EVO SKILLS 2
TIMER MINI LESSON

Essential Question/Summary
Students will get acquainted with basic coding concepts in addition to some of Evo's new features; these include sounds and lights.

Information
- Instructors should know how to use the blocks from level 4.
- Please see this guide for help on uploading OzoBlockly code onto Evo http://files.ozobot.com/stem-education/ozoblockly-evo-getting-started.pdf

Prerequisites
The Count to Ten mini lesson should be completed before beginning this lesson. Students will need to be familiar with the "count with i" block and the logic blocks. They should also understand how variables work.

Grouping
There are two parts to the activity. The first iteration requires the instructor to lead the class in a group activity. In the second part of the activity students can work individually or in pairs if they are not as comfortable with the programming concepts.

Materials
- OzoBlockly.com editor on a computer or tablet
- Ozobot Evo, one per student or pair
- Optional: printout of the *Programming Instructions Handout* which can be found at the end of the lesson

Age/Grade Level
Grades 5 through 12

OzoBlockly Programming Topics
Loops, math, logic, sounds, variables, lights, time

OzoBlockly Mode

OzoBlockly Evo mode must be used. All blocks come from level 4.

Duration

Approximately 30-60 minutes.

Topics

- Computer Science (Loops, variables, logic)
- Math (remainders)

Academic Standards

CCSS.MATH.CONTENT.4.OA.C.5 Generate and analyze patterns
CCSS.MATH.CONTENT.4.OA.A.3 Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted.
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.MP5 Use appropriate tools strategically.
CCSS.MATH.PRACTICE.MP6 Attend to precision.
ISTE 1.c Use technology to seek feedback that informs and improves their practice and to demonstrate their learning in a variety of ways
ISTE 4.c Develop, test and refine prototypes as a part of a cyclical design process
ISTE 5.c Break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem solving
ISTE 6.a Choose the appropriate platforms and tools for meeting the desired objectives of their creation or communication

Vocabulary

- ***Iterator:*** a variable that allows a user to keep track of how many times a loop has been executed. For example, in the "count with i" block the 'i' variable is the number of times the code in the loop has been executed.
- ***Modulo (%):*** an operator that finds the remainder of one integer divided by another. For example, 7 % 5 = 2.

Overview

Students will program their Ozobot to work as a timer. The front lights will light up one at a time to show how many seconds have passed.

Related Activities

Students should work on the Count to Ten mini lesson before working on this lesson. That lesson has deeper explanations on how to use loops. The Binary Blaster activity is a more involved, continuation of this activity.

LESSON/ACTIVITY PLAN

By completing this lesson, students should feel more comfortable using the advanced level blocks while incorporating new, Evo specific blocks. The instructor can introduce the activity as a mini lesson; depending on the age and comfort level of the students either one or two mini lessons can be done in one class session.

Part 1: Group Programming Instructions

In this activity students will learn about modular arithmetic, while practicing using Evo sound blocks. First, ask students to solve a simple division problem where there will be an integer remainders (i.e. 33 / 30). Make sure they understand what the remainder represents. Then, show them the modulo operation (33 % 30 = 3).

A real world application of the modulo operation can be illustrated by evenly distributing items, people, and tasks. Let's say we have five interviewers that must review a growing stream of college applications. To make sure each interviewer receives the same number of applications each interviewer will represent a number between 1 and 5. When the number of an application is divided by 5, the remainder is the number of the interviewer that will review it. The 1st, 6th, and 11th application would go to interviewer 1, the 2nd, 7th and 12th application would go to interviewer 2, and so on.

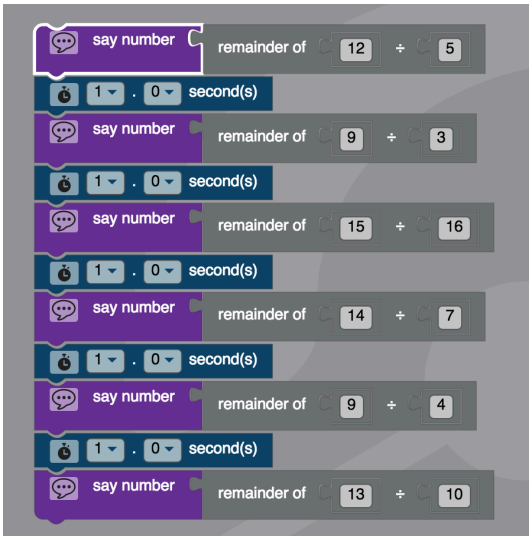
Ask students if they can find solutions for each of the following problems. There may be a number of possible values for some of the problems.

12 % 5 = _____ (2)
9 % 3 = _____ (0)
15 % 16 = _____ (15)
____ % 7 = 0 (7, 14, 21, etc.)
____ % 4 = 1 (5, 9, 13, etc.)
13 % ____ = 3 (10)

Students may begin to see some of the patterns. For example, if a number mod 2 is zero then it is even. Explain that in many programming languages we use the modulo symbol, but in OzoBlockly we can use the "remainder of" block to make things easier.

Group Programming Task:

1. Program Ozobot to tell you the solutions to the above problems (giving Ozobot the first two values and have it gives the answer).
2. Compare your answers to Ozobot's to see if you were correct with the numbers you chose.
3. Program Ozobot to wait one second between saying each answer.



Here is an example solution:

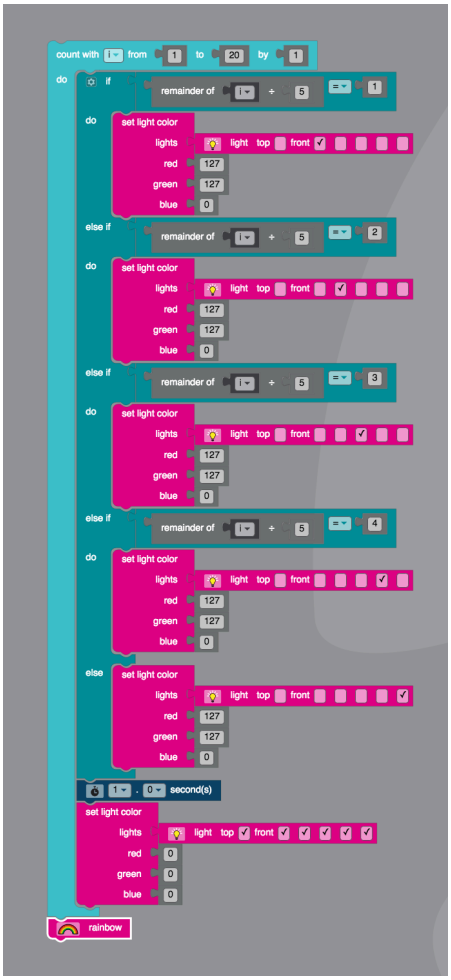
Part 2: Individual Programming Instructions

Students will use their Ozobot as a timer, by counting to a certain number (in this example, 20) and pausing one second between iterations. They will be familiarized with using the level 4 light blocks to light up individual lights on Evo.

Program Specifications:

1. Instead of counting out loud, each front light on the Ozobot will represent a number 1-5.
2. Based on the count, an individual LED will light up in a certain position.
    a. This position is the remainder of the current count divided by five.
    b. For example, if you do ⅕ the remainder is 1, so the first LED is lit. If the count is 7 then you have 7/5. The remainder is 2 so the second LED will be lit, etc.
3. Wait one second before changing the light color each time.
4. Once 20 seconds have passed the Ozobot should light up rainbow to signify that the time is up.

The following image is a possible solution



Notes:

- It may be helpful to run the program on the Ozobot to show the students how Ozobot should light up.
- Each student can work on their own; however, if some of the concepts are new it may help students to work in pairs.
- No handouts are necessary, unless the instructor would like each student to have a copy of the activity instructions, which are attached below.
- If students have not yet used the "count with" block it may be helpful to first do the Count to Ten mini lesson

Option: If students are more advanced it may be helpful to show them the modulo operation in the JavaScript version of the program. It is the operation we use to find the remainder of two numbers. Students can view the JavaScript code on their editor by clicking on the tab on the right side of the screen that says JavaScript.

```
var i;



var i_start = 1;
var i_end = 20;
var i_inc = Math.abs(1);
if (i_start > i_end) {
  i_inc = -i_inc;
}
for (i = i_start;
     i_inc >= 0 ? i <= i_end : i >= i_end;
     i += i_inc) {
  if (i % 5 == 1) {
    setLEDMaskcolorRGB(FRONT_LED_1, 127, 127,
0);
  } else if (i % 5 == 2) {
    setLEDMaskcolorRGB(FRONT_LED_2, 127, 127,
0);
  } else if (i % 5 == 3) {
    setLEDMaskcolorRGB(FRONT_LED_3, 127, 127,
0);
  } else if (i % 5 == 4) {
    setLEDMaskcolorRGB(FRONT_LED_4, 127, 127,
0);
  } else {
    setLEDMaskcolorRGB(FRONT_LED_5, 127, 127,
0);
  }
  wait(1);
  setLEDMaskcolorRGB(TOP_LED | FRONT_LED_1 |
FRONT_LED_2 | FRONT_LED_3 | FRONT_LED_4 |
FRONT_LED_5, 0, 0, 0);
}
rainbow();
```

Create a Timer on Ozobot Evo

Programming Instructions:

Task: use your Ozobot as a timer by counting to 20 and pausing one second between iterations.

1. Instead of counting out loud, each front light on the Ozobot will represent a number 1-5.
2. Based on the count, an individual LED will light up in a certain position.
    a. This position is the remainder of the current count divided by five.
    b. For example, if you do ⅕ the remainder is 1, so the first LED is lit. If the count is 7 then you have 7/5. The remainder is 2 so the second LED will be lit, etc.
3. Wait one second before changing the light color each time.
4. Once 20 seconds have passed the Ozobot should light up rainbow to signify that the time is up.

Create a Timer on Ozobot Evo

Programming Instructions:

Task: use your Ozobot as a timer by counting to 20 and pausing one second between iterations.

1. Instead of counting out loud, each front light on the Ozobot will represent a number 1-5.
2. Based on the count, an individual LED will light up in a certain position.
    a. This position is the remainder of the current count divided by five.
    b. For example, if you do ⅕ the remainder is 1, so the first LED is lit. If the count is 7 then you have 7/5. The remainder is 2 so the second LED will be lit, etc.
3. Wait one second before changing the light color each time.
4. Once 20 seconds have passed the Ozobot should light up rainbow to signify that the time is up.