

Light and the Microbit	Grade 10 Physics
Handout	

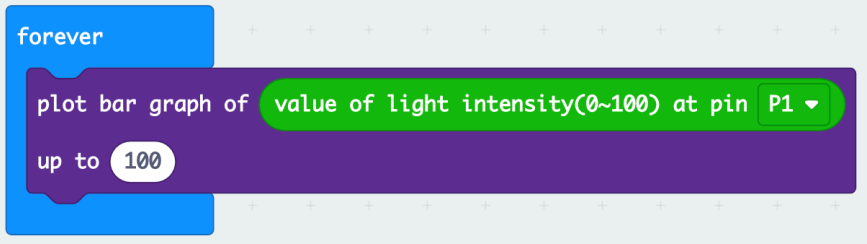
Laser Maze

This activity requires students to construct a path that uses mirrors to direct a laser towards the Microbit's light sensor. When the laser makes it to the light sensor, it will turn the LED from red to green. Use pre-built courses or build your own using the provided grid.


Getting Started
 The Laser Maze Template includes three challenges as well as a template for students to make their own mazes. The premise is that there is a fixed starting spot for the laser, and a fixed end spot for the light sensor. In between those two locations are blacked out squares where mirrors cannot be placed, making the completion of the maze more challenging.

Use plasticine to prop-up the lazer pointer, the mirrors and the microbit's light sensor. Once they are ready, simply code the microbit to act as a receptor for the laser and challenge students to complete the maze by placing mirrors on the grid.

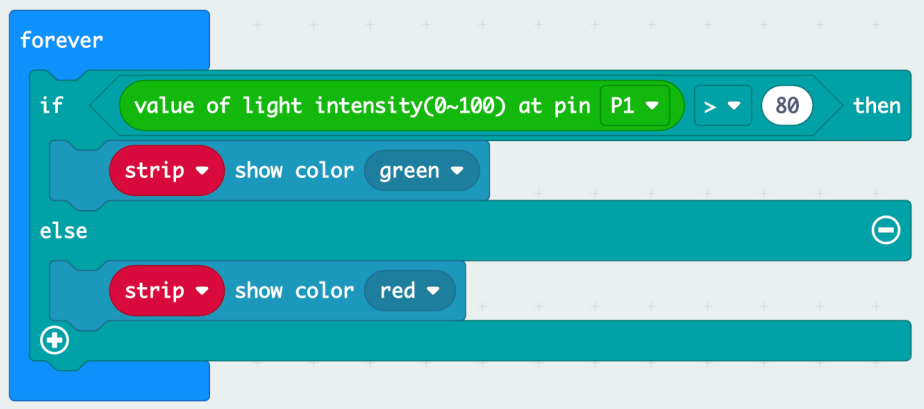
Coding the Microbit
 To start, calibrate the Microbit to determine the light intensity of the laser. Start by plugging the light sensor into Pin1. Use the plot feature to record the light intensity achieved by the laser. Record the value when the laser is shined on the light sensor.



Once the light intensity of the laser has been recorded, delete the code for the bar graph. Plug the Rainbow LED into Pin2 and set-up a single LED with the NeoPixel strip.

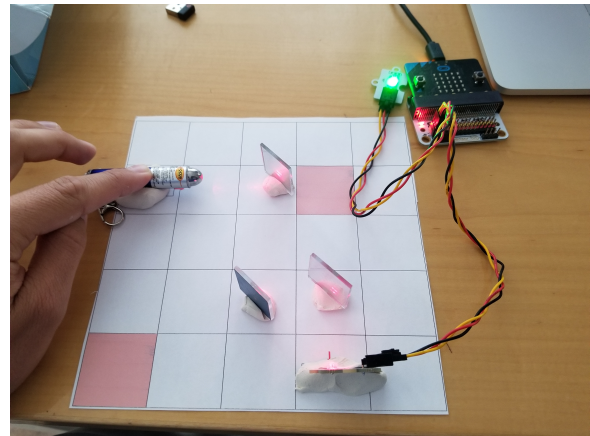
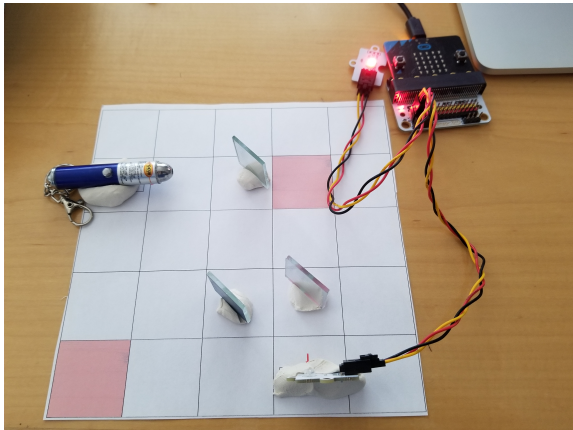


With the LED and Light sensor in place, use a conditional statement to turn the LED from Red to Green, if a light intensity similar to that of the laser (or higher) is reached.



Final Set-Up

Note: This activity works best with a low-level of light in the room.



Hue, Saturation and Luminosity

This is an activity that works better online than with the physical Microbit. Students will explore hue, saturation and luminosity on the rainbow LED to create a definition for each. They will then get the opportunity to compare that to the actual definition and make their own colours.

Getting Started

This is an exploratory activity that doesn't require a lot of set-up. The goal is for the students to create a definition for each of hue, saturation and luminosity by adjusting the settings of the Microbit. By the end of the activity, students will answer:

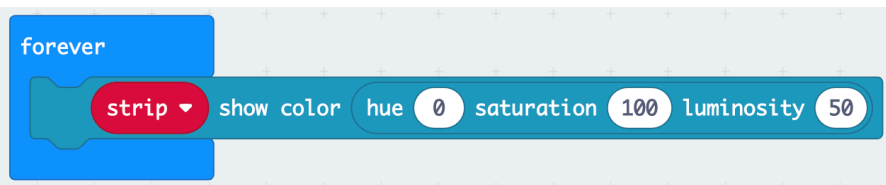
- What is hue? How does changing the value between 0 and 360 change the LED?
- What is saturation? How does changing the value between 0 and 100 change the LED?
- What is luminosity? How does changing the value between 0 and 100 change the LED?

Coding the Microbit

It is possible, and perhaps even better, to do this activity using the Microbit simulator as it is instantaneous, rather than having to download to the Microbit itself each time. To set-up this activity, simply attach the rainbow LED to pin1 and set-up the neopixel strip to reflect the single LED.



Once the LED is set-up, code it to show a colour, but replace the colour with the '*hue, saturation, luminosity*' block. Hue can range from 0 to 360, while saturation and luminosity can change from 0 to 100. Have students put different values in for each of the three conditions, and observe what happens when they change. Using these observations, students can make a definition for each of hue, saturation and luminosity.

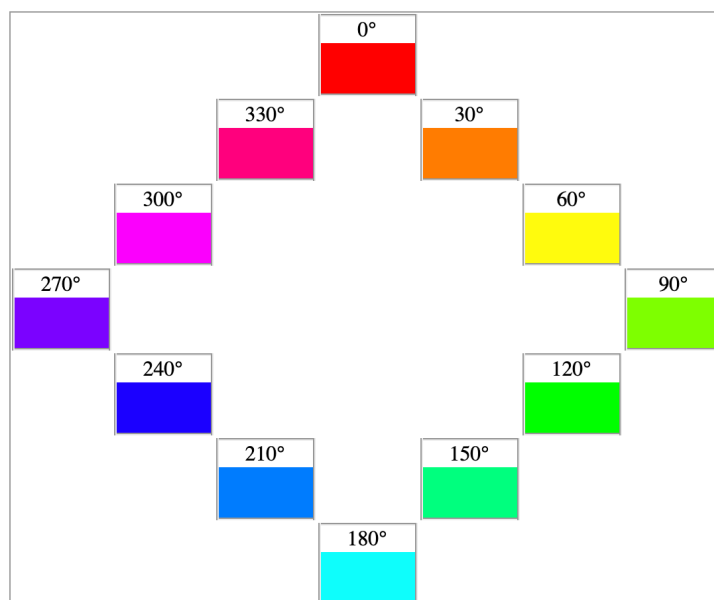


This is equally an opportunity to talk about scientific procedure and that only one variable can be changed at a time. For example, if students are trying to determine what changing the value of saturation does, they should not be adjusting the hue or the luminosity.

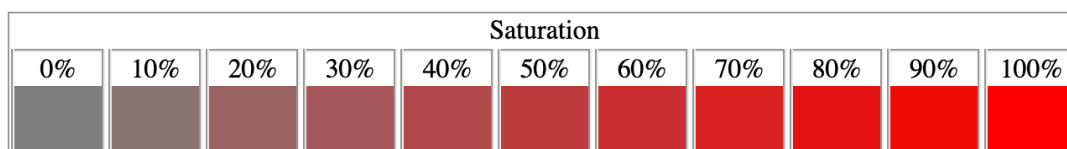
Answers

Hue is the property of light that identifies its colour within the spectrum. In Web colours, it is measured

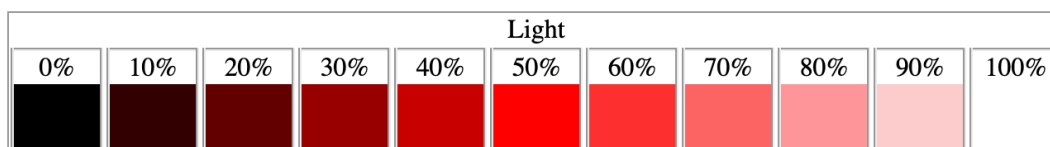
in 360 degrees of a colour circle. The colour circle starts at 0° with Red, which is what it returns to at 360°. Blue is at 240°, green is at 120° and other colours can be achieved by setting the hue between 0° and 360°.



Saturation is a measure of how much grey is mixed into a colour. 100% saturation indicates that there is no grey and that is a pure colour. As the saturation approaches 0% there is more grey in the colour and it appears less pure.



Luminosity (also called Light) is a measure of the brightness of the colour. At 50% the light level is considered normal. As the luminosity approaches 0% there is less light, causing the colour to get darker until it is black. As the luminosity approaches 100% there is more light, causing the colour to lighten until it is white.



Light Intensity

The Microbit's light sensor is capable of recording the intensity of the light reaching it. Using the LED and the light sensor, students will place various objects between the two and observe how much light is able to pass through.

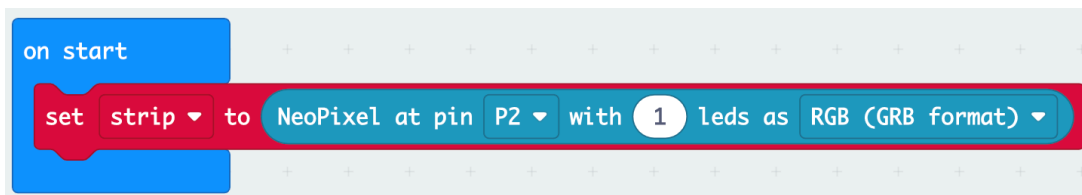
Getting Started

The objective of this activity is to observe how light reacts in the presence of different objects or media. To do this activity, encourage students to find a range of objects to test such as prisms, glasses of water, transparent or opaque materials, etc. These materials will go between the rainbow LED and the light sensor. The rainbow LED and the graph will turn on when the A button is pressed, and turn off when the B button is pressed. The graph function can be used to compare the light intensity of what passes through the objects.

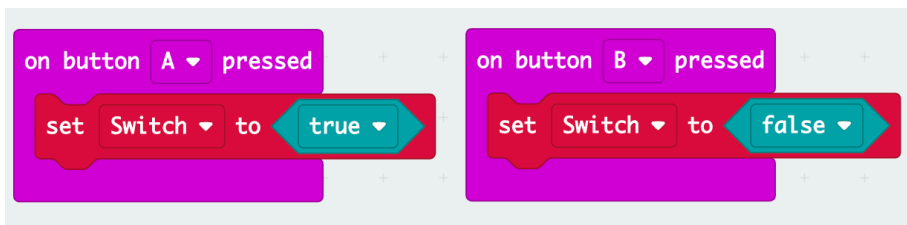
For best results, especially if you notice a consistently high light intensity, orient the light sensor away from any windows or sources of light.

Coding the Microbit

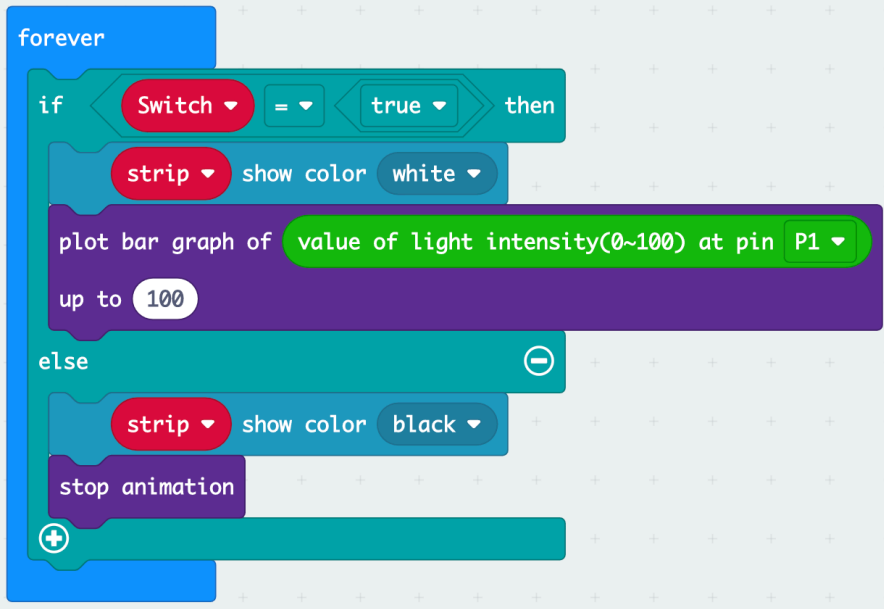
To start, attach the light sensor to pin1 and the rainbow LED to pin2. Set-up the neopixel strip to reflect the single LED.



Create a variable called switch and use the A and B button to set switch to either true or false. This is the on/off switch for the device.



Use a conditional statement so that the Microbit will turn on the light and plot the light intensity when it is turned on with the A button. Pressing the B button will turn off the light and stop the plotting.



Final Set-Up

Note: This activity works best with a low-level of light in the room.

