

MacroLab Lesson 5

Patterns & Colors: Teacher Guide

Overview

In this lesson students will work with patterns, using Sphero as they analyze, generate and solve them. They will also explore how to make Sphero turn different colors for different amounts of time. At the end of the lesson there is a challenge to see if the students can use Sphero within their small groups to send a message in Morse code and then decode the messages of the whole class. It may be useful to discuss Morse code and how it has been used in history. Read through the student guide.

Objective

Students will:

- Create a multi-line program to display many colors sequentially, each for a certain length of time.
- Have Sphero light up in primary colors (red)
- Have Sphero light up in colors that involve two primary colors (yellow and orange)
- Have Sphero light up in colors that involve two or three primary colors (purple).
- Program Sphero to light up with colors in an original pattern
- Solve patterns based on colors
- Send a Morse code message using Sphero

Common Core Math Standards

The following Common Core Math Standards for 4th and 5th grade apply to this lesson:

- CCSS.MATH.CONTENT.4.OA.C.5: Generate and analyze patterns.
- CCSS.MATH.CONTENT.5.OA.B.3: Analyze patterns and relationships.
- CCSS.MATH.PRACTICE.MP1: Make sense of problems and persevere in solving them.
- CCSS.MATH.PRACTICE.MP2: Reason abstractly and quantitatively.
- CCSS.MATH.PRACTICE.MP4: Model with mathematics.
- CCSS.MATH.PRACTICE.MP8: Look for and express regularity in repeated reasoning.

Materials Needed

Spheros are controlled via Bluetooth on either Apple (iPod, iPhone, or iPad) or Android devices. Ideally, you would do this lesson in groups of 3 or 4 students, each with their own Sphero and device. This lesson is designed for iPads, but other devices could be used. Here is what each group would need:

- iPad with Sphero Macrolab loaded. You can get Sphero Macrolab for free from the iTunes app store.
- Sphero that has been fully charged
- Print-out of the worksheet (last page of teacher's guide)

Part 1: Connect the Sphero

In part 1, students need to connect each iPad with a Sphero. They will:

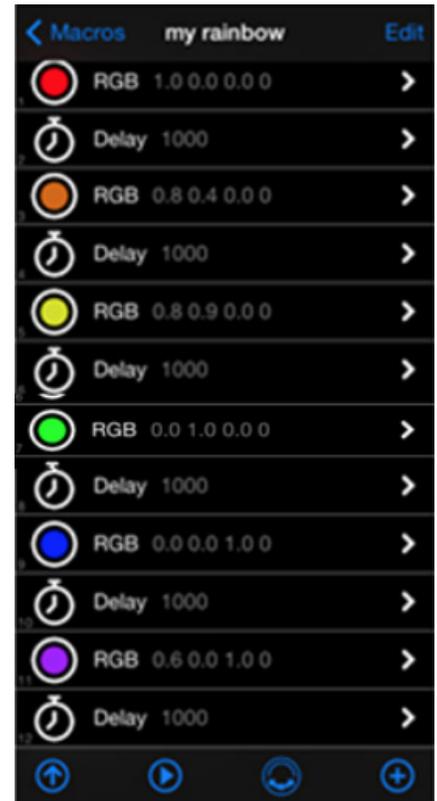
1. Wake up the Sphero
2. Turn on Bluetooth
3. Connect the correct Sphero to the iPad, using the colors flashes as a way to tell which Sphero has which name.

Part 2: Code the Rainbow

To ensure students know how to program each color that will be used later in the worksheet they begin by programming a rainbow with each color showing for 1 second. There is a preloaded macro that is called rainbow but this part challenges students to make a better rainbow than the preloaded macro.

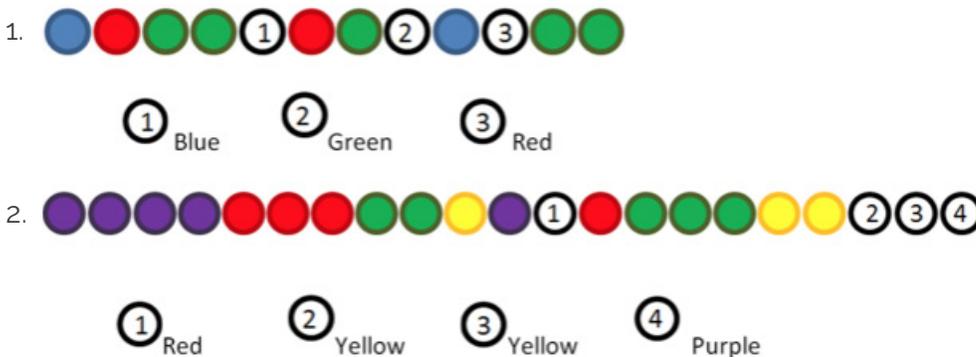


The final macro (right) should look something like this:



Part 3: Pattern Solving

Part 3 does not involve Sphero, instead students will solve the color patterns provided in the student guide. The solutions (below) are:

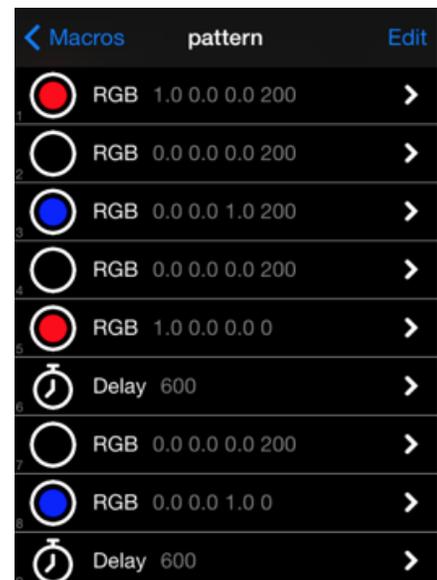
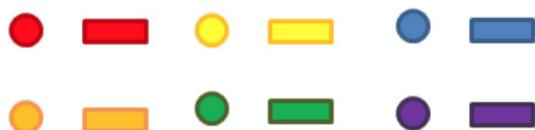


Part 4: Pattern Generating

Using a key with colors and shapes that is in the student guide (and you can see it to the left), the students will develop their own patterns. Each color and shape correspond with coding commands and the students will create macros utilizing this key. The students will then solve each other's patterns. There are examples in the student guide of how to get started.

An example macro (right) that corresponds with the pattern:

Red Circle – Blue Circle – Red Square – Blue Square



Part 5: Challenge

You will provide each group with a word which is part of a message. Using a provided Morse Code table the students will make Sphero light up the word you gave them. To make it easier for decoding, it is recommended to the students that each letter should light up a different color.

Once all of the groups have coded their Sphero, have them play it back for the whole class and see if the students can decode each of the words that the other groups programmed. Once all words have been decoded, they can be put together to form the secret message. It may be helpful to turn off the lights to help see the colors better.

Two potential secret code sentences that could be used are:

- Sphero makes coding fun
- Coding sphero colors rocks

Part 6: Optional Challenge 2

See the color-number key in the student guide.

1. 12 9 10 7

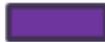
___    ___    ___ ___ 

Missing colors:    

Pattern: 12,9,10,7,8,5,6,3,4,1,2

The mathematical pattern for the first question is: -3, +1, -3, +1

2.

     ___  ___   ___ 

Missing colors:   

Pattern: 12,6,10,5,8,4,6,3,4,2,2,1

The mathematical pattern for the second question is: divide by 2, add 4, divide by 2, add 3, etc.

