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BASIC TRAINING SERIES:
COLOR CODES

Grade K-2 | Computer Science | Robotics | Beginner

OVERVIEW

In this introductory lesson series, students will learn how Ozobot moves from one place to another and how to tell Ozobot what to do using Color Codes.

GROUPING

Individual or small groups of no more than three students per bot.

DURATION

4 sessions, approximately 50 minutes each

QUESTIONS ABOUT THESE LESSONS?

Please contact us at ozoedu@ozobot.com

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ACADEMIC 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

ISTE 1c Students use technology to seek feedback that informs and improves their practice and to demonstrate their learning in a variety of ways.

ISTE 1d Students understand the fundamental concepts of technology operations, demonstrate the ability to choose, and use and troubleshoot current technologies and are able to transfer their knowledge to exploring emerging technologies.

ISTE 4a Students know and use a deliberate design process for generative ideas testing theories, creating innovative artifacts, or solving authentic problems.

ISTE 4d Students exhibit a tolerance for ambiguity, perseverance, and the capacity to work with open-ended problems.

Before You Begin

FAQ: Do I need to use Ozobot brand markers?

No. Ozobot markers are optimal for use with your bots due to the flat tips and ideal color shades, but you can use other black, blue, green, and red markers as well. Sharpie chisel tips and Crayola markers, have been used successfully. We have found that using light green and light blue markers works well, as they are less likely to become too dark for Ozobot to read.

FAQ: What kind of surfaces can Ozobot be used on?

Ozobot works on plain white paper or graph paper. Dry erase boards and reflective surfaces are not recommended.

Calibrating For Younger Students (K-2)

We, and many educators have found, that it is easiest for the instructor to calibrate the bots before use, rather than having the students calibrate the bots themselves. This ensures enough time can be given to important lesson content. Calibration instructions for play on paper can be found in Bot Camp or http://files.ozobot.com/stem-education/ozobot-calibration-tips.pdf.

Handout Previews in Lesson

In the lessons that follow, the handouts that the students will use are previewed in the lesson, but full-page files for printing are available in the attachments on the lesson description page.

Quick Guides

Before each lesson, you will find a Quick Guide. These contain an abbreviated version of the full lesson content. It is recommended that you still read through the full lesson and use the Quick Guide for reference during instruction.

Student Resources in Classroom Kit Binder

Many resources have been printed for you and are included in the classroom kit, including:
- Color Code Reference Charts
- Tips for Drawing Lines and Maps
- Tips for Drawing Color Codes

You may want to laminate or put these sheets in a sleeve to avoid having to print more out. Should you need to print additional resources, you can find them at
https://ozobot.com/stem-education/stem-classroom-kit.

General Tips

For some students with fine motor issues, Color Code Stickers may reduce frustrations. There are some included in the classroom kit and you can order more using the order form in your Classroom Kit Binder.

Additionally, we have found that correcting mistakes or adding Color Codes to an area of a line where no space was left, Avery™ Easy Peel White Inkjet Address Labels are extremely helpful.

Finally, graph paper may be helpful for students just starting out drawing Color Codes. The boxes are the perfect size for drawing Color Code boxes, and provide the ideal width of line for Ozobot to follow.

FAQ: Where can I find lessons and ideas when I am finished with Basic Training?

Our Lesson Library contains 150+ lessons created by us, as well as educators like you! Use the search filter to find subject, grade, and bot-specific lessons. You can find the Lesson Library on the Educators page of ozobot.com, or find it directly at http://portal.ozobot.com/lessons.

Pre-Reader Color Code Reference

For students who cannot read or are just beginning reading, we have a picture-based Color Code Reference sheet found on
http://files.ozobot.com/stem-education/ozobot-coor-codes.pdf.

Basic Training Lesson 1:
Drawing Lines and Maps

QUICK GUIDE

PREPARATION

1. **FIND** some videos of robots to show students (we have some suggestions on page 6 of the lesson).
2. **PRINT** one copy of each handout 1 & 2 for each student or group.
3. **PREPARE** one sheet of butcher paper per group, with two one inch lines on opposite sides of the paper for students to connect (see page 10 for full instructions)

PART ONE: INTRODUCING ROBOTS

1. **EXPLAIN:** A robot is a machine that can be programmed to do certain tasks.
2. **ASK:** "Do you have any robots at home?" "Have you seen any robots?" "What was their job?" "What did they look like?"
3. **SHOW:** Videos of robots in action.

PART TWO: INTRODUCING OZOBOT

1. **DISTRIBUTE:** Ozobots (one per student or group of no more than 3).
2. **EXPLAIN:** Ozobot is a robot you can program yourself! One way to program Ozobot is to use markers, paper, and Color Code to tell Ozobot where to go and what to do.
3. **DO:** Give students a minute to observe the different parts. Point out the power button and practice turning it on and off with your students.

PART THREE: OZOBOT FOLLOWS LINES

1. **DISTRIBUTE:** Handout 1 and black markers.
2. **DO:** Students place their bot anywhere on the line. It will stop at a line break.
3. **EXPLAIN:** Ozobot's optical sensors on bottom are Ozobot's "eyes."
4. **DO:** Tell students to help Ozobot get from the start to finish by drawing lines that are "just right" for Ozobot to follow (¼ in (5mm)). Point out the chisel tip if using Ozobot markers.

PART FOUR: TIPS FOR DRAWING CORNERS AND CURVES

1. **DISTRIBUTE:** Handout 2
2. **EXPLAIN:** When you draw corners and curves, it is still necessary to make the line ¼ in (5mm) thick for Ozobot to follow it.
3. **DO (OPTIONAL):** Have students practice free-drawing corners and curves by turning the paper over and drawing their own path.

PART FIVE: GROUP ACTIVITY (Full details on page 10)
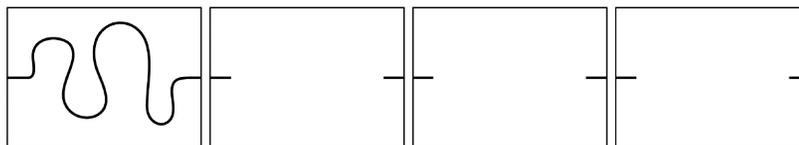
1. **HAND OUT:** Butcher paper with lines to connect on opposite sides and black markers.
2. **EXPLAIN:** Draw a path between the lines. The class will connect their papers and see if Ozobot can make it to the end.
3. **REFLECT/REVIEW:** Did your bot follow the entire path? Why/why not?
4. **DISCUSS:** Sensors, line thickness, random decisions at intersections.

BASIC TRAINING LESSON 1:
DRAWING LINES AND MAPS

MATERIALS (PER GROUP)

- Black and colored markers
- Handouts 1 & 2
- Plain large white paper or white butcher paper
- 1 Bit or Evo (charged and calibrated)
- Computer/projector (to show videos)

PREPARATION

- Print a copy of each handout for each individual or group.
- Queue up some exciting robot videos for part one. Some suggestions are given, but you may share any video you feel your class will enjoy.
- You will need to prepare one sheet of butcher paper per group with beginning and end lines for students to create their own course (see example on page 10).

PART ONE: **INTRODUCING ROBOTS**

EXPLAIN: A robot is a machine that can be programmed to do certain tasks. They are used for many different things, including keeping humans safe from dangerous or boring jobs, getting into small places, doing jobs faster and better than humans can, and much more. From exploring space and the ocean to helping out with household chores, robots can be found all over. They come in all different shapes and sizes.

DO: Show some videos of robots in action. Feel free to find your own videos/articles/ materials that are suitable for your individual classes' interests!

Amazon's speedy shipping robots: goo.gl/daVH7m

The Mars Curiosity Rover: goo.gl/1mjUrb

A robot that goes to school in place of a student with a medical condition: goo.gl/EnVgKa

This train doesn't run on tracks; it has been programmed to follow lines: goog.gl/dKvajH

PART TWO: **INTRODUCING ROBOTS**

EXPLAIN: Ozobot is a robot you can code! For the next few days, we will be learning one way to program Ozobot: using markers and paper.
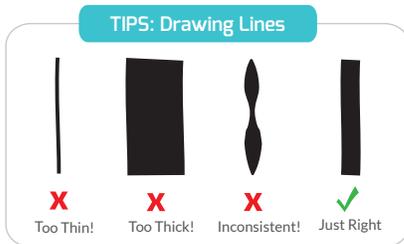
DO: Pass out Ozobots and give students a minute to observe the different parts.
Point out the power button (you may need to show this on an Ozobot without the skin on so the button is more visible). Practice turning it on and off with your students.

Power
button
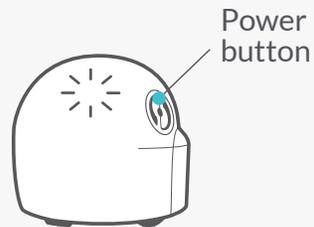
PART THREE: OZOBOT FOLLOWS LINES

DISTRIBUTE: Handout 1 + One black marker per student

TIPS: Drawing Lines

✗	✗	✗	✓
Too Thin!	Too Thick!	Inconsistent!	Just Right

DO: Use markers to connect the path.

Name: _____

☐ **My bot made it from start to finish!**

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HANDOUT 1

DO: Have students turn their bots on and place it on the start. It will stop at a line break.

EXPLAIN: Have students turn Ozobot over (while it is powered on) and see what's underneath. On the bottom, you can see 5 openings (BIT) or 8 (EVO) with lights shining out of them. An optical sensor lives in each of these openings. These sensors are Ozobot's "eyes." Each of the sensors sees how bright the paper underneath is. This way, Ozobot can differentiate the black and white parts of the paper to know where the line is!

DO: With just markers and paper, you can create your own line for Ozobot to follow! To make sure Ozobot can see and follow your line, it needs to be about ¼ in (5mm). Tell students to help Ozobot get from the start to finish by drawing lines that are "just right" for Ozobot to follow. If you are using Ozobot markers, you can point out how the flat end of the chisel tip is the perfect thickness to be able to draw a line in one stroke.
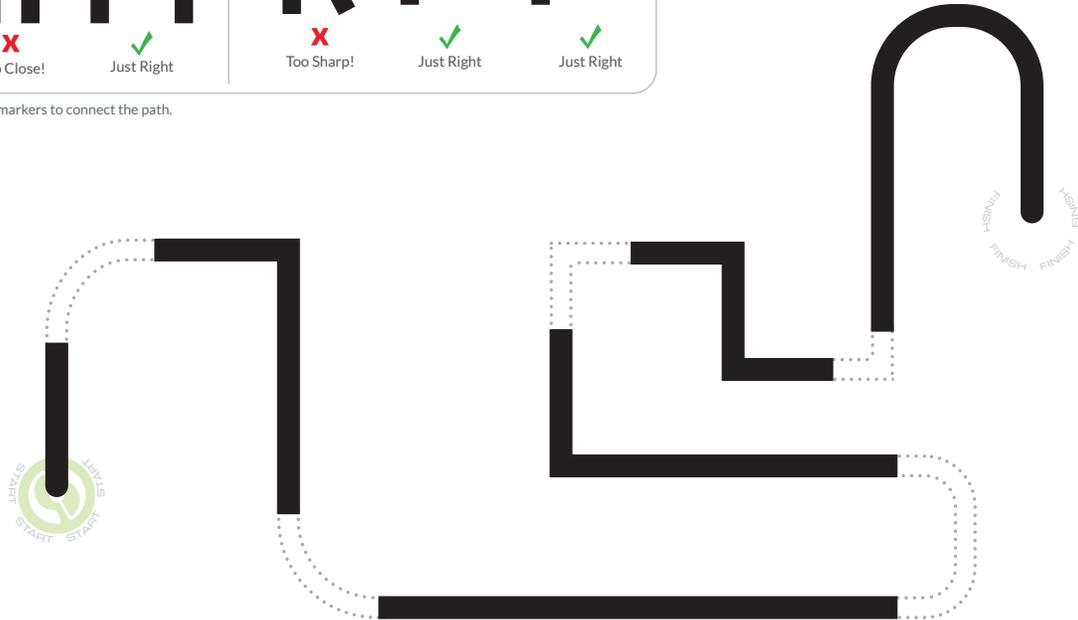
PART FOUR: **TIPS FOR DRAWING CORNERS AND CURVES**

DISTRIBUTE: Handout 2

Tips for Drawing Lines: Corners and Curves

Name: _____

✗	✓	✗	✓	✓
Too Close!	Just Right	Too Sharp!	Just Right	Just Right

Do: Use markers to connect the path.

START

FINISH

My bot made it from start to finish!

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HANDOUT 2

EXPLAIN: When you draw corners and curves, it is still necessary to make the line ¼ in (5mm) thick for Ozobot to follow it.

DO (OPTIONAL): Have students practice free-drawing corners and curves by turning the handout over and drawing their own path.

PART FIVE (CLASS ACTIVITY): STUDENTS PRACTICE DRAWING THEIR OWN LINES

DISTRIBUTE: Plain white paper or butcher paper & various colored markers.

DO: It's the moment your students have been waiting for! At this point, allow your students to create their own path, making it as long and curvy as they want, but having them make sure their lines and curves are such that Ozobot can follow the whole line.

OPTIONAL ACTIVITY: Give each group of students a large sheet of paper with a short pre-drawn line (to be continued by the students) on each side. Have students create a path in between. When everyone is finished, tape the sheets of paper together, matching up the pre-drawn lines, and watch Ozobot navigate their creation!
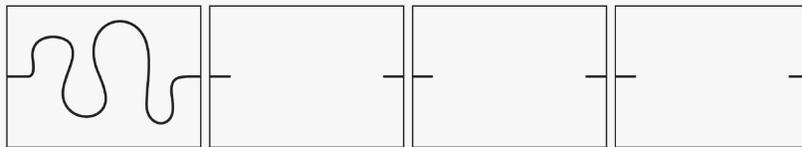
REFLECT/REVIEW: Did your bot follow the entire path? Why/why not? What is the most difficult part of getting Ozobot to follow the lines?

DISCUSS: Sensors, line thickness, random decisions at intersections (decision making will be covered in the next lesson; you do not need to go in-depth here).

Basic Training Lesson 2:
Introducing Color Codes

QUICK GUIDE

PREPARAION

1. **PRINT** one copy of each handout (3 and 4) for each student or group.
2. **PRINT** one copy of the "Tour de Ozobot" activity per student, and one copy of the Pre-Reader Color Code Reference Chart per student or group. *Optional: Project onto the board for the class.*

PART ONE: OZOBOT SEES COLORS

1. **DISTRIBUTE:** Plain white paper and colored markers
2. **DO:** Allow students to spend time free-drawing paths using colored markers.
3. **ASK:** "How does Ozobot tell you the color it sees?"
4. **EXPLAIN:** The middle sensor underneath is a color sensor, and the top LED shows what color Ozobot is seeing.

PART TWO: DISCOVER OZOBOT'S LANGUAGE

1. **DISTRIBUTE:** Handout 3.
2. **DO:** Have students fill in the color code boxes according to the instructions on the handout.
3. **ASK:** "What is each color code telling Ozobot to do?"

PART THREE: ORDER MATTERS

1. **DISTRIBUTE:** Handout 4.
2. **DO:** Have students fill in the color code boxes according to the instructions on the handout.
3. **ASK:** "Which color code does Ozobot react differently to from Start 2?
4. **EXPLAIN:** Some codes are symmetric (has the same meaning both ways Ozobot goes over it). Some codes, though, are non-symmetric (have different meanings when Ozobot reads it from the opposite way).

PART FOUR (ACTIVITY): TOUR DE OZOBOT!

1. **DISTRIBUTE:** Tour de Ozobot and Pre-Reader Color Code Reference Chart.
2. **EXPLAIN:** Find the correct color codes to place in the boxes. Remember that order matters!

REFLECT/REVIEW

ASK: "What is the difference between a symmetric and non-symmetric color code?"
"What is the purpose of a color code?"
"Do you have any tips for your classmates about how to make sure Ozobot reads the color code in the correct order?"
"Which non-symmetric color codes were similar when they were read backward and forward? Which were the most different?"
"What is your favorite color code?"

BASIC TRAINING LESSON 2:
INTRODUCING COLOR CODES

MATERIALS (PER GROUP)

- Bit or Evo (charged and calibrated)
- Black, red, blue, and green markers
- Plain white paper
- Handouts 3 and 4
- White Avery™ mailing labels (optional- for re-do's)
- Color Codes Reference Sheet
  http://play-ozobot.com/print/guides/ozobot-color-codes-reference.pdf

PREPARATION

- You will need to print a copy of Handout 3, Handout 4, and "Tour de Ozobot" (found in lesson attachments) for each individual or group.

PART ONE: OZOBOT SEES COLORS

DISTRIBUTE: Plain white paper and colored markers

Tip: For this activity, you can use other colors such as orange, purple, pink, etc., the bot will display the colors.

DO: Start by allowing students to free-draw lines with colors, remembering what they learned in the previous lesson about drawing lines that Ozobot can follow. Have students put Ozobot at the start of the line and watch as it follows the line over the colors.

ASK: How does Ozobot tell you the color it sees? Answer: The LED light on top changes to the color it is driving over and sensing underneath.

EXPLAIN: The middle sensor underneath is a color sensor. Ozobot can see many different colors.

(Examples)

PART TWO: DISCOVER OZOBOT'S LANGUAGE

DISTRIBUTE: Handout 3

DO: Color in the code boxes
Fill in the Color Code boxes!

Name: _____

Top box: ▊ Bottom box: ▊

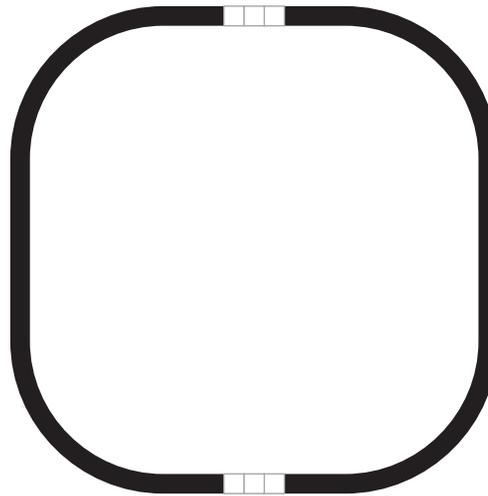☐ My bot _____ when it read this Color Code

Tips for Drawing Color Codes

✗ White spaces

✗ Overlapping colors

✗ Too dark

☐ My bot _____ when it read this Color Code

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HANDOUT 3

EXPLAIN: Ozobot can see many colors, but when certain pre-determined combinations of colors (red, green, blue, and black) form patterns in the form of small, subsequent boxes, they give an instruction to Ozobot.

DO:
1. Have students color in the top set of boxes (blue-green-blue) and bottom set (blue-red-blue), challenging them to try to fill in the box completely yet without going over it more than once since Ozobot won't be able to read the colors if they are too dark.
2. Have students turn Ozobot on and watch as Ozobot navigates the lines and reads the codes (notice how Ozobot flashes the color of the box it is reading).
3. If Ozobot is unable to read the codes of some of the students, you can give them a new sheet of paper OR cover the code with a white sticker and have them try again. Make sure the colors are not overlapping or too dark.

ASK: What do you think these patterns (Color Codes commands) are telling Ozobot to do?
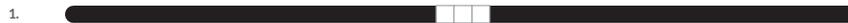Answer: blue-green-blue: turbo & blue-red-blue: u-turn.

PART THREE: **ORDER MATTERS**

DISTRIBUTE: Handout 4

Do: Use the color codes below to fill in the blank boxes. Then, have Ozobot read the color codes from both ends of the lines. Which Color Code means something different when it is read backward? Why?

Name: _____

1.

2.

☐ I discovered that # _____ means something different when Ozobot reads it the other way!

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HANDOUT 4

DO:

1. Have students color the top code box (blue-black-blue), again reminding them to try not to make the boxes too dark. Then, have them color the second set of boxes (red-green-blue), left to right.
2. Have students place Ozobot on the beginning of the top line and watch as it follows the line and reacts to the Color Code.
3. Starting from the opposite end of the line, watch as Ozobot follows the line and reacts to the Color Code.
4. Repeat steps 2 &3 with the bottom line.

ASK: Which code does Ozobot react differently when read backward? *Answer: the bottom code. From the beginning of the line, it goes really fast, but on the way back, it goes really slow.*

EXPLAIN: Order matters! Some codes are symmetric (meaning either way you turn it, Ozobot reads the same order of colors). The top code is symmetric. Either way Ozobot reads it will be red first, then blue, then red again. Some codes, though, are not symmetric, like the bottom one. When you started from the beginning of the line, Ozobot read red-green-blue, which means "snail dose." When you started from the other side, it read blue-green-red, which means "nitro boost."

PART FOUR (ACTIVITY): **TOUR DE OZOBOT**

DISTRIBUTE: Tour de Ozobot (one per student) + Color Code Reference Sheet

EXPLAIN: Find the correct Color Codes, to place in the boxes. Remember that order matters, so fill out your codes from Ozobot's point of view!

Solution:

REFLECT/REVIEW

ASK: "What is your favorite color code?"

"What is the purpose of a color code?"

"What is the difference between a symmetric and non-symmetric color code?"

"Do you have any tips for your classmates about how to make sure Ozobot reads the color code in the correct order?"

"Which non-symmetric color codes were similar when they were read backward and forward? Which were the most different?"

Basic Training Lesson 3:
Drawing Color Codes
QUICK GUIDE

PREPARATION
1. **PRINT** one copy of each handout (5,6, and "Ozobot's Day") for each student or group.
2. **PRINT** one copy of the Pre-Reader Color Code Reference Chart per student or group. *Optional: Project one copy for the class.*

PART ONE: HOW DOES OZOBOT MAKE A CHOICE?
1. **DISTRIBUTE:** Handout 6, direct attention to the first intersection.
2. **EXPLAIN:** Ozobot has three choices when it gets to the intersection: go left, right, or straight. Place Ozobot at the start and see which color it "chooses." Repeat several times.
3. **ASK:** "Does Ozobot always choose the same color?" "Can you know which way Ozobot will turn?

PART TWO: TELLING OZOBOT WHICH WAY TO GO
1. **HAND OUT:** Color Code Reference Sheet (Optional: project it for the whole class)
2. **EXPLAIN:** "Unless you tell Ozobot what do do when it reaches an intersection, it will make a random choice about which way to go.
3. **DO:** Have students choose a color code that will cause Ozobot to always choose green and test it out.

PART THREE: OZOBOT'S POINT OF VIEW
1. **DISTRIBUTE:** "Ozobot's Day" handout, one per student.
2. **EXPLAIN:** "When you want to tell Ozobot which way to go, you need to choose the color code based on what direction Ozobot will be facing, not you. Sometimes, it may be helpful to turn the paper so that you and Ozobot are facing the same way on the line."
3. **DO:** Have students practice "seeing" from Ozobot's point of view by completing "Ozobot's Day."

PART FOUR (ACTIVITY): CODING CHALLENGE
1. **DISTRIBUTE:** Handout 6 Beginner
2. **EXPLAIN:** Use the Color Codes in the boxes to help Ozobot get from home to school without getting stuck or lost!

REFLECT/REVIEW
ASK: "Was it difficult to get Ozobot to turn the way you wanted it to go?"
"Are there any times you might want your bot to make a random choice?"

BASIC TRAINING: LESSON 3
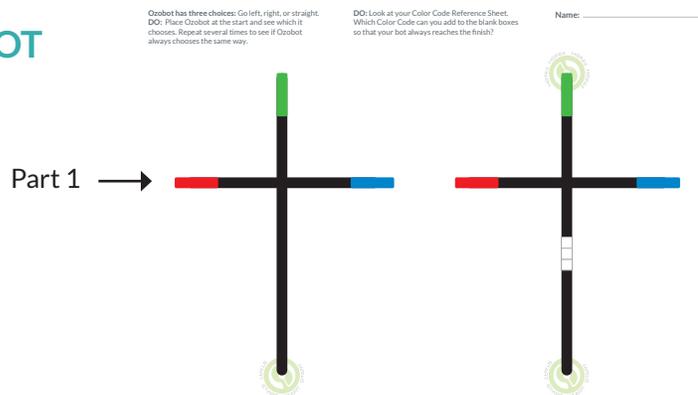# DRAWING COLOR CODES

MATERIALS (PER GROUP)

- Bit or Evo (charged and calibrated)
- Black, blue, green, and red markers
- Handouts 5, 6, Beginner and Ozobot's Day
- Color Codes Reference Sheet

PREPARATION

- You will need to print a copy of Handout 5, Handout 6, and "Ozobot's Day" (found in lesson attachments) for each individual or group.

PART ONE: HOW DOES OZOBOT MAKE A CHOICE?

DISTRIBUTE: Handouts 5 and markers

Part 1 →

Ozobot has three choices: Go left, right, or straight.
DO: Place Ozobot at the start and see which it chooses. Repeat several times to see if Ozobot always chooses the same way.

DO: Look at your Color Code Reference Sheet. Which Color Code can you add to the blank boxes so that your bot always reaches the finish?

Name: _____

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HANDOUT 5

EXPLAIN: When you put Ozobot at the Start, it has three choices: to go left (to red, right to blue or straight to greeen. Let's see what Ozobot chooses.

1. Place Ozobot on "Ozobot Start" on the intersection
2. Press the power button to turn Ozobot on
3. Watch which color Ozobot chooses
4. Repeat several times

ASK: "Was there any way to know which color your bot would choose?"

EXPLAIN: Ozobot's decisions are a bit like flipping a coin. There is no way to know before the coin is tossed whether it will land on heads or tails. Similarly, which way Ozobot turns is a matter of chance. Just like there is no way to know for sure which side a coin will land on, Ozobot's decisions are random with no logic behind them.

PART TWO: TELLING OZOBOT WHERE TO GO

DISTRIBUTE: Color Code Reference Charts + Markers

Ozobot has three choices: Go left, right, or straight.
DO: Place Ozobot at the start and see which it chooses. Repeat several times to see if Ozobot always chooses the same way.

DO: Look at your Color Code Reference Sheet. Which Color Code can you add to the blank boxes so that your bot always reaches the finish?

Name: _____

← Part 2
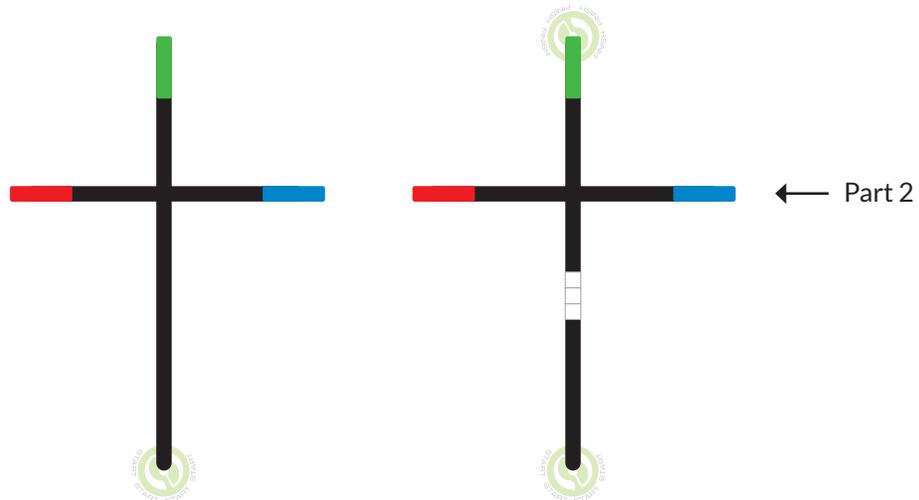
DO: Have students take out Color Codes Reference Sheet (or display one on a projector) and look now at the second intersection with the blank code boxes. Now, using the handout with the blank code, ask them to find the code that will allow Ozobot to always reach the green line.

EXPLAIN: Unless you tell Ozobot what to do, when given a choice, it will choose randomly. If you want Ozobot to go a certain way when it comes to another line, you must program it with a Color Code.

PART THREE: OZOBOT'S POINT OF VIEW

DISTRIBUTE: Ozobot's Day Worksheet

OZOBOT'S DAY

1. EAT
2. PUT ON
3. GO TO
4. PLAY WITH

Name: _____

ozobot.com

EXPLAIN: When you want to tell Ozobot which way to go, you need to draw the Color Code based on what direction Ozobot will be facing, not you. Sometimes, it may be helpful to turn the paper so that you and Ozobot are facing the same way on the line.

Display the Basic Color Codes Reference (this has symbols instead of words).

DO: Have students practice "seeing" from Ozobot's point of view by completing "Ozobot's Day," using direction codes.

PART FOUR: CODING CHALLENGE

DISTRIBUTE: Handout 6 (Beginner)
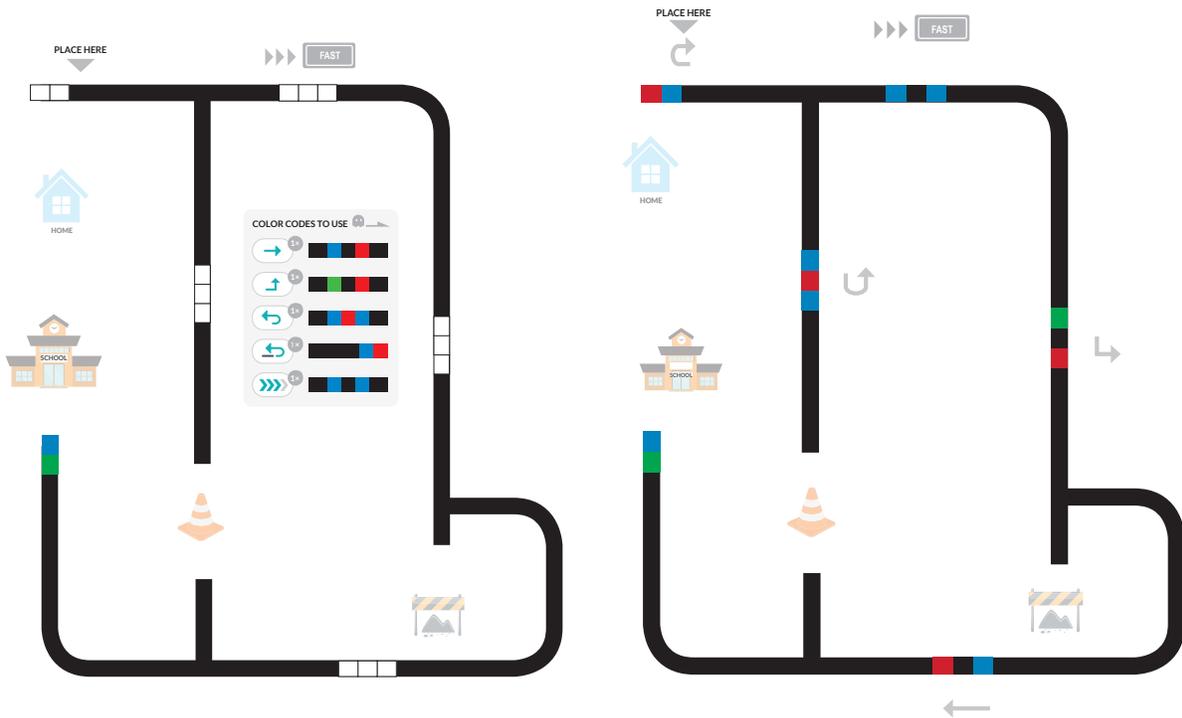
MISSION: Help Ozobot make it from home to school without getting stuck or going the wrong way! You have all the codes you need in the blue box.

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Handout 6 Beginner

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HANDOUT 6 BEGINNER

EXPLAIN: The goal of this activity is to help Ozobot find the way from Home to School without getting lost or stuck!

Use the Color Codes in the blue box (you'll have to use your Color Codes Reference Sheet to see what colors to use in the empty code slots). When you are finished, place Ozobot at home and see if it reaches school. Try it a few times. If Ozobot gets stuck anywhere or doesn't make it to school, get a new sheet or cover the codes you wish to change with blank white stickers and try again. Have fun!

REFLECT/REVIEW

ASK: "Was it difficult to get Ozobot to turn the way you wanted it to go?"

"Are there any times you might want your bot to make a random choice?"

Basic Training Lesson 4:
Free-Drawing Lines and Color Codes
QUICK GUIDE

PREPARATION
1. **PRINT** one copy of each handout (7and 8) for each student or group.
2. **PRINT** and cut out sheets of "Spaceship Driver's Licenses."
3. **PRINT** board game: Ozobot Expedition to Mars.

PART ONE: FREE DRAWING PRACTICE
1. **DISTRIBUTE:** Handout 7
2. **EXPLAIN:** The tips on the top of the sheet show to draw color codes so Ozobot can read them.
3. **DO:** Have students look over the visuals for the tips and then attempt to draw their own Color Codes from the boxes. Optional: demonstrate and narrate the first Color Code, reminding students to draw black lines on both sides of the Color Code.

PART TWO: WHERE TO PLACE COLOR CODES ON A LINE
1. **DO:** Display the "Code Placement" portion of the Ozobot Tips Sheet (or print copies to give to students).
2. **EXPLAIN:** For Ozobot to read a Color Code, the code must be drawn between straight, black lines. Color Codes should not be on a curve, too close to an intersection, or too close to another code.
3. **OPTIONAL DISCUSSION:** Why are these rules important? Do these guidelines tell you anything about how Ozobot works? Where the sensors are located?

PART THREE: SPACESHIP DRIVER'S LICENSE TEST
1. **DISTRIBUTE:** Handout 8
2. **EXPLAIN:** Soon, you will be taking your Ozobot on a journey to Mars using what you've learned about drawing lines and Color Codes. But, before you start driving in space, let's review what you've learned about the "rules of the road" with this Spaceship Driver's License Test, to get you own Spaceship Driver's License!
3. **DO:** Have students complete the quiz individually or in groups. Go over the answers as a class, offering the opportunity to correct "mistakes" so all students can earn their Driver's License, and then distribute one license to each student and have them fill in their names.

PART FOUR (OPTIONAL): OZOBOT EXPEDITION TO MARS
DO: Divide students into groups of 3-5, and read through instructions with students, and begin the journey to Mars!

REFLECT/REVIEW
ASK: "What was the most difficult of drawing color codes without having boxes to color in?"
"Do you have any tips for the rest of the class to be successful in free-drawing color codes?"
"What did you like about Expedition to Neptune? Were there any frustrating parts?"

BASIC TRAINING LESSON 4:
FREE-DRAWING LINES AND COLOR CODES

MATERIALS

- 1 Ozobot Bit or Evo per group (charged and calibrated)
- Markers in colors black, red, light blue and light green (we recommend you use
- Ozobot markers. Alternatively, choose Sharpie's wide chisel tip, Crayola classic,
- or Crayola pastel), per person
- Handouts 7 and 8, one per person
- Ozobot Expedition game (link below), per group
- Spaceship Driver's Licenses
- Lots of plain white 8.5" x 11" paper, per group of 3-5
- Timer, per group
- 1 pair of scissors, per group

PREPARATION

- You will need to print a copy of Handout 7 and 8.
- Optional: Cut out game components to have them ready for students to play.Alternatively, have each group cut out their own game components (see game instructions).
- Gather materials for game: one timer per group, a stack of 8.5x11 white paper, and scissors.
- Please note you will need one set of markers PER STUDENT playing the game.
- Print one copy of Ozobot Expedition to Mars from

  https://portal.ozobot.com/lessons/detail/mission-to-mars

  Note: You do have the option to increase the difficulty of this game for students by playing Ozobot Expedition to Neptune, which incorporates "Challenge Cards," smaller sheets to draw on, and a longer game board. Find it here:

  https://portal.ozobot.com/lessons/detail/mission-to-neptune

PART ONE: FREE-DRAWING PRACTICE

DISTRIBUTE: Handout 7

EXPLAIN: To make sure Ozobot can read the codes you draw on a line, there are several things to keep in mind (refer to tips on Handout 7):

1. Make sure each ColorCode has a black line before and after (except the U-Turn line end code, which we will not be working with today).
2. Ozobot cannot read codes when they are on colored lines, only black.
3. Code boxes must all be the same size, about ¼ in. (5mm) thick. If they are too thick or too thin, Ozobot won't be able to properly sense them.
4. Make sure there are no white spaces between the boxes or between the code and the line.
5. However, take care to not allow the colors to overlap.
6. Ozobot cannot read colors that are too dark, so try not to go over a color more than once.

DO: Have students look over the visuals for the tips and then attempt to draw their own Color codes from the boxes. Optional: demonstrate and narrate the first Color Code, reminding students to draw black lines on both sides of the Color Code.

This is a good time to go around and make sure students are experiencing some success in drawing their Color Codes. It may be helpful to carry around some white sticker labels so students can re-do Color Codes if Ozobot was unable to read them as drawn.

PART TWO: **WHERE TO PLACE COLOR CODES ON A LINE**

DO: Display the "Code Placement" portion of the Ozobot Tips Sheet (or use a printed copy to give to students).
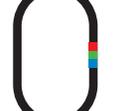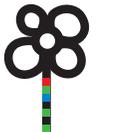
EXPLAIN: For Ozobot to read a Color Code, the code must be drawn between straight, black lines. It should not be on a curve, too close to an intersection, or too close to another code.

DISTRIBUTE: Handout 8

Spaceship Driver's Test

Name: _____

DO: Look at the images to determine whether or not you think Ozobot would be able to read the Color Codes on the maps. Check the box to indicate your decision. If you believe Ozobot wouldn't be able to read the Color Codes, explain why in the blank.

☐ Ozobot would read this!
☐ Ozobot wouldn't read this because
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☐ Ozobot would read this!
☐ Ozobot wouldn't read this because
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☐ Ozobot would read this!
☐ Ozobot wouldn't read this because
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HANDOUT 8

EXPLAIN: Soon, you will be taking your Ozobot on a journey to Mars using what you've learned about drawing lines and color codes. But, before you start driving in space, let's review what you've learned about the "rules of the road" with this Spaceship Driver's License Test, to get you own Spaceship Driver's License!

DO: Have students complete the quiz individually or in groups. Go over the answers as a class, offering the opportunity to correct "mistakes" so all students can earn their Driver's License, and then distribute one license to each student and have them fill in their names.

PART FOUR (OPTIONAL)

DISTRIBUTE: MISSION TO MARS

(Instructions, game board, game pieces, stacks of white paper, timer, and one set of markers per student playing)

DO: Divide students into groups of 3-5, read through instructions with students, and begin the journey to Mars!

Note: You do have the option to increase the difficulty of this game for students by playing Ozobot Expedition to Neptune, which incorporates "Challenge Cards," smaller sheets to draw on, and a longer game board. Find it here:

https://portal.ozobot.com/lessons/detail/mission-to-neptune