EVO CLASSROOM KIT ACTIVITY

Ozobot Driver's Education

Essential Question/Summary

Students will become acquainted with Evo and the features that are available only to Evo (and some that are available to Bit and Evo).

Information

This activity assumes students have had some practice with OzoBlockly before.

Prerequisites

Knowing basic computer science concepts, such as loops and logic statements, will be helpful for completing this activity. OzoBlockly and Evo Basic Training skills will be needed for this activity.

Grouping

Pair or group activity (2-4 students in each group).

Materials

- Driving course printouts
  - ~ Three levels of courses (easy, medium, advanced)
  - ~ Each level contains two 8x11 sheets of paper that must be taped together (an image of the setup will be shown below)
- Accessories for the activity—to obtain additional copies of the game cards, licenses and student handouts you must print the digital version provided with the kit here http://ozobot.com/stem-education/stem-classroom-kit
  - ~ Packages of foam marshmallows (one package is used for two groups)
  - ~ 1 set of game cards (for the third level), cutouts
  - ~ Handout/checklist for students to complete
  - ~ Drivers "licenses" (cutouts)
- OzoBlockly.com editor on a computer or tablet
- Ozobot Evo

Age/Grade Level

Grades 5-12

OzoBlockly Programming Topics

Sensors, sounds, lights, time, logic, loops, movement

OzoBlockly Mode

Evo mode on levels 3 and 4

Duration

Approximately one or two class sessions

Topics

Computer Science

Academic Standards

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

- Algorithm— a step by step, sequential set of rules to be followed (often times in terms of a computer). It is the method for solving a problem.
- Program—a specific set of ordered operations that a computer can perform.
- Bug—an error or fault in a program.
- Optimize—to rewrite/edit a program to make it faster or more efficient.

Overview

Each group of students will write their own program that will let Evo navigate the driving course autonomously. This is a great example to show students how self driving cars might work (in a very simple way). When they have correctly programmed Evo to drive

from start to finish without hitting any obstacles, they will then be "licensed" to program Evo, the autonomous vehicle.

Related Activities

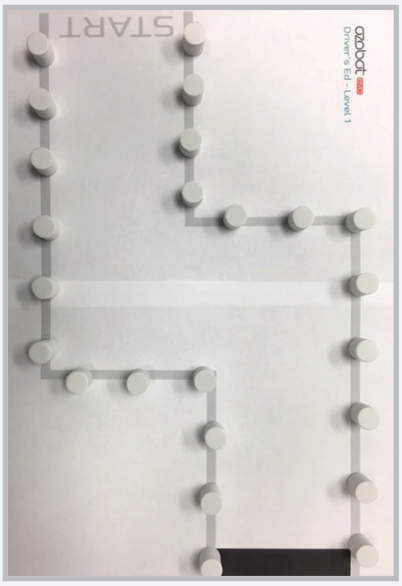
The sensors mini lesson is a good intro for this activity. The link for it is here: https://storage.googleapis.com/ozobot-lesson-library/ebtl3-sensors/ebtl3-sensors.pdf

ACTIVITY PLAN

Instructors should explain to students that they must pass all three levels to be licensed to program Evo (to receive a physical license–one of the cutouts). Each level will add on another layer of difficulty that will help students learn how to program Evo.

Notes

- Begin by introducing the Evo. Explain that it is like the Ozobot Bit, but is connected by bluetooth and there are several additional features; i.e. more LED lights, sounds, IR sensors and remote control. It can still line follow and be used with most Bit examples/ lessons.
- Students are encouraged to collaborate and may work in groups of 2-4 students.
- There are several included handouts. There are three course maps that use two sheets of paper each. The other handout is the programming instructions for the students.
- Instructor should show students an example of how to set up the obstacles (foam marshmallows) on the course. Levels 1, 2, and 3 are shown below.



- There are several methods for using the sensors to guide Evo, but the example programs given seem to work the best with these barriers. If students are have trouble, try and give them a hint based on the solutions provided.

Instructions

Begin with level one. Hand out level one course and the activity handout to each group and explain what the program should accomplish in the intro course. Then follow the given steps for the first level, as explained below. After a level has been "passed," students may move on to the next level.

1. Handout Ozobot Evo.
2. Give each group 20-25 marshmallows. Each side of the course should need between 10 and 12 marshmallows to act as road barriers, for every level.
3. Have students create their program in groups or pairs.
4. Students should explain what they think will happen when they run the program (on the separate handout).
5. Run the program
    i. Write down any errors/bugs in the program. Does it run? Does it partially work? Does it work perfectly?
    ii. If it does not work, students should edit their implementation
    iii. Have instructor check work. If it is correct the instructor will give the students the next level course.

6 Repeat the process from "b" until all three courses have been passed.

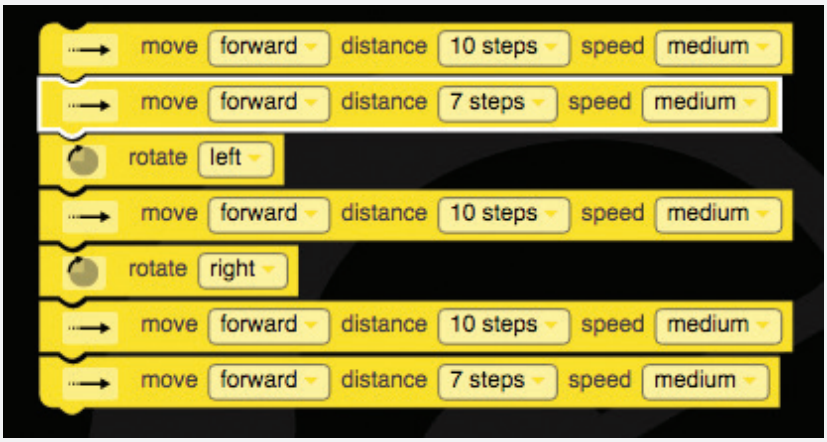
7. If students have finished all levels have them "turn in" in their completed worksheets in exchange for their Ozobot Evo licenses.

Level 1 Requirements

Allow students to create any sort of program that will get the car from start to finish. They do not need to use any specific blocks. The level one course has a start and finish line with two 90 degree turns within the course (the course is straight, left, straight, right straight). Because of the shape of the map (turns are at 90 degrees) students should estimate the number of steps Ozobot needs to take in each direction. Other requirements:

- Cannot go outside of the course lines/move any of the foam marshmallow barrier.s
- Must stop at the finish line.
- Must make some sort of sound at the finish line (happy, sad, etc.).
- Students must guess and check the number of moves they must take in each direction. However, a sample solution is provided below.

*Level 1 Sample Solution (without using sensors)

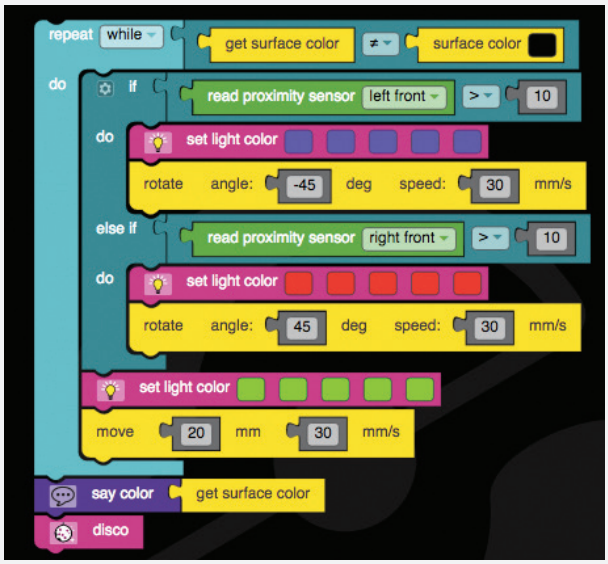


Level 2 Requirements

The level 2 map is just like the level 1 map, but the course is wavy. This means sensors must be used to navigate the course. Sensors should be keeping Evo from running into the barriers. The key idea is to program Evo to turn 45 degrees away from the direction that it "sees" an obstacle. This is another chance for students to guess and check and get creative with their solutions. However, a functional solution has been provided below for reference.

- When Ozobot senses the color black (the finish line) it stops.
- Program Evo to move away from the barriers when they have been sensed.
- If Ozobot hits a barrier, try a different solution.
- Program the lights (red for left turn, blue for right turn, green for forward) and play the disco animation at the finish.
- Say the surface color at the finish.

*Level 2 Sample Solution (there are various solutions that may work)

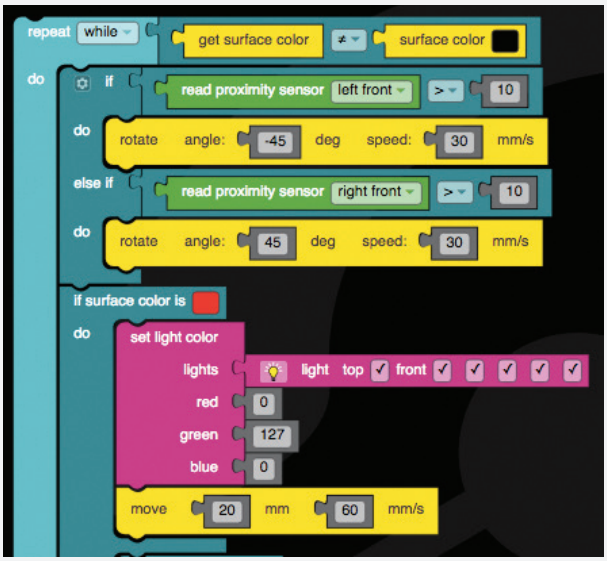


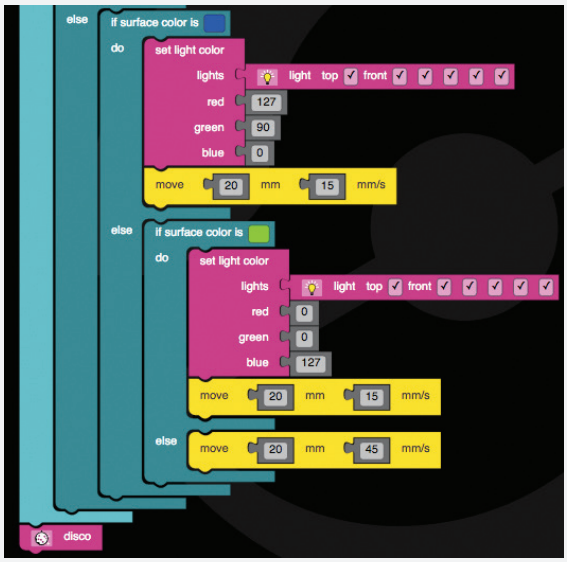
Level 3 Requirements

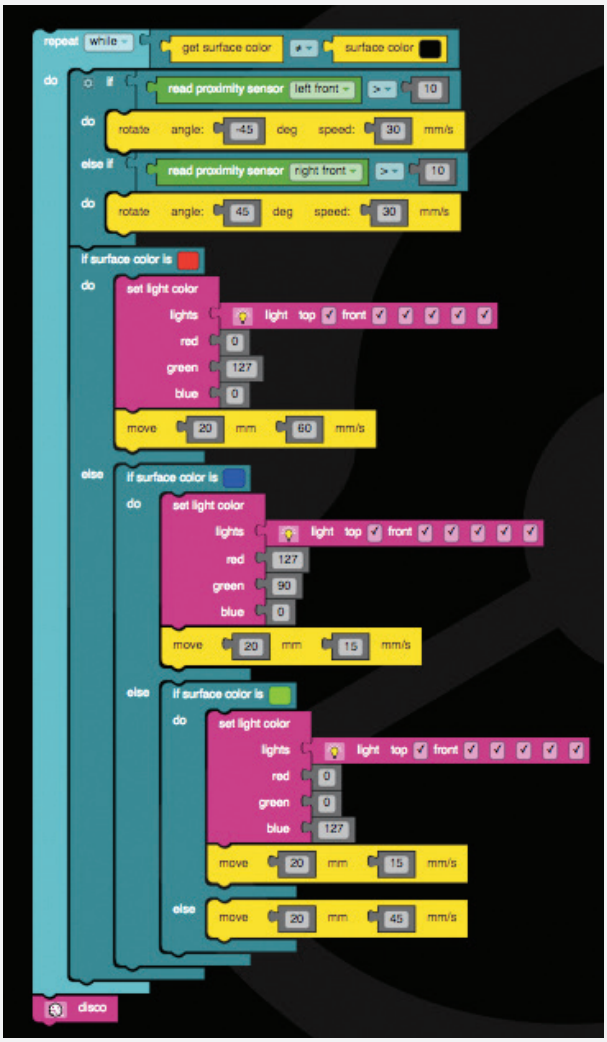
Several obstacles will be given and Evo will have to drive through the course while obeying traffic laws and avoiding all obstacles. The level 3 map is the same as level 2, except for that there are blocks of color on the map. Evo will be programmed to behave a certain way, based on the surface color that it reads. The behavior will be determined by randomly choosing cards (explained below).

- Cut out the game cards and put all cards face down into two piles (one with the colors and one with the actions).
- Draw one card from the color pile and one card from the action pile. These will be linked. For example, if red has been paired with the "Stop Sign," then Evo will be programmed to do what the stop sign card says when it reads a red surface color.
- Do this until all four color cards have an action to go with it.
- Leftover action cards can be used in another round of playing.
- In your program, make sure when Evo senses a surface color then it obeys the traffic law that the color has been matched with it.

*Level 3 Sample Solution (these will vary significantly)







Algorithm Design

Have students complete step by step instructions on how to write their programs, with the given handout.Their algorithms must be in plain english and be detailed enough for another reader to construct the program with no confusion. It is an exercise for learning how to create a project's specifications.

EVO DRIVER'S EDUCATION HANDOUT

Program Evo to drive autonomously through each course to earn your license. You must not hit any of the barriers and must obey the laws of the road to pass the test!

Each level has a different course, and you can only get to the next level by passing the current level. After you think your program has been perfected, have your instructor watch your Evo navigate the course, sign your handout and then give you the next level!

Level 1

Specifications:

Create any sort of program that will get the Ozobot Evo from start to finish without hitting any barriers. The program does not need to use any specific blocks. Additionally, Ozobot

- Cannot go outside of the course lines/move any of the foam barriers.
- Must stop at the finish line.
- Must make some sort of sound at the finish line (happy, sad, etc.).
- Must guess and check the number of moves you must take in each direction.

1. Write your program in OzoBlockly and load it to Evo
2. Write a one sentence summary of what your program should do:

3. Run your program
4. Any bugs or errors? List them here:

5. In two or three sentences write the final algorithm for the program:

Teacher Approval x_____

Level 2

Specifications:

The level 2 map is just like the level 1 map, but the course is wavy. This means sensors must be used to navigate the course. The sensors should be keeping Evo from running into the foam barriers.

- When Ozobot senses the color black (the finish line) it stops.
- Program Evo to move away from the barriers when they have been sensed.
- If Ozobot hits a barrier, try a different solution.
- Program the lights (red for left turn, blue for right turn, green for forward) and play the disco animation at the finish.
- Say the surface color at the finish.

1. Write your program in OzoBlockly and load it to Evo
2. Write a one sentence summary of what your program should do:

3. Run your program
4. Any bugs or errors? List them here:

5. In two or three sentences write the final algorithm for the program:

Teacher Approval x_____

Level 3

Specifications:

Several obstacles will be given and Evo will have to drive through the course while obeying traffic laws and avoiding all obstacles. On the level 3 map the different surface colors will be linked to different traffic laws or obstacles.

- Cut out the game cards and put all cards face down into two piles (one with the colors and one with the actions).
- Draw one card from the color pile and one card from the action pile. These will be linked. For example, if red has been paired with the "Stop Sign," then Evo will be programmed to do what the stop sign card says when it reads a red surface color.
- Do this until all four color cards have an action to go with it.
- In your program, make sure when Evo senses a surface color then it obeys the traffic law that the color has been matched with it.

1. Write your program in OzoBlockly and load it to Evo
2. Write a one sentence summary of what your program will do:

3. Run your program
4. Any bugs or errors? List them here:

5. In two or three sentences write the final algorithm for the program:

Teacher Approval x_____

Set speed to 60 and set Evo's light to **GREEN**.

Set speed to 30 and set Evo's light to **YELLOW**.

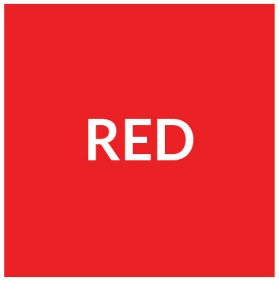
Stop for 5 seconds and set far left and far right LED's to **RED**.

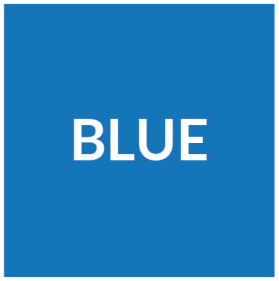
Set lights to **RED** and pause for 3 seconds, then turn off lights.

Set speed to 15 and set far left and far right LED's to **ORANGE**.

Set lights to **BLUE** and set the speed to 15.

Stop for 5 seconds and set top light to **YELLOW**.





Set speed to 60 and set Evo's light to **GREEN**.

Set speed to 30 and set Evo's light to **YELLOW**.

Stop for 5 seconds and set far left and far right LED's to **RED**.

Set lights to **RED** and pause for 3 seconds, then turn off lights.

Set speed to 15 and set far left and far right LED's to **ORANGE**.

Set lights to **BLUE** and set the speed to 15.

Stop for 5 seconds and set top light to **YELLOW**.

ozobot

DRIVER'S LICENSE

DL: 01100001
EXP: 1-23-2028

CLASS: Autonomous Vehicle

SKILLS: Coding Master

X

www.ozobot.com

ozobot

DRIVER'S LICENSE

DL: 01100010
EXP: 1-23-2028

CLASS: Autonomous Vehicle

SKILLS: Coding Master

X

www.ozobot.com

ozobot

DRIVER'S LICENSE

DL: 01100011
EXP: 1-23-2028

CLASS: Autonomous Vehicle

SKILLS: Coding Master

X

www.ozobot.com

ozobot

DRIVER'S LICENSE

DL: 01100100
EXP: 1-23-2028

CLASS: Autonomous Vehicle

SKILLS: Coding Master

X

www.ozobot.com

ozobot

DRIVER'S LICENSE

DL: 01100101
EXP: 1-23-2028

CLASS: Autonomous Vehicle

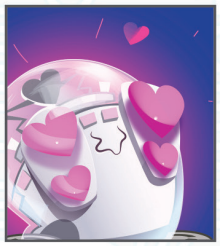
SKILLS: Coding Master

X

www.ozobot.com

ozobot

DRIVER'S LICENSE



DL: 01100110
EXP: 1-23-2028

CLASS: Autonomous Vehicle

SKILLS: Coding Master

X

www.ozobot.com

ozobot

DRIVER'S LICENSE

DL: 01100111
EXP: 1-23-2028

CLASS: Autonomous Vehicle

SKILLS: Coding Master

X

www.ozobot.com

ozobot

DRIVER'S LICENSE

DL: 01101000
EXP: 1-23-2028

CLASS: Autonomous Vehicle

SKILLS: Coding Master

X

www.ozobot.com

ozobot

DRIVER'S LICENSE

DL: 01101001
EXP: 1-23-2028

CLASS: Autonomous Vehicle

SKILLS: Coding Master

X

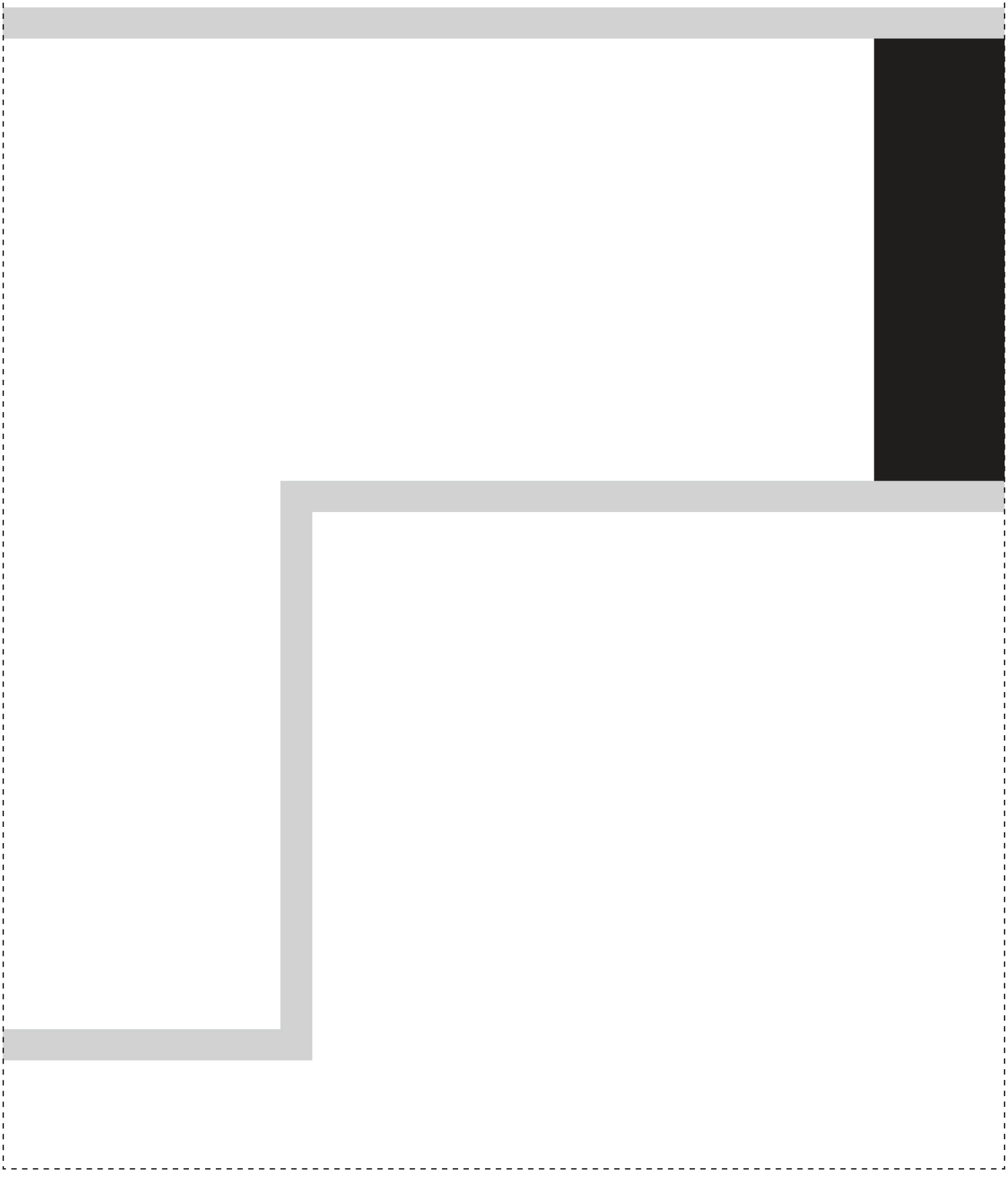
www.ozobot.com

Cut along the dotted line and tape the two sides together

Driver's Ed - Level 1

START

Cut along the dotted line and tape the two sides together



Cut along the dotted line and tape the two sides together

START

Driver's Ed - Level 2

Cut along the dotted line and tape the two sides together

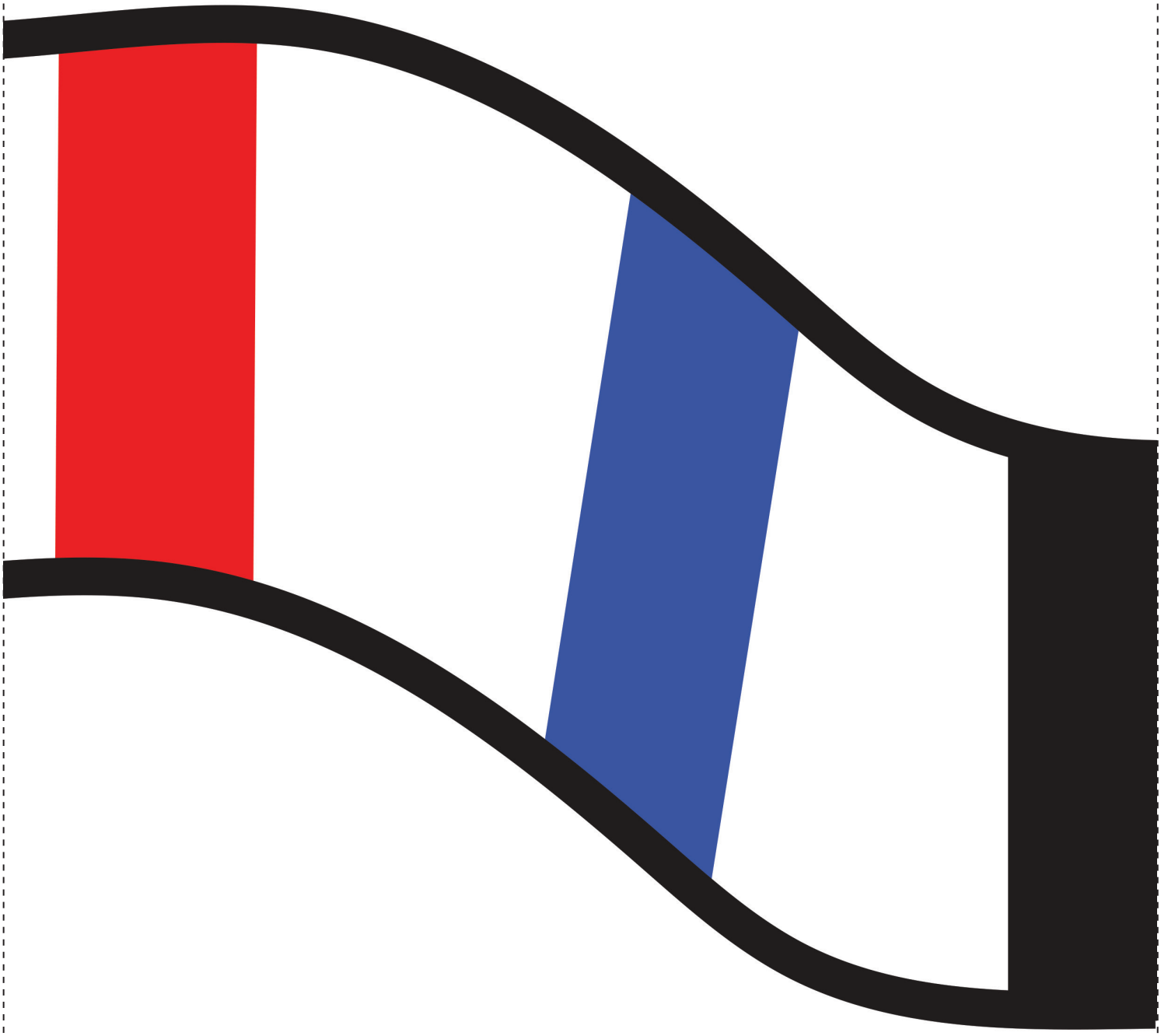
Cut along the dotted line and tape the two sides together

START

ozobot

Driver's Ed - Level 3

Cut along the dotted line and tape the two sides together



ozobot.com