OzoBlockly Lesson 03: Level 2 Beginner Programs

Time/Duration: 60 - 120 Minutes

Question: How can we write programs to take more precise control over Ozobot lights and movement, and add repeating patterns?

Overview: In this lesson we learn the Beginner level programming codes and take more control of the lights and movement of the robot.

Prior Knowledge: Ozobot Level 1 Novice Programming

Materials:

- Ozobot (one per group) – Completely Charged

- Computer or Tablet with Browser (Chrome preferred)

- Ruler with metric measurements, Paper, and Pencil (sharpened)

- (optional) Tablet or phone to take picture or video of completed activities

Standards:

CCSS.MATH.PRACTICE.MP1 Make sense of problems and persevere in solving them.

CCSS.MATH.PRACTICE.MP5 Use appropriate tools strategically.

CCSS.MATH.PRACTICE.MP7 Look for and make use of structure.

Objectives:

1. Demonstrate how to give commands to Ozobot with a graphic programming language (OzoBlockly).

2. Understand and use the Beginner Level 2 codes for controlling Ozobot robot.

3. Apply knowledge of codes to solve a problem

4. Inter-disciplinary: robotics, physics and math come together to create a robot which follows commands

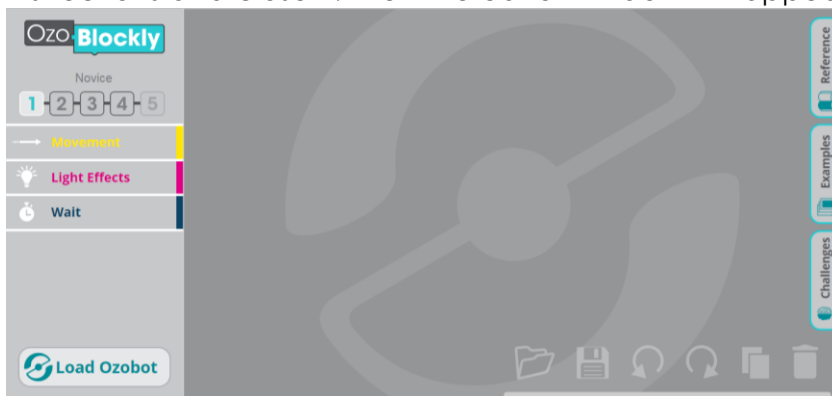5. Computer science: use visual codes to program the robot

Vocabulary:

- Variable

- Parameter

- Characteristics

Activity:

Programming Ozobots

As we recall from the Getting Started lesson, we start programming the Ozobots by going to the Ozoblockly.com website. Read the pop up Screen which has basic instructions and close it. Then the editor window will appear.
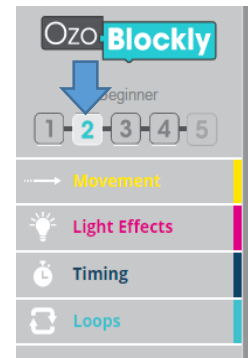

Beginner Programming Level

We click on the 2 to set the programming level to Novice.

 This shows the programming groups of commands:

- Movement

- Light Effects

- Timing

- Loops

These descriptions are pretty self-explanatory. The Movement commands control how Ozobot moves, the Light Effects commands control turning on the LED lights and also have some special light animations. The Timing commands set waits and other time controls.   The new category of Loops provides methods of repeating commands. We will go through these commands in more detail.

There are also some sample Beginner programs that we will review:

- The Square Walk Program

- The Victory Lap Program

- The Dizzy Program

Controlling Movements

Let's start with taking a look at the movement commands.   We already know what most of these commands will do. But they look a bit different. The commands now have parameters which are set as part of the command block.

Now instead of setting the speed as normal or turbo before a move command, we set that as a parameter (or option) of the command.

For example, the Move block will drive Ozobot forward or backward. The Move block lets you configure the movement direction (forward or backward), the traveling distance (in steps) and the speed using drop-down selectors. We now have 1 to 10 steps for the distance, and each step equals about one centimeter. The speed choices are - slow (25 mm/sec), medium (45 mm/sec), fast (65 mm/sec), and very fast (85 mm/sec). Each of these choices is a parameter or option that can be set.

Next instead of several rotate commands, we have one Rotate block. The Rotate block turns Ozobot in place in either clockwise or counter-clockwise directions. Use the dropdown selector to choose from the following turn options: slight left or slight right (about 45 degrees), left or right (about 90 degrees), and u-turn left or right (about 180 degrees). All turn maneuvers are performed at the default medium speed.

The Zig-Zag block makes Ozobot move forward in an angular left-right-left pattern. Choose the desired speed using the dropdown selector. Just like the move command, the speed options are slow, medium, fast, and very fast.

The Skate Move block makes Ozobot perform an exciting maneuver that resembles a skating motion. Ozobot can travel in both forward and backward directions while going in a preprogrammed wavy pattern. Use the dropdown selectors to choose the movement direction (forward or backward) and the speed.

Use the Spin command to turn Ozobot around 360 degrees in to the right (clockwise) or left (counter-clockwise) directions. While performing the maneuver, Ozobot starts by accelerating to its top speed and then decelerating to a full stop.

This small Circle block makes Ozobot follow a circular path of a small radius. Speed, movement direction (backward/forward), rotation direction (left/right) and the travel time (in seconds) can be selected using dropdown selectors.

This big circle block is similar to the Small Circle block except Ozobot will follow a circular path of a larger radius. Speed, movement direction (backward/forward), rotation direction (left/right) and the travel time (in seconds) can be selected using dropdown selectors.

Be aware that with both the circle blocks, the selected speed also influences the turning radius. Also, the selected time will determine the distance that Ozobot is able travel along the perimeter of the circle.

Your Turn 01

Now let's try these commands.   Create a program that:

- Moves forward 10 steps fast

- Spins left

- Skates backward slow

- Moves in a small circle forward left at medium speed for 3 seconds

- Zigzags at fast speed

- Moves in a large circle backward right at fast speed for 4 seconds

- Spins right

You remember how we calibrate and then load the program onto the Ozobot. Then we place Ozobot onto a table or flat surface and double click the start button to see how this program runs.

Controlling Lights and Timing

Next let's control Ozobot's lights. Once again, these commands should be familiar, except for the first one.

Turn LED Off disables Ozobot's LED until another Light Effects block enables the light again.

To turn on an LED we set the light color. Now we have 12 different colors to choose from.

Ozobot will perform all of the subsequent movements while shining the chosen light color until you set the LED to another color later in your program. Remember, if we want Ozobot to shine a color while stationary, we can insert a Wait block from the Timing category right after we set the LED color. We can also use the turn LED off between wait commands to make a flashing light.

The new wait command in the Timing section has a selection of the number of seconds, from 1 to 10.

The remaining light effects work the same as they did in the Novice mode: police car, rainbow, traffic lights, disco, christmas tree, and fireworks. Remember, Ozobot remains stationary while doing the light animations.

Your Turn 02

Now let's try out some of the light commands.   Let's create a program that

- Shows Disco lights
- Waits 1 second
- Turns on lime green light
- Waits 1 second
- Turns off LED
- Waits 1 second
- Turns on orange light
- Waits 1 second
- Turns off LED
- Waits 2 seconds

- Shows the Rainbow colors

Then load the program onto the Ozobot. Then once again we place Ozobot onto a table or flat surface and double click the start button to see how this program runs.

Loop Commands

There are many times that we want to repeat a sequence of commands over and over again. There are two different loop commands that help us do that. For both of these commands, we insert the blocks that we want to repeat inside of them.

The Repeat Forever block is a type of a control structure that will run the block instructions in its body over and over again in an infinite loop. This is often used to make a whole program start over and keep playing again and again until the robot is switched off.

The Repeat N-Times block will run the code in its body the specified number of times. You can select between 2 and 10 repeats in the dropdown list. How would we use this command?   An obvious one is to create a light effect that repeats multiple times, as shown in this example which turns the green light on and off 3 times. But we can also create sequences of moves that repeat over and over.
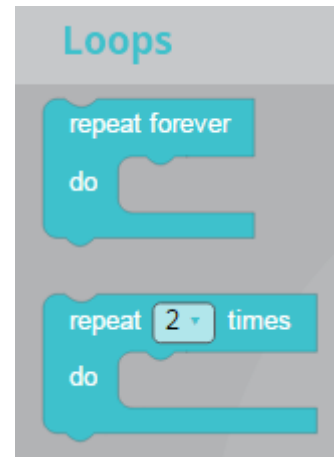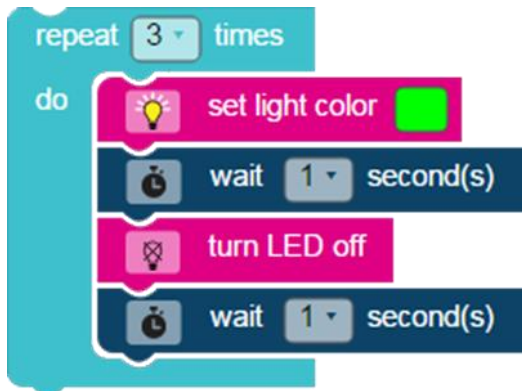
Your Turn 03

Use the light program we created

- Repeat Forever

  ➢ Shows Disco lights

  ➢ Repeat 2 Times

    - Waits 1 second

- Turns on lime green light

- Waits 1 second

- Turns off LED

- Waits 1 second

- Turns on orange light

- Waits 1 second

- Turns off LED

➢ Waits 2 seconds

➢ Shows Rainbow lights

Hint: Try adding the repeat commands in from the left. This may be easier to insert all the commands at once inside the loop. Then pull out the commands that you don't want inside the loop. Notice that we don't want the Wait 2 seconds and Rainbow lights inside our Repeat 2 times loop.

Example Square Walk Program

Let's take a look at the Example program named square walk.
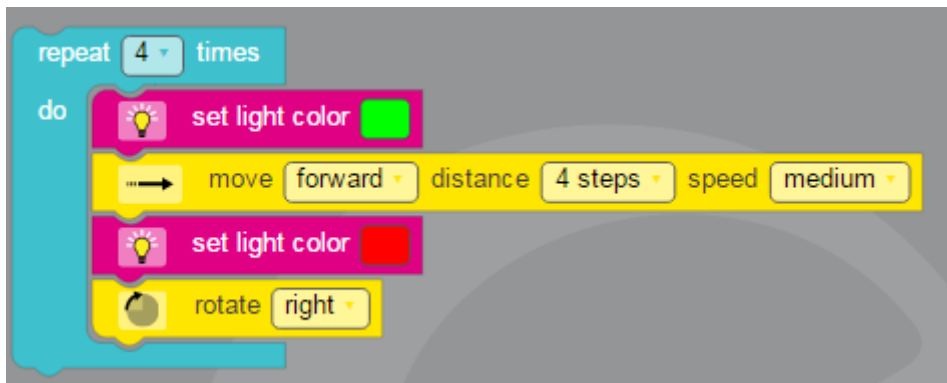
We see that it repeats 4 times.

While the light is green it is moving forward 4 steps at medium speed.

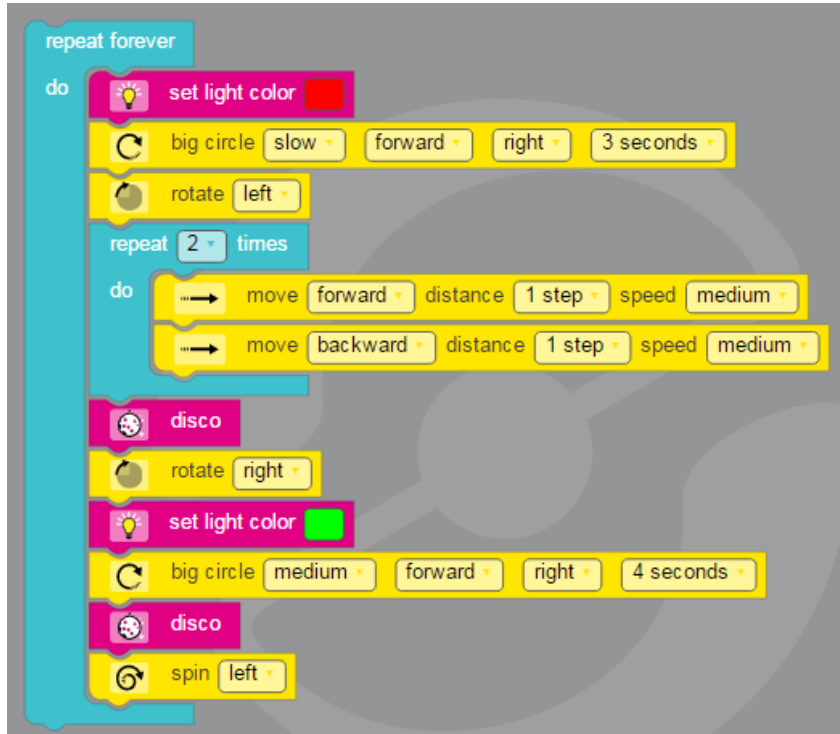Then while the light is red it rotates right.

So can you guess what this will look like?

Let's load the program to the Ozobot and run it.

This is a great example of how the repeat N times decreases the number of commands that are needed to accomplish a task.

Example Victory Lap Program

Next let's look at the example victory lap program.

It has a variety of moves and lighting effects. There is a repeat forever, so it will keep running till we turn the robot off.

There is also a small section that repeats 2 times and has a couple of moves in it.

There are some fun disco lights and some circle and spin moves.

Let's load the program to the robot and run it.

Example Dizzy Program

Next let's look at the Example Dizzy Program. This is a pretty long program.

We see there is a section that is repeated 5 times. It has a lot of turning in circles in it. This is a good example of how a dance routine can be created by using the repeat loop.

There are also a lot of spins before and after the repeated section. So we can see why they call this one Dizzy.

Let's load it to our robot and watch it run.

Programming Challenge 1: Rectangle Walk

OK Here is a programming challenge for you. You can use what you learned from any of the Your Turn programs and from the example programs to complete it.

First, draw a rectangle on paper with a pencil and ruler. Make the lengths of each side whole cms (not fractions).

Then create a program where you make Ozobot trace the rectangle.

Have Ozobot's LED shine green when going on the short edge of the rectangle and red when going on the long edge.

After Ozobot has completed the rectangle, make Ozobot spin and do an LED animation of your choice.

Try to use as few blocks as possible (you will have to use a loop for that).

Extra Credit:

Make sure that Ozobot goes counter-clockwise when tracing the rectangle. Then, make Ozobot do the same again, but this time clockwise. Do the spin and LED animation in the very end, after both rectangles have been completed.

Create your own LED animation instead of using one of the pre-programmed ones.

Programming Challenge 2: Word Walk

Here is another Programming Challenge.

Draw a short word with block letters on paper using a pencil and ruler. Make the lengths of each side whole cms (not fractions). Connect the letters together with a line either on top or bottom.

Create a program where Ozobot traces over the letters and the line. The tracing does not have to be perfect. Close counts.

At the end add in a light animation and a victory dance.

Try to use as few blocks as possible (you will have to use a loop for that).

Hint: you may need to slightly adjust the size of the drawn lines, circles and curves after you have tried your program several times.

Review – Beginner Programming Level

Now we have mastered the Beginner Programming level for Ozobots.

We know how to control movements, create light effects, change the timing, and create loops.

We tried out and learned from the example programs: square walk, victory lap, and dizzy.

We also took on the challenges and wrote our own programs to solve a problem.

We are now ready to tackle the Intermediate level of programming – level 3.