

## Blink

### Activity Overview

The students continue their understanding of coding by defining and initializing plans to include LED outputs. They also further explore the effect of delay.

### Learning Objectives

#### Students will be able to:

- Modify existing code by copying, pasting and editing
- Identify function construction: curly brackets, auto-color, and indentation
- Identify variable syntax
- Identify pinMode syntax
- 

#### Files/Materials Needed

- Computer
- Engineering Journal
- LilyPad ProtoSnap Plus
- Micro-B USB Cable
- Blink\_simple.ino

#### Code Vocabulary

- Variable – a way of naming and storing a value for later use by the program, such as data from a sensor or a value used in a calculation
- pinMode – Configures the specified pin to behave either as an INPUT or and OUTPUT
- input – is a constant predefined in the Arduino language; pins configured as input are useful for reading a sensor
- output – is a constant predefined in the Arduino language; pins configured as output can provide a substantial amount of current to circuits; they can provide current or absorb current
- curly braces {} – are used in several constructs in C programming language; are used in functions, loops, and conditional statements
- digitalWrite – writes a HIGH or LOW value to digital pin

#### Syntax

- Integer Variable: in variable = value;
- PinMode – **pinMode** (pin, mode);
- Curly braces {}
- digitalWrite – **digitalWrite**(pin, value);

### Lesson Instructions

#### Sew What: The Hook

In this activity students will combine the “Programming Unplugged. My Robotic Friends” activity previously and add initializing variables. Download this lesson here:

<https://curriculum.code.org/csf-1718/courseb/6/>

Follow the same format as the previous lesson when playing the game, only this time students will identify (right hand) and (left hand) to stack cups.

We are going to say: (these are the global variables)

R = right hand

L = left hand

If you want to use local variables, you need to write a “Left hand” or “Right hand” next to each instruction you write.

Student Roles:

A = Programmer Lead – records code with input of team

B = Computer (compiler) – when program is run makes sure robot follows code

C = “robot” – follows code exactly as written

D = observer motivator – thinks of ways to improve or suggest changes

Students fulfill roles and complete activity, repeat as necessary.

Processing Questions:

How does it help to tell which hand to use? (pair, share)

What are things to remember when programming your ProtoSnap Plus board? (Round Robin)

### Present New Information

Inform students they will be working with an LED. They will get an LED to blink and add new variables to program. Ask students to identify, on their devboard, the LED pin number(s)

Pins: A5, 6, -A7, and -A8 are shown in the picture below. Note: pins can be referred to by just the number i.e. 7 and not -A7 in the code.

1. Ask student to open file blink-simple.ino and look at the sketch.
2. Students can verify and upload the sketch.

Section	Line numbers	Description
Comments	1-3	Describes the sketches overall action
Variable Declaration	5	Only one variable, named ledPin using pin 5

Setup	9-11	Sets ledPin as an output
Loop	13-18	Turns on and off the led in 1 second increments

### 3. Process the new information

- How is this similar to the vibe sketch?  
Same parts: comments, variable declaration, void setup, and void loop  
Uses same commands. pinMode, digitalWrite.
- How is this different than the vibe sketch?  
The variable name and pin # has changed: ledPin, 5

## Apply Skills in Coding: A Guided Practice

### Add an LED and program delay

Tell students that the code is like a recipe. First, we tell the cook what ingredients they need, this is like the variable declaration part of the code. If we don't tell the cook what they need, they won't use the ingredient or know what to do with it. Similarly, if the program doesn't know we want to use another LED by telling it, it won't know what it is, or that it even exists (that's deep!).

We are going to add one LED together, remember the steps so you can add the others on your own.

As you work, have the students notice that the lines of code seem to line up sometimes. These are intended to help identify parts of code. As we work, we should try to keep the code organized or "pretty." Indentations do not affect how the code runs. Organization is more for the human reading the code. Similarly, to writing, the use of paragraphs helps organize different ideas and thoughts.

The following steps add one variable to variable declaration, setup and loop.

#### 1. Initialize a new variable:

So we remember which LED is which, change the name of ledPin to ledPin1 in line 5.

Becomes

Notice we changed the pin name in the code AND comments.

#### 2. Define a new variable:

Copy and paste the changed line and place it below. In this example. I am copying line 5 and pasting it to line 6.

Review: Don't do it yet, but tell a partner how to add the next LED to the variable declarations section.

Now the LilyPad Plus will know that the ledPin2 is on pin 6. For almost every variable we add we need to tell the computer what it is, and what it might do. Using the cooking metaphor, if we have 3 carrots, set-up tells us to chop the carrots into 1 inch chunks.

### 3. Add new variable to setup:

This is important, if the students got it from the previous lesson, that's great, but just as a reminder. Functions and loops have some special punctuation around them. They are called brackets. We need to make sure items added to setup, loop, or other functions stay inside the correct punctuation.

Since we changed the name of the first ledPin to ledPin1, change the line (line 9) to ledPin1. Copy and paste the new line. Notice you might need to tab or space it over to line it up with the other pinMode. In this example, copy line 9 and paste it to line 10.

Copy and paste the new line. Notice you might need to tab or space it over to line it up with the other pinMode. In this example, Copy line 9 and paste it to line 10.

Change ledPin1 to ledPin2 and change comment to pin 6.

### 4. Add new variable to void loop():

Add the variable in void loop to turn it on and off.

We will need to change ledPin to ledPin1 on both the ON and OFF positions (line 13, and 15)

Add your new initialized variable (ledPin2) to the void loop section by copying and pasting line 13 to line 15; and line 18 to line 19. Change ledPin1 on lines 18 and 20 to ledPin2.

Have students Verify the sketch for errors. Have students Upload their sketch.

### 5. Ask students to try to do these three steps for the rest of the LED's (A7 and A8; and/or 15-20)

- Add variable
- Add variable to setup
- Add variable to void loop

Allow students to work, while the instructor circulates and helps students.

Give students time to adjust the delay and place/write them in different places. By changing the world. (challenges are not in difficulty sequence, they can try any of them)

- Blink in succession
- 2 blink together, 2 off and alternate
- Play the beat (visually) of their favorite song
- Simultaneous light and vibe
- Alternate light and vibe

#### LED blink Examples

The following examples show two different ways to orient the code in void loop() to achieve different results.