☐ Lesson Split Time

Depending on needs, this lesson can be split and taught in two 45-minute periods. With a 15 minute break separating two sessions for a break or clean-up. An additional 15 minute session at the end is for clean-up.

### ☐ Stockpile of Cut Straws

Alternatively to letting students cut straws, use a stockpile of trimmed straws, both 1/2 and 1/3 the size of a full length straw, and set aside for students to use for future projects.

## ■ Learning Objectives

- ☐ Begin to understand the possibilities of wearable technology and dive into a building a set of skills to form their own concept.
- ☐ Introduced to flow programming, a unique way to code with visual clarity and coordination.
- ☐ Explore the physical principles of sensor interfacing, electrical conductivity, and triggering events.
- ☐ Understand the process of Invention Literacy, being able to invent from found objects and materials.

## ■ Preparation

- ① Students can register ahead of time with Quirkbot CODE (<https://code.quirkbot.com/>) and create an account to save and publish projects. Otherwise, students can log in as an Anonymous User and begin programming immediately.
- ② Before teaching with Quirkbot programming be sure to make sure your classroom internet is setup and you are able to access the <https://code.quirkbot.com/> (<https://code.quirkbot.com/>). You will be unable to create and upload programs.

It is recommended to use Google Chrome to ensure Quirkbot CODE will work.

- ③ When plugging in the Quirkbot for the first time to the computer may ask to install a driver. This applies to any Apple OS & Windows Operating Systems.
- ④ Charge the Quirkbots ahead of time for students to detach and use for extended periods of time away from the computer.
- ⑤ If a Quirkbot has stopped responding during class you can enable Recovery Mode. While on Recovery Mode the Quirkbot should be detectable again, allowing you to upload new code to it. Before starting lessons with Quirkbot you can familiarize yourself with the Quirkbot Recovery Mode instructions (<https://code.quirkbot.com/recovery-mode/>).

## ■ Lesson Steps

### 1. Introduction

**Duration:** 5 minutes

Tell your students they are going to make a light-up wearable, nicknamed a blink star with Quirkbot and Quirkbot CODE. They will decide how it will blink and change by programming it. Take this time to demonstrate your pre-made blink star, if you have made one, to show the lumient glow the LEDs make through the straws. Explain to your students that they will design one of these and incorporate it into their wearables of their design.

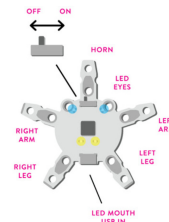
### 2. Quirkbot Anatomy

**Duration:** 5 minutes

Pass out the Quirkbots to the students and plug them into the computer to let them charge. Students should place the USB cord from the mouth of the Quirkbot to the computer. Have students turn them on once they are connected.

The Quirkbot can be referred to as a creature with arms, legs, a horn, and even eyes! With your students, have them practice and identify which parts of the Quirkbot is the left and right sides of the Quirkbot, then identify the legs and arms.

When talking about the anatomy, we always refer to the parts from the Quirkbot's perspective, i.e. the LEFT ARM is on your right - just like when you stand in front of any other person. Have students practice identifying parts of the Quirkbot for become more familiar with the anatomy.

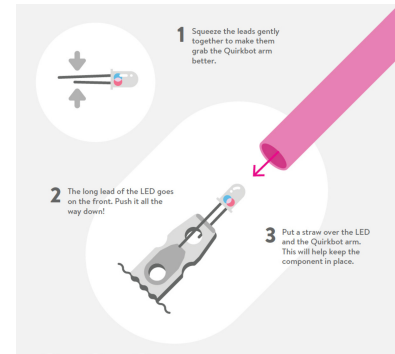


### 3. Attaching a Dual Color LED to Quirkbot

**Duration:** 15 minutes

Pass out one LED per Quirkbot to make sure they can successfully attach one correctly with a Straw.

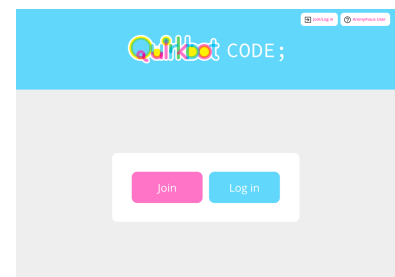
LEDs can fit snugly on the horn, legs and arms. They can be held in place with a straw over it. When putting on an LED, be sure that the longer leg of the LED is on the **FRONT** of the Quirkbot so it can reach and connect with that metallic surface. *The LEDs that came with the Quirkbot kit are Dual Color LEDs* you can place on the Arms, Legs, and Horn of the Quirkbot and can be programmed to be blue or red.



### 4. Connecting to Quirkbot Online

**Duration:** 5 minutes

Have your students open the Quirkbot CODE website by this link: [code.quirkbot.com](https://code.quirkbot.com) (<https://code.quirkbot.com>) and remind your students to open access the website through Google Chrome Browser for everything to work. When arriving to the front page, your students can select Anonymous User to open the platform and begin coding. Be aware that without an account their programs will not be saved if the browser is closed.



## 5. Programming the Quirkbot with a Dual Color LED

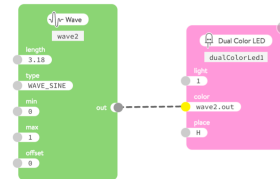
**Duration:** 20 minutes

Have your students drag one Wave brain node and one Dual Color LED output node onto the Quirkbot CODE workspace. \*Please note that the LED node is referring to the Quirkbot's built in LEDs – blue LEDs for eyes and the two green LEDs for its mouth. \*

The node to control Light Emitting Diodes (LEDs) With two leads and two colors. Like the 3 mm Red-Blue LEDs that come with the Quirkbot kits. It controls LEDs connected to the Arms, Legs, and Head. The light sets the brightness of the LED, the color changes from Red (0) or Blue (1). What would happen if you have a value in between? The place determines where on the Quirkbot the LED will light up. If the LED does not light up, have your students double check the placement on CODE or look at if the legs of the LEDs are oriented in the right position.

The Wave node outputs a continuous Wave that oscillates (swings back and forth). There are a number of different Waveforms (types of waves) that can be selected. The Wave Node can be used in many different situations like moving a Servo Motor back and forth or blinking an LED. By changing the type of waves the behavior of the LED's light will change. Have your students experiment with changing the settings of the nodes and report what they find!

*For an additional challenge:* what would happen if you pull out another Wave node and connect color from the Dual LED node to the **out**? Let your students test this and describe the type of behavior the LED does.



## 6. Programming More LEDs

**Duration:** 30 minutes

Once students are able to successfully light-up and blink one LED on the Quirkbot, now students are encouraged to add more on each leg, arms, and the horn.

To make it easier to program multiple LEDs, you can use the List node. Connecting the current Wave node to the List node iterates each limb of the Quirkbot. The items on the list can also be used as routable inputs for any stream of numbers. You can add up to 100 items by kicking the + sign and removing items by clicking the - sign next to them, but for this lesson we will use only 5 for each leg, arms, and the horn. This will enable the LEDs to light starting at the top of the list moving down. On the Quirkbot you may want to let your students know to try to make a circular pattern and order the list based on which limb they want to light up first.

On the first Wave node (connecting to the List node), ask your students to change the type of SINE and watch the behavior of the LEDs change after uploading. Have your students experiment with this Wave to see what happens!

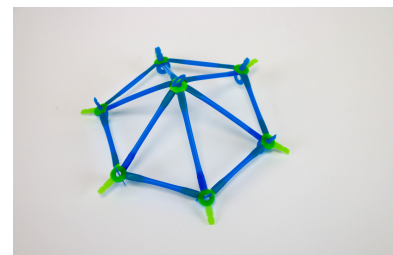
Challenge your students to program the Quirkbot's Dual LEDs to blink or flash a signal or message to someone. An example is a blinking red light at a street intersection, a red pulsing motion acting as a warning, or a fading blue color to show calmness.

## 7. Building Wearables

**Duration:** 20 minutes

Before testing using Quirkbot, students can begin thinking creatively by making their own wearables. Challenge your students to design a wearable that holds your signaling Quirkbot as a way to communicate or tell a message to another classmate during the fashion show. Students can become something abstract, become an animal, or interpret an object for their wearable.

When incorporating the Quirkbot into a wearable, have your students think about the bases and what it would take to make it fit and prevent it from sliding around, especially to prevent the Quirkbot, the heaviest part of the Strawbees project, from making it fall to the ground.



## ***8. Wearable Tech Fashion Show and Reflection***

**Duration:** 20 minutes

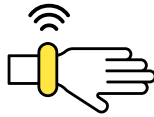
When your Quirkbot is successfully lighting up that way you like, detach from the computer attach it to your Strawbees wearable!

When your students are finished with their projects, have a wearable fashion show. Have students gather in the hallway or start a parade in your current classroom by turning off the lights.

After the fashion show, ask your students what their thoughts were on the design process of making the wearable and programming the behavior to make it accurately reflect what they wanted. Ask your students, if they were to try to improve their designs by making another version of their wearable using additional materials, what would it be?

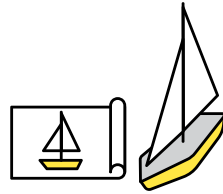
After finishing, make sure to turn off the Quirkbots and recharge them for the next project!

## ■ Vocabulary



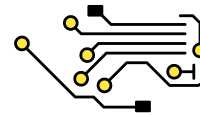
### *Wearable*

A worn item, ranging from something that can be worn on your head, shoulders, arms, legs, etc,



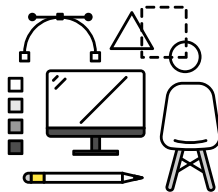
### *Prototyping*

To make a draft of an idea where additional versions of it will be developed.



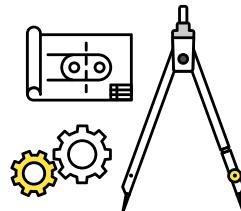
### *Electronic Circuit*

An electronic circuit is composed of individual electronic components, such as resistors, transistors, capacitors, inductors and diodes, connected by conductive wires or traces through which electric current can flow.



### *Design*

A plan for the work process in the creation of a system, object, or interaction.



### *Engineering*

The intersection of technology and science through a design process of transforming an idea and bringing it to life.



### *Multimedia*

The combination of various artistic media, usually in the digital arts.



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