Pop Star|Creating Functions With Ozobot Color Codes|Created for the Hour of Code

Author: Ozobot

Grades:	Subject(s):	Pre-Reader/ESL-Friendly?
2—8	Computer Science, Art, ELA, Math	No
Compatible Bot(s):	**Coding Method:**	
Evo	Color Codes	

Quick Summary:

Students will be introduced to the concept of functions by using color codes to represent a function.

Duration: 28 min

Objectives & Outcomes

1. Student will name and write a behavior that the Ozobot will mimic.
2. Student will identify, name and draw color codes that would mimic behaviors.
3. Student will combine two or more color codes to create a function by drawing codes with a marker.

Preparation

Teacher Materials & Digital Resources

- Ozobot-Edu-CCC-4GRL2.pdf
- ozobot-color-codes.pdf
- Pop Star|Creating Functions With Ozobot Color Codes

Student Materials

- 1 Evo or Bit Ozobot per group
- 1 Teacher Sample Sheet per class
- 1 Functions Student Worksheets per student
- 1 Ozobot Color Codes Reference Sheet https://files.ozobot.com/stem-education/ozobot-color-codes.pdf per group

Teacher Tips

Students are not expected to fully understand how functions work by the lesson's conclusion. Students should leave this lesson understanding that functions are a way to create groupings of code that will be executed in the same way each time. While this lesson does not cover the full aspects of functions, it serves as a scaffold and launching point for students to understand the concept.

During this lesson, clarify the difference between loops and functions. Loops consecutively repeat bits of code, while functions repeat bits of code in many different places and must be "called".

The objective of this lesson is to have students take a "high level" action and break it down into "low level" actions. They will be able to execute the function, but won't necessarily be able to place it and call it within a larger context of code. They will build on their learning in the next lessons when they build functions and include them in their code.

Direct Instruction

1 Introduce the concept of a function by asking students to think about their evening routine. With the class, create a list of actions that would be part of an evening routine. An example could be:
1. Eat dinner
2. Take a shower
3. Read a book
4. Play games
5. Fall asleep

2 Pick one action to extrapolate further on. Ask students to break it down into smaller steps. For example, taking a shower could be broken down into:
1. Get wet
2. Wash your hair
3. Wash your body
4. Wash your face
5. Dry Off

3 Again, pick one action to extrapolate further on. Ask students to break it down into smaller steps. For example, washing your hair could be broken down into:
1. Squeeze shampoo into hand
2. Put shampoo on to hair
3. Lather
4. Rinse

4 Explain to students that they created a function. Explain that a function is a single name for a set of actions. In this example, the name of the function would be "washYourHair" and the set of actions include:
1. Wet hair
2. Squeeze shampoo into hand
3. Put shampoo on to hair
4. Lather
5. Rinse

5. Explain to students that in computer science, functions are used to call a group of commands that can be used multiple times and in different places. Explain using the hair-washing analogy. This is a function that a person performs daily, and in different circumstances, such as hotel rooms, locker rooms, and friends' and families' homes.
6. Tell students that they will use color codes to create some functions. They will be given some prompts and asked to use color codes to mimic behavior.
7. Display the Teacher Example Sheet. Explain to students that the name of the function will be “Pop Star” and ask students how the bot could mimic her movements. Explain that Pop Stars can sing and dance.
8. Brainstorm some famous pop stars that students could choose to mimic. Some ideas may include: Beyonce, Justin Timberlake, Lady Gaga. If helpful, choose one star to focus the project on.
9. Ask students, “How can we use color codes to write a function with the name, “Pop Star?”
10. Display the OzoCodes Sheet. Prompt a discussion around what color codes would mimic dancing.
11. Display the Teacher Sample Sheet. Point to the “function name”, and ask students what the name should be (Pop Star). Point to the “behavior” and ask what behavior the Ozobot should display (dancing). Point to the “Color Codes” and ask which codes would make sense for the Pop Star function, and explain that the Ozobot uses tornado, backwalk and nitro boost.

    Note: Students are free to draw their function color code in any shape or form that makes sense to them. In this particular example, there are multiple curves so that each color code is read from right to left. If students understand the concept of symmetric and non-symmetric codes, they can write codes that are read from left to right and won’t be constrained by the direction of the robot.
12. Execute the code with the Ozobot. Check for understanding by asking, “Why is this color code a function?” (It has a single name for a set of actions. We can “call” it, or use it again if needed.)
13. Explain that this is an example and that students will be creating functions for a racecar, baby, snake, and dog.
14. Clarify any directions for the Functions Student Worksheet. Explain to students they can choose color codes that make sense for the behavior they are attempting to mimic. This is intentionally left open-ended so students have creative freedom.

Supplements

Lesson Closure

A. Initiate a discussion by asking, “How did you use a color code to create a function?” and “Give an example of a color code you used. How did that color code mimic the behavior you were attempting to display?”

B. Optional: For students that created their own “pop star” functions, have their Ozobot perform in a “Pop Star” Competition.

Lesson Extension(s)

1. Using the blank Student Practice Worksheet, create your own function. List its name, behavior, and color codes.
2. Draw the color code and execute the function.

Academic Standards

- NGSS 4-PS3-1. Use evidence to construct an explanation relating the speed of an object to the energy of that object.
- NGSS 4-PS3-2. Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.
- NGSS 4-PS3-4. Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.
- CSTA 1B-CS-01 Describe how internal and external parts of computing devices function to form a system. (P7.2)
- CSTA 1B-CS-02 Model how computer hardware and software work together as a system to accomplish tasks. (P4.4)
- CSTA 1B-CS-03 Determine potential solutions to solve simple hardware and software problems using common troubleshooting strategies. (P6.2)
- CSTA 1B-AP-08 Compare and refine multiple algorithms for the same task and determine which is the most appropriate. (P6.3, P3.3)
- CSTA 1B-AP-09 Create programs that use variables to store and modify data. (P5.2)
- CSTA 1B-AP-10 Create programs that include sequences, events, loops, and conditionals. (P5.2)
- CSTA 1B-AP-11 Decompose (break down) problems into smaller, manageable subproblems to facilitate the program development process. (P3.2)
- CSTA 1B-AP-12 Modify, remix, or incorporate portions of an existing program into one's own work, to develop something new or add more advanced features. (P5.3)
- CSTA 1B-AP-15 Test and debug (identify and fix errors) a program or algorithm to ensure it runs as intended. (P6.1, P6.2)
- CSTA 1B-AP-16 Take on varying roles, with teacher guidance, when collaborating with peers during the design, implementation, and review stages of program development. (P2.2)
- CSTA 1B-AP-17 Describe choices made during program development using code comments, presentations, and demonstrations. (P7.2)
- 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, use and troubleshoot current technologies and are able to transfer their knowledge to explore emerging technologies.
- ISTE 4a Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems.

- ISTE 4b Students select and use digital tools to plan and manage a design process that considers design constraints and calculated risks.
- ISTE 4c Students develop, test and refine prototypes as part of a cyclical design process.
- ISTE 4d Students exhibit a tolerance for ambiguity, perseverance and the capacity to work with open-ended problems.
- ISTE 5a Students formulate problem definitions suited for technology-assisted methods such as data analysis, abstract models and algorithmic thinking in exploring and finding solutions.
- ISTE 5b Students collect data or identify relevant data sets, use digital tools to analyze them, and represent data in various ways to facilitate problem-solving and decision-making.
- ISTE 5c Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving.
- ISTE 5d Students understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions.
- ISTE 6a Students choose the appropriate platforms and tools for meeting the desired objectives of their creation or communication.
- ISTE 6b Students create original works or responsibly repurpose or remix digital resources into new creations.
- ISTE 6c Students communicate complex ideas clearly and effectively by creating or using a variety of digital objects such as visualizations, models or simulations.
- ISTE 6d Students publish or present content that customizes the message and medium for their intended audiences.
- CCSS.ELA-LITERACY.SL.4.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 4 topics and texts, building on others' ideas and expressing their own clearly.
- CCSS.ELA-LITERACY.SL.4.1.B Follow agreed-upon rules for discussions and carry out assigned roles.
- CCSS.ELA-LITERACY.SL.4.1.C Pose and respond to specific questions to clarify or follow up on information, and make comments that contribute to the discussion and link to the remarks of others.
- CCSS.ELA-LITERACY.SL.4.1.D Review the key ideas expressed and explain their own ideas and understanding in light of the discussion.
- CCSS.ELA-LITERACY.SL.4.3 Identify the reasons and evidence a speaker provides to support particular points.
- CCSS.ELA-LITERACY.SL.4.5 Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes.

- CCSS.ELA-LITERACY.SL.4.6 Differentiate between contexts that call for formal English (e.g., presenting ideas) and situations where informal discourse is appropriate (e.g., small-group discussion); use formal English when appropriate to task and situation. (See grade 4 Language standards 1 here for specific expectations.)

- CCSS.ELA-LITERACY.L.4.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

- CCSS.ELA-LITERACY.L.4.3 Use knowledge of language and its conventions when writing, speaking, reading, or listening.

- CCSS.ELA-LITERACY.L.4.3.A Choose words and phrases to convey ideas precisely.*

- CCSS.ELA-LITERACY.L.4.3.C Differentiate between contexts that call for formal English (e.g., presenting ideas) and situations where informal discourse is appropriate (e.g., small-group discussion).

- CCSS.MATH.CONTENT.4.OA.A.1 Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 × 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.

- CCSS.MATH.CONTENT.4.MD.A.2 Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.

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Create a list of actions for your evening routine:

1. Eat Dinner
2. Take a shower
3. Read a book
4. Play games
5. Fall asleep

Break Down "Take a Shower":

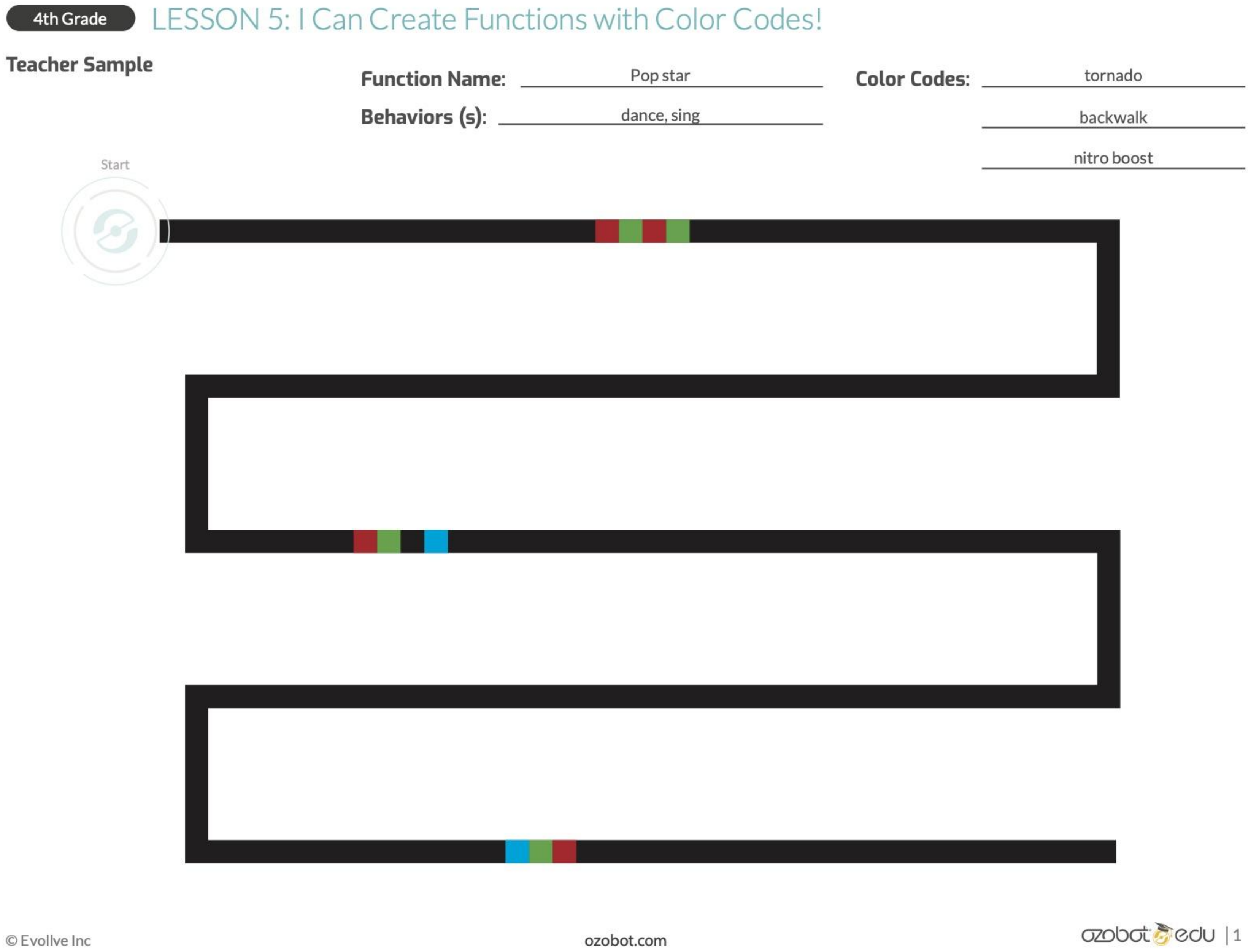
1. Get wet
2. Wash hair
3. Wash body
4. Wash your face
5. Dry off

Break Down “Wash hair”:

1. Squeeze shampoo into hand
2. Put shampoo into hair
3. Lather
4. Rinse

Congratulations! You wrote the following functions:

1. Evening routine
2. Take a shower
3. Wash hair



4th Grade

LESSON 5: I Can Create Functions with Color Codes!

Teacher Sample

Function Name: Pop star

Behaviors (s): dance, sing

Color Codes: tornado

backwalk

nitro boost

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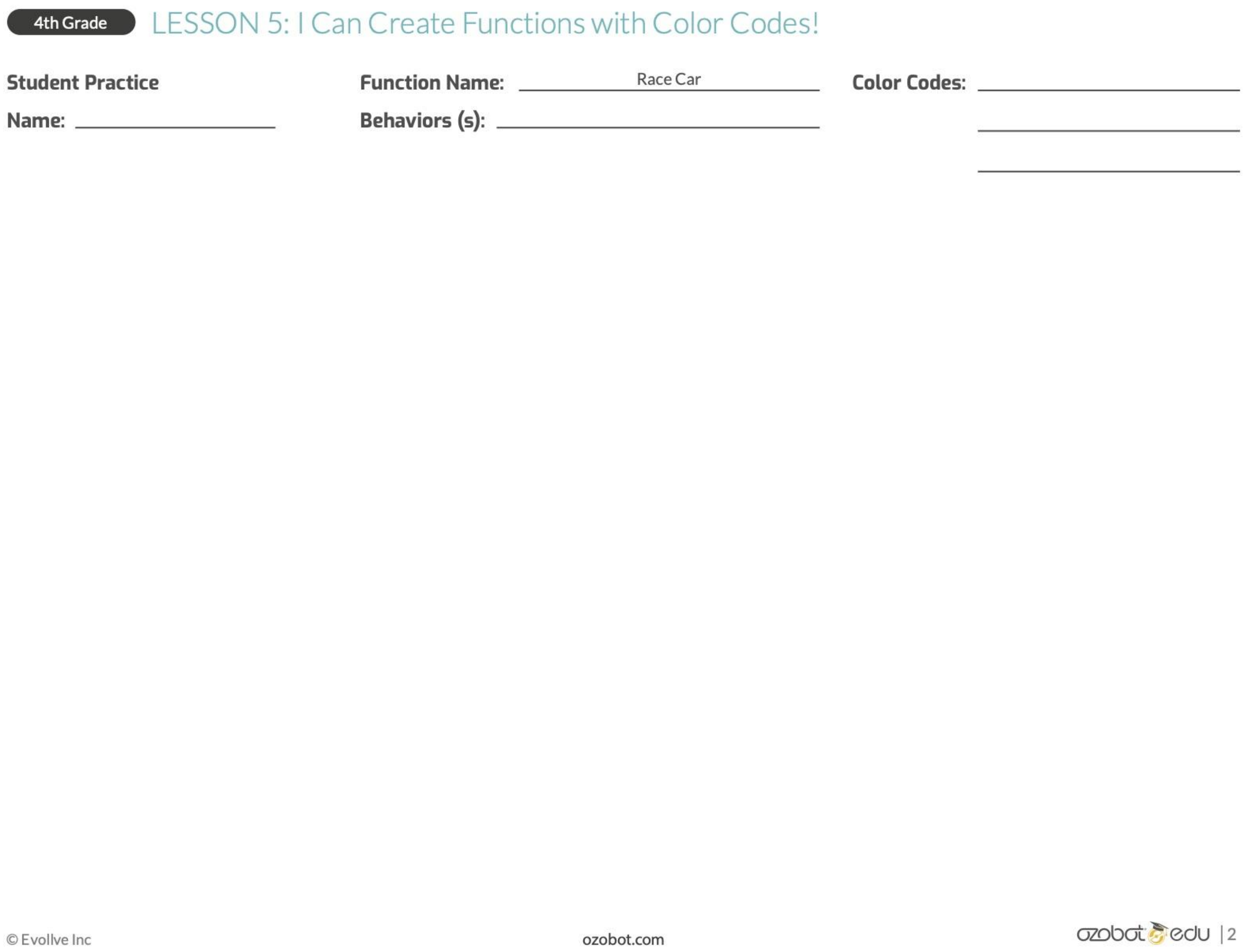

4th Grade

LESSON 5: I Can Create Functions with Color Codes!

Student Practice

Name: ____________________

Function Name: Race Car

Behaviors (s): ____________________

Color Codes: ____________________

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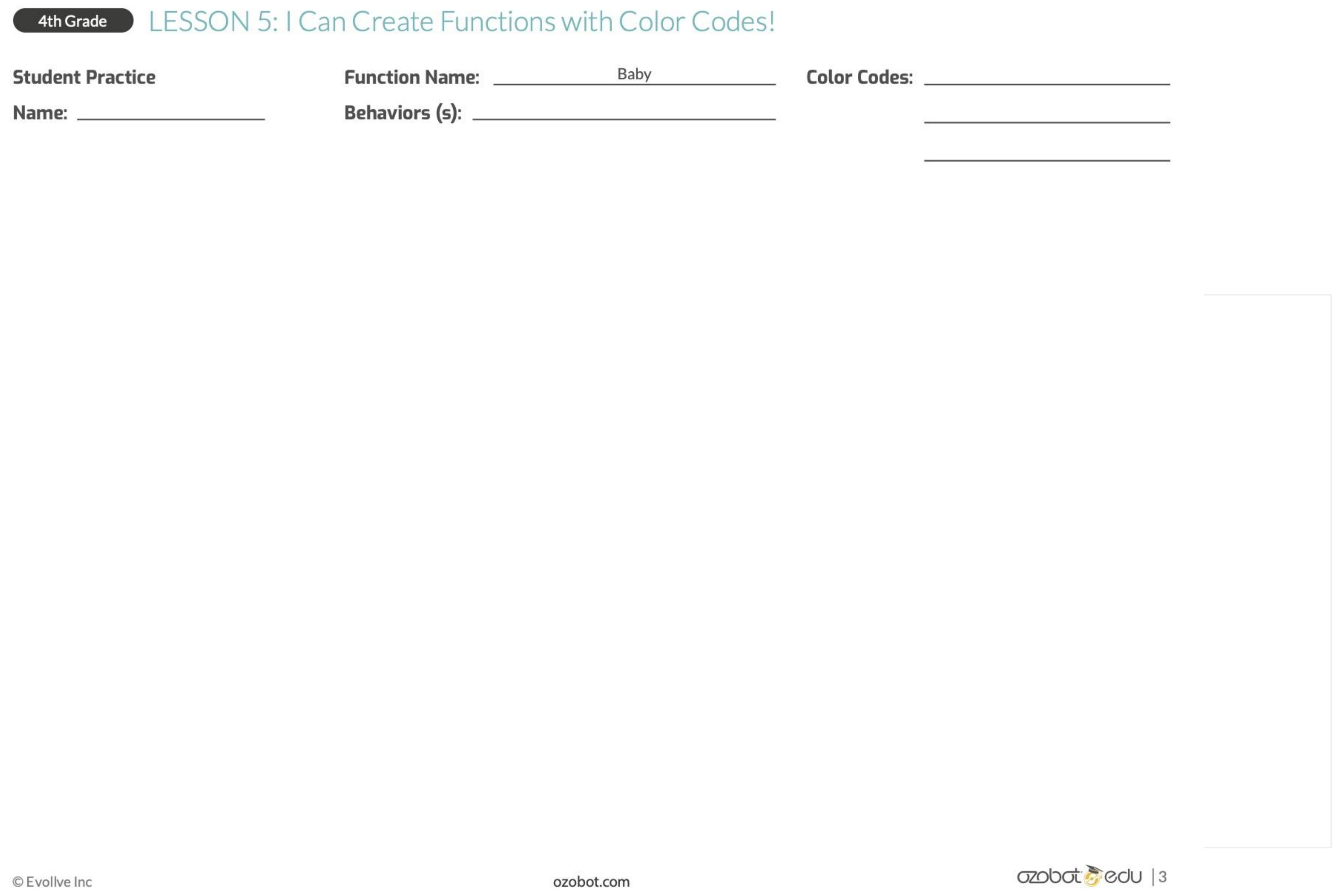

4th Grade

LESSON 5: I Can Create Functions with Color Codes!

Student Practice

Name: ____________________

Function Name: Baby

Behaviors (s): ____________________

Color Codes: ____________________

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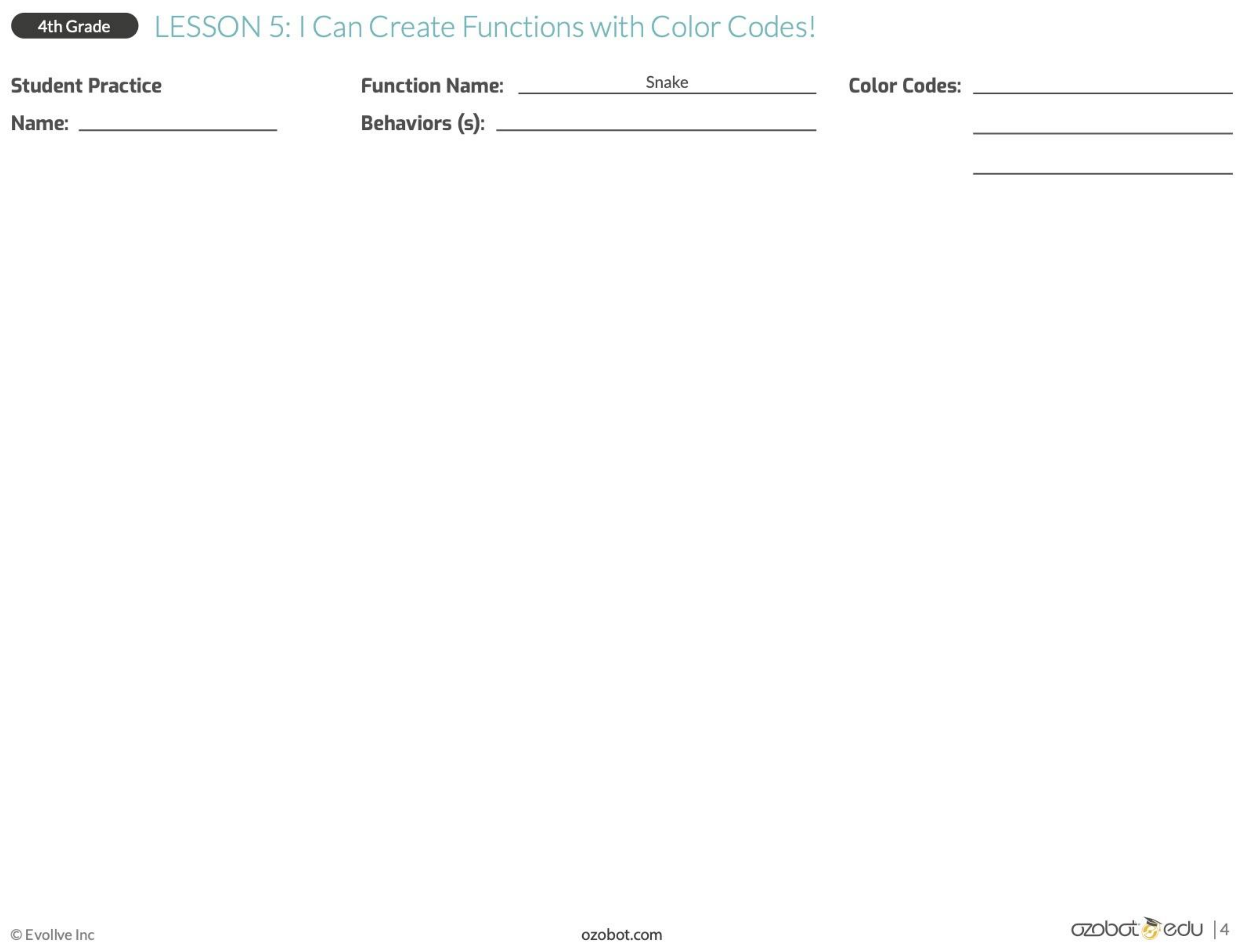

4th Grade

LESSON 5: I Can Create Functions with Color Codes!

Student Practice

Name: ____________________

Function Name: Snake

Behaviors (s): ____________________

Color Codes: ____________________

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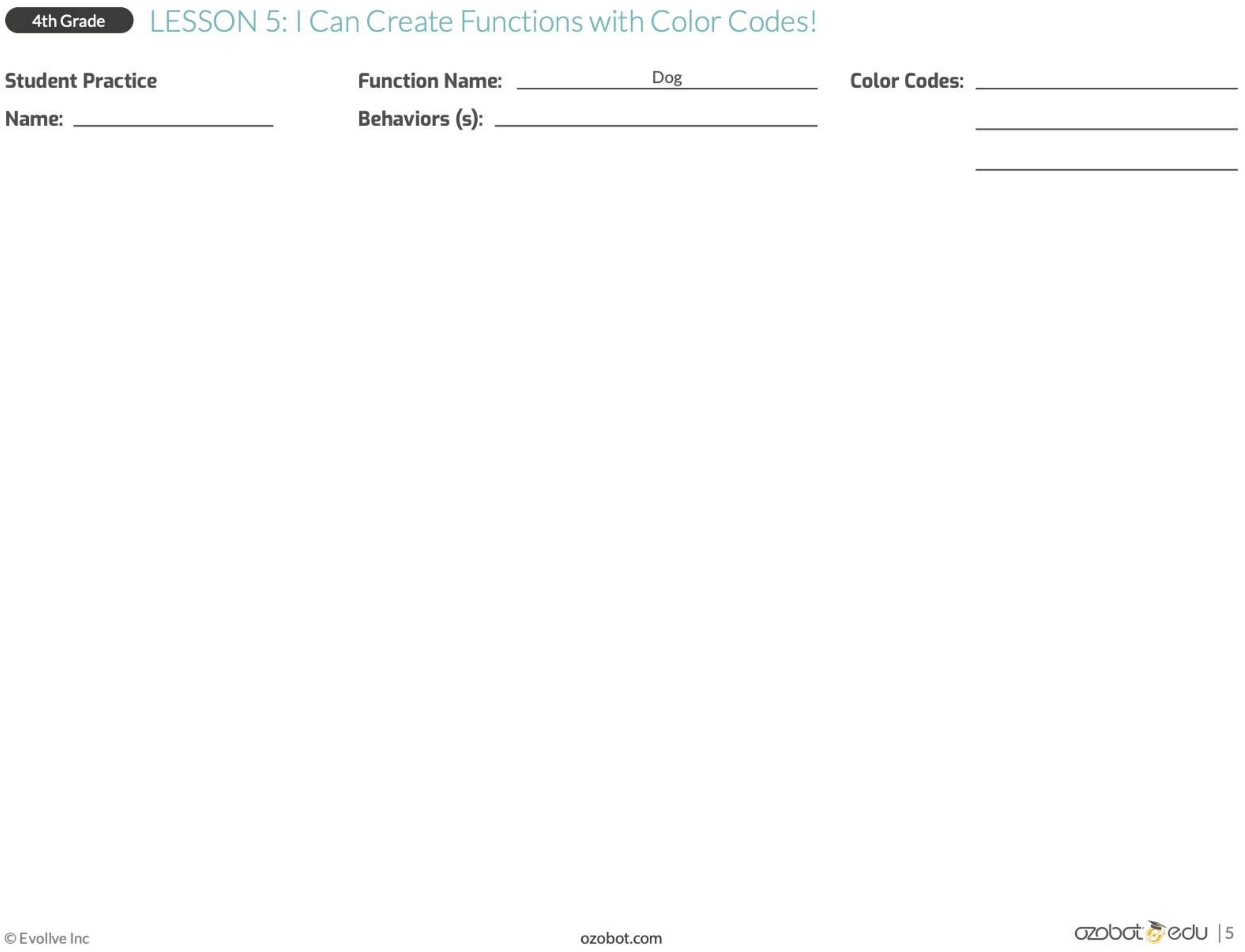

4th Grade

LESSON 5: I Can Create Functions with Color Codes!

Student Practice

Name: ____________________

Function Name: Dog

Behaviors (s): ____________________

Color Codes: ____________________

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4th Grade

LESSON 5: I Can Create Functions with Color Codes!

Student Practice

Name: ____________________

Function Name: ______________________________

Behaviors (s): ______________________________

Color Codes: ______________________________

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Lesson Closure:

- How did you create a color code function?
- Give an example of a color code you used. How did the color code mimic the behavior you were trying to display?

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What We'll Cover:

1. We'll name and write a behavior that the Ozobot will mimic.
2. We'll identify, name and draw color codes that would mimic behaviors.
3. We'll combine two or more color codes to create a function by drawing codes with a marker.

Materials:

- 1 Evo or Bit Ozobot per group
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Activity Instructions:

1. Look at the “Racecar” function. Record a behavior and three color codes.
2. Draw your color code and execute the function.
3. Look at the “Baby” function. Record a behavior and three color codes.
4. Draw your color code and execute the function.
5. Look at the “Snake” function. Record a behavior and three color codes.
6. Draw your color code and execute the function.
7. Look at the “Dog” function. Record a behavior and three color codes.
8. Draw your color code and execute the function.