LINE TRACING ROBOT

STEM CLUB ACTIVITY

OVERVIEW

In this introductory lesson, you will be introduced to programming with a line-tracing robot. There are two ways to program: color coding with markers and block-based coding on a computer. We will begin by learning the basics of programming by coding with markers. Then we will try programming the robot with a computer.

ALGORITHM: A repeating pattern that robots use to make decisions

PROGRAM: A set of instructions for the robot or computer to follow

CODING: The act of writing programs or instructions for the robot or computer to follow

ROBOT: An object that inputs information, process it, and outputs actions

DEBUGGING: Finding and fixing problems within a program

DO

COLOR CODING

1. Begin by turning your line-tracing robot on by squeezing the side button.

2. Draw a thick, black line for your line-tracing robot on a blank sheet of paper. Place your line-tracing robot on the paper next to the line and observe what happens.

   - *Challenge: Program your line-tracing robot to follow a line.*

3. Practice drawing color codes for your line-tracing robot. Use this color code PDF to get started.

   - *Challenge: Program your line-tracing robot to change its speed.*

   - *Challenge: Program your line-tracing robot to make a special move.*

4. Draw a T-shaped intersection on your paper. Let your line-tracing robot travel to the intersection and observe what happens. Try it a few times. How often does it decide to turn left? Turn right?

GRADES: 4-8

SKILL LEVEL: Beginning, Intermediate, and Advanced options

GROUP SIZE: 1-2 students per robot

TIME: 90 minutes

IOWA COMPUTER SCIENCE STANDARDS: 1B-AP-15 Test and debug (identify and fix errors) a program or algorithm to ensure it runs as intended.

NEXT GENERATION SCIENCE STANDARDS: MS-ETS1-4 Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

MATERIALS:
- A device with internet access and a screen. Recommended: laptop, tablet, or iPad
- Line-tracing robot
- Whiteboard markers
- Printed copies of the challenge checklists, either laminated or slipped into sheet protectors

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Extension and Outreach

5. Leaving about a ½″ of the black line before the intersection, color a directional code of either "Turn Left" or "Turn Right."
   - *Challenge: Program your line-tracing robot to turn left reliably.*
6. Watch this video: https://www.youtube.com/watch?v=uaquZBOqKv4
   - *Challenge: Design, build, and test a wheel for your line-tracing robot to help it move around your room.*

BLOCK-BASED PROGRAMMING

1. On your device, open up https://ozobot.com/create/ozoblockly and click on the "Get Started" button.
2. Check out the different programming levels (1-5) and choose the one that is right for you. For most 4-8th graders new to programming, I would recommend level 3.
3. Try dragging out a simple program, such as this:
4. Download your program to your line-tracing robot by following the instructions on the screen. You will need to hold your line-tracing robot up to your screen. Make sure your line-tracing robot is on while downloading, your screen brightness is 100%, and red light mode is turned off.
5. Experiment with the programming software.
   - *Challenge: Program your line-tracing robot to flash a light show.*

REFLECT

1. What did you enjoy about this activity?
2. What challenges did you face along the way, and how did you solve them?
3. How would you explain how to program the line-tracing robot to someone completely new to programming and robots?

APPLY

1. What were your debugging strategies, and how might you apply those in your future programs?
2. What makes your line-tracing robot a robot? In what ways does it sense, think, and act?

CAREER CONNECTION: COMPUTER SCIENTIST

Computer Scientists write programs to solve problems and re-imagine technology use? For more information about Iowa State University's Computer Science program, visit https://www.cs.iastate.edu/content/about-us.

IMPLEMENTATION IDEAS:

- Focus on play with a set of guided tasks to complete. Print out a checklist and laminate it. Let youth use whiteboard markers to keep track of their progress.
- If there are more than one youth per robot, consider setting a series of 2-minute timers to help them take turns.

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