

THE OZOBLOCKLY TUTORIAL

Prepared for Ozobot
by Linda McClure, M. Ed

ESSENTIAL QUESTION

What is computer programming?
How do you create a program?

OVERVIEW

What is the Hour of Code? The 'Hour of Code™' is a nationwide initiative by Computer Science Education Week (www.csedweek.org) and Code.org (www.code.org) to introduce millions of students to one hour of computer science and computer programming. The idea is to introduce the concept of coding to students and letting them know that anyone can write computer code!

The following is a planner created by Ozobot that suggests a lesson that can be used for the Hour of Code. In this lesson you will introduce the concept of coding and allow students to practice coding by playing Ozobot tutorials, called Shape Tracer Games, with or without an Ozobot Bit or Evo robot. This is followed by a project idea that can be done beyond the Hour of Code.

PREREQUISITES

None

STANDARDS

- | | |
|---------|--|
| ISTE | 1.c – Use models and simulation to explore complex systems and issues
4.b – Plan and manage activities to develop a solution or complete a project
6.a – Understand and use technology systems |
| CC Math | 1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively. |

AGES

Grades 1-12

Note: Lesson can be leveled up or down depending on students.

GROUPING

Lessons can be done individually or in groups of two or three students.

MATERIALS

- Tablet or computer for each group and teacher
- Ozobot Games website, <http://games.ozoblockly.com>
- Ozoblockly website at <http://ozoblockly.com/>
- Ozobot Bit or Evo, 1 for every 2-3 students is recommended but not required
- Link to video about code: <https://www.youtube.com/watch?v=THOEQ5soVpY> or inspirational videos from the Hour of Code website <https://hourofcode.com/us/promote/resources#videos>

DURATION

1 hour, additional time for the optional extension project

OZOBLOCKLY PROGRAMMING TOPICS

Free Movement, Light Effects

OZOBLOCKLY MODE

Use mode 2 or higher

VOCABULARY

- *Ozobot Bit or Evo* - Little robot that can follow drawn lines or can be programmed using visual codes or through the OzoBlockly programming language
- *OzoBlockly* - A visual editor which allows to create programs by plugging blocks together. The blocks can be used to control Ozobot's behavior like movement, LED lights, etc.
- *Rotate Right or Left* - 90° turn
- *Rotate Slightly Right or Left* - Aprox. 45° turn
- *Steps* - a unit of movement forward
- *Line Following* - Ozobot's default capability of sensing and following lines on paper or digital screens
- *Free Movement* - Ozobot's capability of moving around freely without visual guidance such as following lines

TIPS

If this is the first time you are organizing an Hour of Code event, please take a look here <https://hourofcode.com/us/how-to/events> for general info on how to plan your event. You can also sign up your event there!

BEYOND THIS LESSON

After completing this lesson, students should be comfortable writing their own OzoBlockly program. As the next step, you may want to do another lesson using OzoBlockly. You can see all of these lessons in the OzoBlockly section of the Ozobot Lesson Library here <http://portal.ozobot.com/lessons/list/ozoblockly>.

CONTACT

Please contact us at ozoedu@ozobot.com with any question about Ozobot or this lesson plan.

ACTIVITY

1. CLASS LESSON

INTRODUCTION

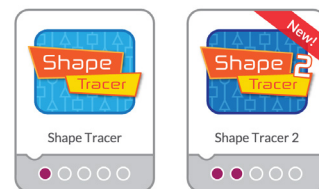
"How many of you have heard of computer code? Today we are going to learn what coding is, and actually write our own computer code!"

GUIDED ACTIVITY: "STEPS TO COMPLETE A TASK", INTRODUCTION TO CODE

1. As a class, brainstorm the steps for washing a car (putting on shoes, baking a cake).
 - Start by allowing the kids to come up with ideas without input from you.
 - Write the steps on white board, cards or paper strips so they can be moved around and edited instructions inserted.
 - As the steps develop, question the students so they see where the steps need to be more specific. Add details to the instructions.
2. Show video: <https://www.youtube.com/watch?v=THOEQ5soVpY> about "What is coding?", or any of the inspirational videos from the Hour of Code website <https://hourofcode.com/us/promote/resources#videos>.

INDEPENDENT ACTIVITY - OZOBLOCKLY TUTORIAL GAMES

1. "Today we are going to write a computer program to teach a robot to do a task"
2. Go to <http://games.ozoblockly.com>. Note: for your convenience, we have included the solutions at the end of this lesson plan.
3. Demonstrate Game 1 from each Shape Tracer level:



Shape Tracer 1 is good for younger students/beginners. Shape Tracer 2 will work well for older students. Teacher or Students can choose which levels to complete.

Shape Tracer 1 Games	Shape Tracer 2 Games
<p>1 Game 1. Demonstrate to the class how the simulated Ozobot can move forward or back using a block from "Movement". The units of measurements are "steps". Show the students how to set and change color using the block from "Light Effects".</p> <p>2 Game 2. Explain that the Ozobot can make turns. For this we use the "Rotate" block found in "Movement".</p> <p>Allow the students to work through the games at their own pace.</p>	<p>1 Game 1. Introduce the "Loop" block. Any combination of blocks that repeat can be placed inside a loop block. All you have to do it tell the loop how many times to repeat the commands.</p> <p>Allow the students to experiment with finding the solutions for the remaining levels.</p>
<p>Note: an Ozobot Bit or Evo will be necessary to run the program on levels 4, 7, and 10 in each Level as the simulator is disabled. If no Ozobot is available, students can skip these levels or you can have them check their program against the solutions shown at the end of this lesson plan.</p>	

Note: for more details on the Shape Tracer tutorials and how to teach them, you may want to take a look at "OzoBlockly Basic Training" lessons 1 and 2.

<http://portal.ozobot.com/lessons/compilation/ozoblockly-basic-training>

Note: A game will be unlocked when students solve all 10 levels. This game can be played with a group of students and helps them practice the concepts they have learned so far. Playing the game may be an interesting and fun activity to do at this point if you have the time.

REWARD YOUR STUDENTS!


After completing the Shape Tracer games or after spending one hour trying, please direct your students to the final page from the Hour of Code www.code.org/api/hour/finish. There, your students can see leaderboards, share their achievements on social media and print out certificates.

2. EXTENSION PROJECT: CODING AN ACTION SCENE

In this project, students take everything they learned and use it to create and program an action scene that Ozobot can perform. Students are encouraged to use movements and LED light effect to create an original scene.

EXAMPLES

There are several examples in the OzoBlockly editor that students can take a look at:

- Go to the OzoBlockly editor <http://ozoblockly.com/editor> and choose the Novice (1) or Beginner (2) mode.
- In the right pane, click on the examples tab . This shows all the examples for the mode you are in.
- Choose an example and click "Load Example". This will show the code in the editor. Good examples for this project are "Victory Lap" and "Dizzy" in mode 2 and any of the mode 1 examples.
- Have students read the description of the example and then study the code to see how the scene was implemented.
- If Ozobot Bits are available, let students load the program and see how Ozobot acts out the program. For more info on how to load and execute a program, click "Load Ozobot" on the bottom left and choose "Help".

Note: when loading the program to an Ozobot, you may notice that certain blocks can extend the load time substantially. Specifically, this is the case for the composed LED animations (police car lights, rainbow, etc.), but not for the elementary "Set light color" block. Certain composed moves (skate or zigzag) also prolong the loading time.

CODING ACTIVITY

- Brainstorm what kind of scenes could be programmed. Sketch out the types of movements students know how to program (forward line, change colors, turn, repeat) and what kind of light effects they can use.
- Have students come up and decide on which action scene they want to code. Let them create a simple sketch on a piece of construction paper. They should indicate movement as well as LED animations or light changes.

- Using the OzoBlockly editor <http://ozoblockly.com/editor>, write a program that would allow Ozobot to act out the drawn sketch. Students can use any mode to write the program.
- Note: If Ozobot Bits or Evos are available, make sure that students do not put the Ozobot on the lines that they drew. The sketch is merely an abstraction and meant to be used to plan the program. Instruct the students not to use line following in their program (i.e. only use blocks from the "Movement" and not from "Line Navigation" category).
- If the drawings are too detailed or have shapes that cannot be completed with the current tools and knowledge, demonstrate how to edit the sketch to achieve success with the code. For example, if the lines for Ozobot's movements are too curvy, they may be difficult to program. Suggest that students use a series of small linear movements instead.

Note: In OzoBlockly modes 1-4, it is not possible to have LED light animations while Ozobot is moving. For example, using a "Police car lights" block, followed by a "Move forward" block will do the police car animation first while Ozobot is stationary. Then, after the animation is done, Ozobot will start moving. If you want to express changing LED colors while Ozobot is moving, you will have to use alternating short movements with the "Move" block and changing the LED color with the "Set light color" block.

Project Showcase

There are several ways students can showcase their programs:

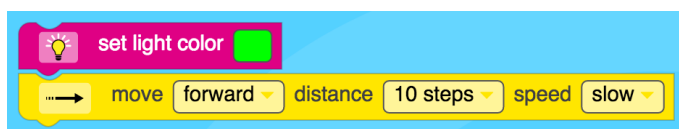
- Have the students write out the code on their sketch for display.
- Have students screen shot and print out the code to include with their sketch.
- Have students video Ozobot running the program (i.e. reenacting the scene).

We would love to see your student's creations! Please share your documents, photos and videos with us for a chance to win cool prizes and be featured on our website. Contact us at ozoedu@ozobot.com.

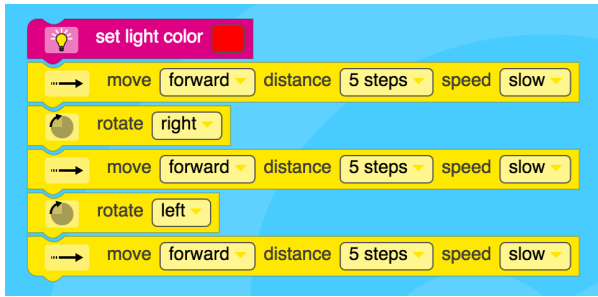
3. TUTORIAL GAMES SOLUTIONS

SHAPE TRACER 1

Level 1



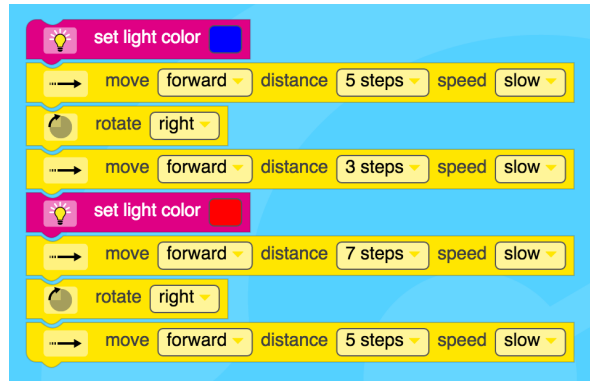
Level 2



OzoBlockly script for Level 2:

- set light color (red)
- move forward distance 5 steps speed slow
- rotate right
- move forward distance 5 steps speed slow
- rotate left
- move forward distance 5 steps speed slow

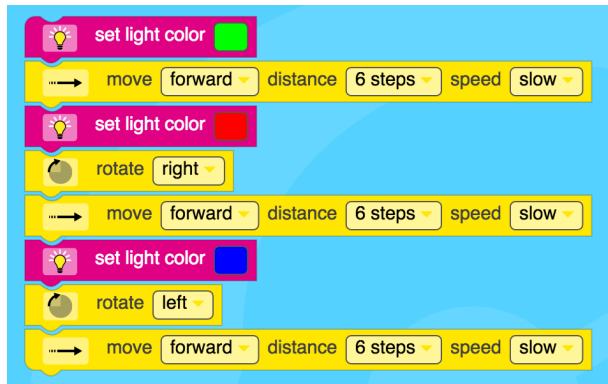
Level 3



OzoBlockly script for Level 3:

- set light color (blue)
- move forward distance 5 steps speed slow
- rotate right
- move forward distance 3 steps speed slow
- set light color (red)
- move forward distance 7 steps speed slow
- rotate right
- move forward distance 5 steps speed slow

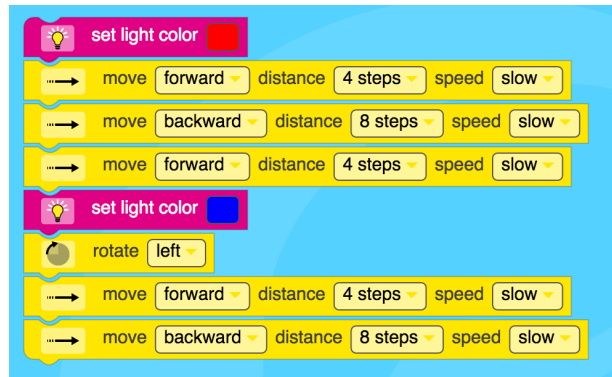
Level 4



OzoBlockly script for Level 4:

- set light color (green)
- move forward distance 6 steps speed slow
- set light color (red)
- rotate right
- move forward distance 6 steps speed slow
- set light color (blue)
- rotate left
- move forward distance 6 steps speed slow

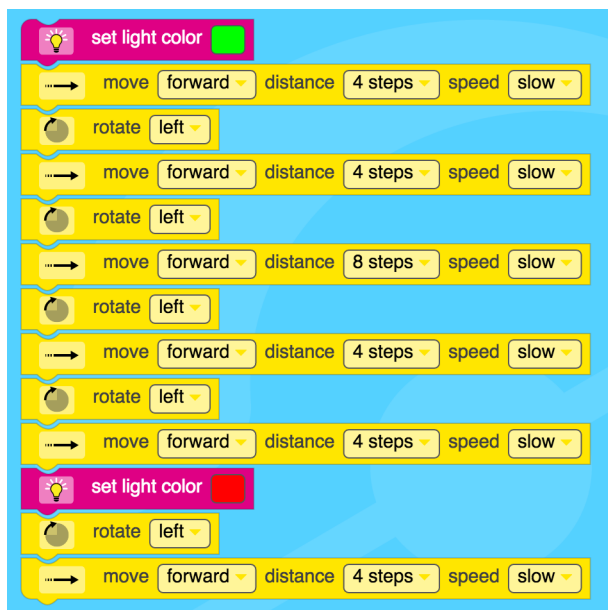
Level 5



OzoBlockly script for Level 5:

- set light color (red)
- move forward distance 4 steps speed slow
- move backward distance 8 steps speed slow
- move forward distance 4 steps speed slow
- set light color (blue)
- rotate left
- move forward distance 4 steps speed slow
- move backward distance 8 steps speed slow

Level 6



OzoBlockly script for Level 6:

- set light color (green)
- move forward distance 4 steps speed slow
- rotate left
- move forward distance 4 steps speed slow
- rotate left
- move forward distance 8 steps speed slow
- rotate left
- move forward distance 4 steps speed slow
- rotate left
- move forward distance 4 steps speed slow
- set light color (red)
- rotate left
- move forward distance 4 steps speed slow


Level 7



OzoBlockly script for Level 7:

- set light color (red)
- move forward distance 5 steps speed slow
- set light color (yellow)
- move forward distance 3 steps speed slow
- rotate left
- move forward distance 3 steps speed slow
- set light color (green)
- move forward distance 3 steps speed slow
- rotate left
- move forward distance 3 steps speed slow
- set light color (magenta)
- move forward distance 3 steps speed slow
- rotate left
- move forward distance 3 steps speed slow

Level 8



Scratch script for Level 8:

- set light color (red)
- rotate (slight right)
- move forward distance 5 steps speed slow
- rotate (right)
- move forward distance 5 steps speed slow
- set light color (blue)
- move forward distance 5 steps speed slow
- rotate (left)
- move forward distance 5 steps speed slow
- rotate (left)
- move forward distance 5 steps speed slow
- rotate (left)
- move forward distance 5 steps speed slow
- rotate (left)
- move forward distance 5 steps speed slow
- set light color (red)
- move forward distance 5 steps speed slow
- rotate (right)
- move forward distance 5 steps speed slow

Level 9



Scratch script for Level 9:

- rotate (left)
- set light color (magenta)
- move forward distance 8 steps speed slow
- rotate (slight right)
- set light color (yellow)
- move forward distance 6 steps speed slow
- rotate (slight right)
- set light color (magenta)
- rotate (right)
- move forward distance 8 steps speed slow
- set light color (yellow)
- rotate (slight right)
- move forward distance 6 steps speed slow

Level 10



Scratch script for Level 10:

- rotate (slight right)
- set light color (green)
- move forward distance 5 steps speed slow
- rotate (slight right)
- move forward distance 5 steps speed slow
- rotate (slight right)
- set light color (red)
- move forward distance 5 steps speed slow
- rotate (right)
- rotate (slight right)
- move forward distance 5 steps speed slow
- rotate (slight right)
- move forward distance 5 steps speed slow

SHAPE TRACER 2

Level 1

```

set light color [green]
repeat 3 times
do
  move forward distance 4 steps speed slow
  rotate right
  move forward distance 4 steps speed slow
  rotate left
  
```

Level 2

```

set light color [red]
repeat 4 times
do
  move forward distance 10 steps speed slow
  rotate right
  
```

Level 3

```

rotate slight right
repeat 2 times
do
  set light color [blue]
  move forward distance 8 steps speed slow
  rotate right
  set light color [green]
  move forward distance 8 steps speed slow
  rotate right
  
```

Level 4

```

set light color [yellow]
rotate slight left
repeat 2 times
do
  repeat 3 times
  do
    move forward distance 3 steps speed slow
    rotate left
    move forward distance 3 steps speed slow
    rotate right
  rotate u-turn left
  set light color [magenta]
  
```

Level 5

```

set light color [red]
move forward distance 6 steps speed very fast
rotate right
repeat 4 times
do
  set light color [blue]
  move forward distance 2 steps speed slow
  set light color [red]
  move forward distance 2 steps speed slow
  set light color [blue]
  rotate left
  move forward distance 6 steps speed slow
  
```

Level 6

```

set light color [green]
repeat 4 times
do
  move forward distance 8 steps speed slow
  rotate left
  set light color [red]
  rotate slight right
  move forward distance 6 steps speed slow
  rotate left
  move forward distance 7 steps speed slow
  
```

Level 7

```

repeat 4 times
do
  set light color blue
  move forward distance 4 steps speed slow
  rotate slight right
  set light color red
  move forward distance 4 steps speed slow
  rotate slight right
  
```

Level 8

```

set light color pink
move forward distance 10 steps speed slow
rotate slight left
repeat 4 times
do
  set light color pink
  move backward distance 2 steps speed slow
  set light color yellow
  move backward distance 2 steps speed slow
rotate slight right
move forward distance 10 steps speed slow
  
```

Level 9

```

set light color blue
rotate slight right
move forward distance 6 steps speed slow
rotate right
move forward distance 6 steps speed slow
rotate slight left
set light color red
move backward distance 5 steps speed slow
rotate slight right
set light color green
move forward distance 6 steps speed slow
rotate left
move forward distance 6 steps speed slow
  
```

Level 10

```

repeat 4 times
do
  set light color red
  move forward distance 2 steps speed slow
  turn LED off
  move forward distance 2 steps speed slow
  set light color green
  move forward distance 2 steps speed slow
  turn LED off
  move forward distance 2 steps speed slow
  set light color yellow
  move forward distance 2 steps speed slow
  turn LED off
  move forward distance 2 steps speed slow
  rotate left
  
```