OZOBOT POINT COUNTERS

Modeling Animal Habits and Habitats

SUMMARY

Students learn about point counter OzoCodes and use them to mimic animal behaviors in their habitat.

OVERVIEW

This lesson introduces the **Point Counter** codes that Ozobot already knows, and gives students practice by placing those codes on a map to model animal behavior, with Ozobot as the animal.

By strategically placing Point codes on the rabbit hill map, students will help "OzoBunny" find food quickly (count down points) so it can rest (Ozobot stops after counting from five to zero points). Students must be aware of how Ozobot reacts to non-orthogonal intersections in order to place these codes in the most beneficial way. If students don't have much experience, the teacher can demonstrate with a bot how Ozobot walks on a blacked-out map. There are multiple solutions.

Optional: With the experience gained from this activity, students can design their own maps that model another animal's behavior. Ideas are provided, and group work is recommended depending on the age. This extension can be used as a second day activity if there isn't enough time in the first.

LESSON OUTLINE

1. Students discover how point-counter OzoCodes work, and create a test course.
2. The map and the problem students must solve are presented, along with real-world connections.
3. Students solve the map, and consider other ways to model animal behavior with Ozobots.
4. Students design their own animal habit and habitat.

PREREQUISITES

Ozobot Basic Training lessons, experience with non-orthogonal intersections.

GROUPING
Pairs or groups of three

MATERIALS
- Ozobot Bit or Evo, one per group
- Printout of *Modeling Animal Habits Map* per group
- Printout of *Modeling Animal Habits and Habitats Handout,* one card per group
- Markers, 1 set per group
- Code Reference Guide (http://files.ozobot.com/stem-education/ozobot-ozocodes-reference.pdf)

GRADE LEVEL
Grades 1 and up

DURATION
30 minutes

VOCABULARY
- *Ozobot Bit and Evo* - Little robot that can follow drawn lines or can be programmed using visual codes or through the OzoBlockly programming language.

CURRICULUM 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

NGSS 3-5-ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.
3-PS2-2 Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.
MS-ETS1-2 Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

CCSS MATH.PRACTICE.MP1 Make sense of problems and persevere in solving them.
MATH.PRACTICE.MP5 Use appropriate tools strategically.
MATH.PRACTICE.MP7 Look for and make use of structure.

QUESTIONS ABOUT THIS LESSON?
Please contact us at ozoEdu@ozobot.com

LESSON

STEP 1 POINT COUNTERS HOW-TO

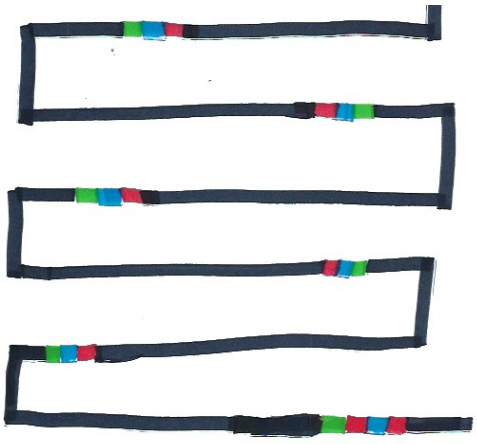
Students look at the point counters section in the OzoCode Reference Guide. (http://files.ozobot.com/stem-education/ozobot-ozocodes-reference.pdf)

Point counter codes are some of the pre-made OzoCodes that Ozobots understand. Once enabled (**Enable Point Counter**), Ozobot's point counter starts at 5 and when it counts down to zero, Ozobot stops moving, but the counter codes can increase or decrease the points. There is a variety of point counter codes including counting intersections and colors; this lesson focuses only on **Point -1** and **Point +1**.

Point out that the **Points** are the flipped version of one another. This means that if Ozobot walks across a code in one direction the points increase, and the points decrease when walked across from the other direction, which may not be intended.

In order to use these codes, Ozobot must go over the **Enable** code first, and in the right direction. Following that, Ozobot must go over five **Point -1** codes, or at least five times, to "stop". The stopping behavior could be used for either "winning" or "losing". In this case, counting down and stopping will result in a win.

How can you tell if Ozobot saw the point counter? Bits keep track by lighting up green if the points go up, and red if the points go down - then it blinks the number of points it currently has recorded. Evo will make a noise if it's not muted, and will perform an exciting display once the counter has reached zero.



Example: Ozobot begins at the bottom right, enables the counter, then counts from 5 to 0.

PRACTICE

Have students design a zigzag or hexagon with an **Enable** code followed by five **Point -1**, making sure Ozobot will go in the right direction. Students can witness how Ozobot reacts to the point counters so they can make sure their code works.

Note - drawn codes must be very clear (and not too dark)! Otherwise, Ozobot might not read the code and then not be successful in its trip.

Once students are successful, move on to Step 2.

STEP 2 PRESENT THE ACTIVITY

Ask students: *How can robots be programmed to imitate animals? Do you know of any ways that robots or computer programs model the natural world right now?*

The educator can discuss the ideas of modeling nature with a computer program, where a computer roams around with a few rules and some freedom. Scientists do this for predicting weather, astronomical phenomena, animal populations, etc.

Present the map. Inform students of the task: they will use the randomness of Ozobot's line-following and the angles of the intersections to help Ozobot act like a real bunny on a hill, running around and eating grass. They must help Ozobot ("OzoBunny") on its way by placing food (point codes) in the best places. Students need to think about which directions Ozobot will go and what intersections it will most likely take. Students are successful when "OzoBunny" takes its rest once 5 point counters have been collected. **Beware**: point counters in the opposite direction will increase your Ozobot's points, which is away from the goal of zero points.

For advice on how to draw OzoCodes, refer to the OzoCodes Tips Sheet (http://files.ozobot.com/stem-education/ozobot-tips.pdf).

STEP 3 MAIN ACTIVITY

If students aren't familiar with how Ozobots react to differently-angled intersections, the educator can print an extra map, black out the codes, and let students watch how Ozobot reacts.

Give students a time limit appropriate to their experience level. Hand out the task cards, or write the instructions from the cards on a board for all to see,

Hand each individual or group a map. With the map in hand, students should

1. Notice the shapes of the intersections and decide where Ozobot will likely go
2. Color their codes in the right directions
3. Test their map!

Remember, the goal is for Ozobot (OzoBunny) to count down from five to zero.

Students don't have to fill in all the blanks with point codes - they can add in speeds or behaviors that might mimic a rabbit, or black it out. Maybe the rabbit runs to chase (or get away from) something, or it goes very slow in a patch of delicious clover.

If white Avery sticker labels are available, students can use these to cover codes that don't work or that go in the wrong direction (bugs in the code).

Students report when they are successful, or, if there is enough time, students demonstrate their maps to the teacher. Another possibility is to lay all maps in a central location and start the Ozobots at the same time for all to watch. Do all the OzoBunnies finish around the same time?

POST ACTIVITY

Have your students reflect on:

1. how well their map was able to accomplish the task (count to zero and stop).
2. how well their map reflected the behavior of rabbits.
3. why were the non-orthogonal intersections able to simulate animal behavior (as in, do animal also go to the same places in the same way?).
4. how Ozobot can be programmed to model nature, and any ideas they have for other experiments.

EXTENSION

Students design another map to model animal behavior and habitats using the point counters. They can also explore using color and intersection counters. Ozobot should make it through the course and stop only if it has collected all 5 of whatever it needs (Ozobots can stop if they hit a Win/Exit code - those aren't allowed).

a. Get creative - cheetahs and lionesses will sprint, birds will hover, whales move very slowly, bees buzz around very quickly!
b. The overall map should resemble the habitat, and the points and other codes should resemble behavior the animal would have.
c. Be sure to set up intersections so that a solution is attainable.

Once their unique maps are made, students solve the maps, or pass their map to another group to solve. Solutions are presented to educator and/or class.

Modeling Animal Habits and Habitats Handout

Help OzoBunny eat enough food to take a rest! How?

1. **Clearly** color in the OzoCodes "Enable Point Counter" and "U-Turn" at the rabbit hole in the right direction.
2. Think hard about which direction Ozobot might go at every intersection.
3. When you've decided which direction Ozobot will most likely go, put the Point -1 codes, in the right direction, on the lines Ozobot will most likely walk on.
4. Turn on Ozobot and calibrate to a black circle.
5. Set Ozobot at the rabbit hole and let it walk around, looking for food, and take a rest when it finds enough.

Did your OzoBunny find enough food?

ozobot

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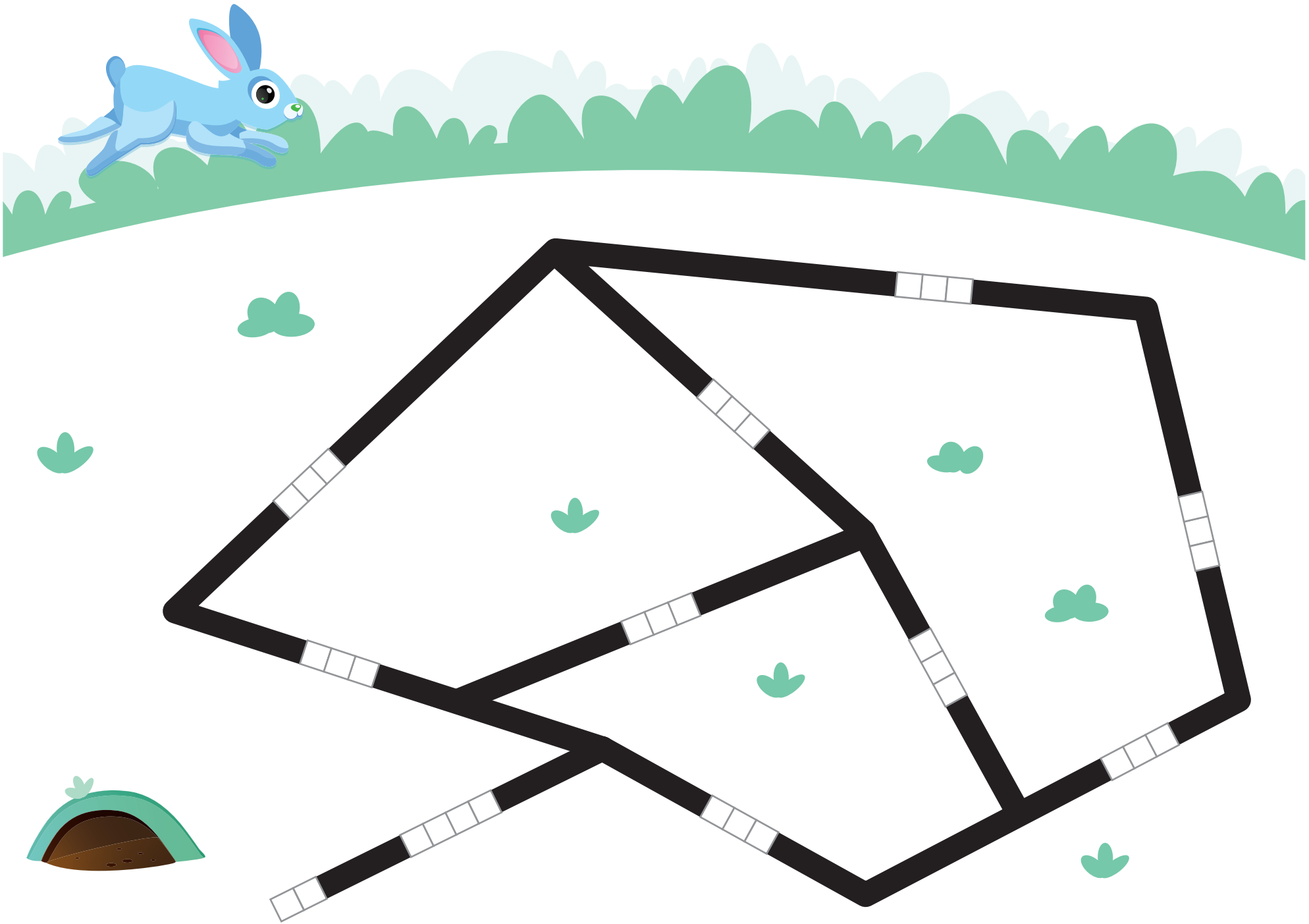

ozobot Modeling Animal Habits and Habitats Map