

Robot Name: Arduino

Project One: Light

Activity: Adding a Potentiometer to an LED

Grade Level	7-8	Difficulty	Beginner
Subject	Practical and Applied Arts Science		
Description	<p>Each project is broken up into several circuits, the last circuit being a culmination of the technologies that came before. The purpose of these projects is to help students learn about new technologies and concepts. This first project is titled “Light” and is divided up into several activities.</p> <p>By completing Activities 1A - 1H, students will be given the prior knowledge to design, build, and program their own multi-coloured light project that uses inputs and outputs to change the color, timing, and intensity of lighting.</p> <p>In Activity 1C, students will learn about potentiometers (control knob) In this circuit, students will write a code that makes an LED blink on and off.</p>		
Outcome(s)	<p>Supports: PAA - Electronics Modules - ELEC02A, ELEC04A; Robotics Modules - ROBA7, ROBA9, ROBA12A, ROBA13A, ROBA15A, ROBA21, ROBA23A, ROBA28A; Science - CE9.1, CE9.2</p>		
Required Prior Learning	Getting Started: Activity One - Downloading Programs for Arduino Activity 1A		
Time Frame	One hour		
Materials	Arduino Uno Board, Breadboard, LED, 330 Ω Resistor, 2 Jumper Wires Activity: Adding a Potentiometer to an LED VIDEO: Adding a Potentiometer to BLINKY BlocklyDuino Reference for a link to all the blockly codes.		
Additional Resources	Sparkfun Inventor's Kit Guide , Guide To Installing Arduino Software , Blocklyduino App: Easy Intro to BlocklyDuino & C		
Assessment	Review lesson ending questions with students for understanding and future application.		

Activity: Adding a Potentiometer to an LED

Procedure:

Review the organization of the kit and how groups need to be careful with all the components, how they are used, and how they need to be kept organized and put back into their place when done.

Divide your class into groups of two (Paired Programming). Paired programming is highly recommended when working with coding and robotics so that students can piggyback off each others ideas and strengths.

Students will wire a circuit by adding a potentiometer (pot) to their original circuit from Activity 1A where a potentiometer controls the frequency of the blinking. By operating the pot, the students will be able to adjust the frequency of the blinking. Hand out Activity 1 B Using a Potentiometer and guide the students through the instructions. Once students have wired their Arduino, students will then copy and paste the provided code into the Arduino Editor and download it onto the Arduino Board. Once downloaded, the students will be able to adjust the frequency of the blinking by turning the pot.

Extension

Students can complete the extension challenges once they have done the first program

Student Handouts

Activity - Adding a Potentiometer to Control Blinky

Assessment Guide

Circulate the room observing and assisting with students so that they can complete the project. Correct the assignment sheet as a class ensuring that students share their errors and successes while reinforcing the importance of persistence and patience in programming.

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Activity: Adding a Potentiometer to an LED

Purpose: To add a potentiometer to a circuit to control the speed of the blinking. Pots can also be used control volume and intensity.

Materials: Computer, Arduino Uno Board, USB cable, Breadboard, 2 coloured LED's, 200 - 330 Ω Resistor, 2 Jumper Wires, potentiometer

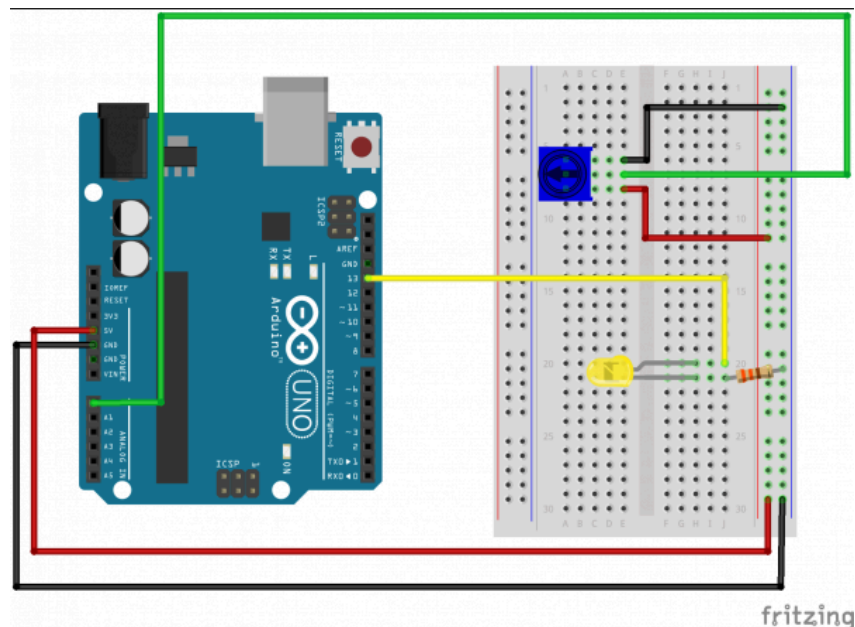
New Components:

Potentiometer (pot): A potentiometer is a 3 pin variable resistor. The middle pin outputs a voltage between 0 and 5 volts depending on the position of the knob. The more volts that the pot allows to travel through the circuit, the greater the volume, speed, or intensity of the function will be. We need to hook up the pot to one of the analog pins which are labelled A0 to A5.



Procedure:

1. Wire the project using the following schematic.

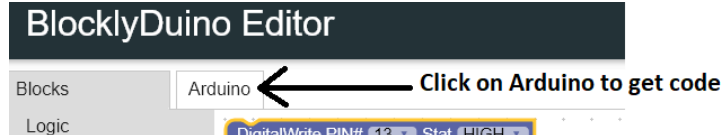


2. Once in BlocklyDuino, simply “drag” code blocks to create your code. Put the blocks into the editor as shown below to get your light to blink in sequence: Watch the following video to assist you with this.

[VIDEO: Adding a Potentiometer to BLINKY](#)

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BLOCK CODE	ARDUINO CODE
	<pre> void setup() { pinMode(13, OUTPUT); } void loop() { digitalWrite(13, HIGH); delay(analogRead(A0)); digitalWrite(13, LOW); delay(analogRead(A0)); } </pre>

*****SAVE your sketch to your BlocklyDuino Folder that you created*****

- Copy and paste your program into the Arduino IDE and upload to the Arduino.
- Your program is now loaded. Observe your LED as you turn the potentiometer and complete your worksheet titled Assignment: Adding a Potentiometer to a blinking LED.
- Now let's see if we can read the pot directly to the computer. We will use the serial monitor to "see" what the arduino senses as the potentiometer is turned. There is no need to change the wiring we will simply look at only the potentiometer and ignore the LED. Create and load the following code.

BLOCK CODE	ARDUINO CODE
	<pre> void setup() { Serial.begin(9600); } void loop() { Serial.print(analogRead(A0)); delay(100); } </pre>

Activity: Adding a Potentiometer to an LED

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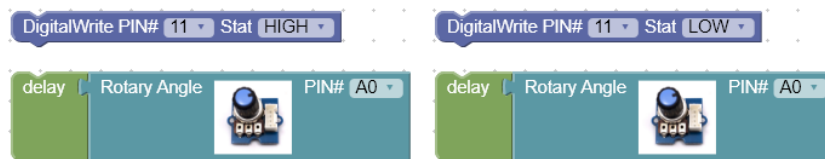
1. What does the LED do when you adjust the potentiometer? What did the serial monitor show you?

2. Look carefully at the code how did the reading from the pot change the code?

3. The pot is sometimes called a variable resistor, what is the purpose of the potentiometer? List some real life applications where a potentiometer is used or where one would be useful.

Extension Challenges:

4. Let's add a 2nd LED. Connect a 2nd LED to Pin 11.
 - a. When writing code, we need to declare our pins. In the existing code, we are using pin 13 to operate the LED. Declare another LED to pin 11:
 - b. Add code to make the 2nd LED light. Use the code from the existing program to help you. You will need to add the following blocks:



5. Test your code to see if both lights are controlled by the pot.

6. Change your code so that when one light flashes on the other light flashes off. You will still be able to change the speed of the flashing using your potentiometer. Test your code by running the program on your Arduino to see if when the first light flashes on, the other flashes off. (HINT: Consider the timing and how you should use your delay coding)
 - a. Were you successful? Explain

 - b. What problems did you have to solve to make your challenge successful?