OzoBot Section 01 Lesson 01 Getting Started

For Grades: Grades 3-5 *Time/Duration:* 50 to 90 mins (or 2 sessions of 30 to 45 min)
Question: What is Ozobot and how will we use it?
Overview: This lesson introduces students to Ozobot and also to the teamwork process and use of handouts for the class. *Note: Teachers should consider directing this lesson, even if other lessons are to be self-directed, to help get students started.*

Prior Knowledge:
Robots (what is a robot?), the scientific method, typing and how to use a word processor (optional – if you are using Word processor for worksheets).

Materials:
- Ozobots (1 per student or group of 2 or 3 students, make sure they are calibrated on paper and charged).
- Playground (Folded Paper Maze) that comes in the Ozobot package
- Blank white paper, a few sheets per group
- Markers in colors black, red, light blue and light green (we recommend either Sharpie's wide chisel tip or Crayola markers), one set per group
- Team assignments – Students in teams of 2 or 3
- Handouts: #1 Robot Team Roles, #2 Drawing Lines for Ozobot
- Youtube Videos – have ready to play
  - describes Ozobot: https://youtu.be/zm_H8HXWFZ4
  - unpacking the box: https://www.youtube.com/watch?v=twD-4cKKEKA
- Lesson 01 Worksheet – printout or as Word processing document
- Optional: printout of lesson (or lesson on computer), one per group, if students are learning self-guided

Standards:
CCSS.MATH.PRACTICE.MP1 Make sense of problems and persevere in solving them.
CCSS.MATH.PRACTICE.MP5 Use appropriate tools strategically.

Objectives:
1. Understand what Ozobot is and how it operates.
2. Understand careers options and some of the roles of programmer, robot technician, scientist, engineer, reporter, and media specialist
3. Form a team, learn about team roles, and decide the roles to be played in the team each class session.
4. Demonstrate use of the lessons, using worksheets, and handing in worksheets.
5. Demonstrate understanding of the scientific method and how it will be used in this class.
6. Demonstrate how to draw lines using the correct method so that Ozobot can follow them.

Vocabulary:

- Robot
- Ozobot
- Miniature
- Programmed
- Programming
- Scientific Method
- Hypothesis
- Programmer
- Robot technician
- Scientist
- Engineer
- Reporter
- Media Specialist

Background:

Ozobot is a miniature smart robot that can follow lines or roam around freely, detect colors, and can also be programmed. Students will learn hands-on about robotics and programming while applying STEAM concepts. Ozobot can be used to teach many STEAM concepts in a fun way so students learn while being engaged and playing.

This lesson will introduce the robot and demonstrate how it works with pen and paper.

In later lessons, students will start programming Ozobot with visual color codes – using markers on a piece of paper and on a tablet using Apps. Starting in elementary school and all the way to middle school, students can also learn advanced programming skills with the OzoBlockly App, which is similar to Scratch.

Teacher Directed Activity Steps:
Note: Teachers should consider directing this lesson, even if other lessons are to be self-directed, to help get students started.

Class Session 1: 30 to 45 minutes

1. **Introduce Ozobot** (5 minutes)
    a. Hold up the robot. Say "Today we will start exploring robotics with a miniature smart robot called Ozobot. Here's a short video showing what it can do. "
    b. Show video to the class which describes Ozobot: https://youtu.be/zm_H8HXWFZ4
    c. Activate prior knowledge: Ask "Has anyone seen a robot like this before?" followed by "What is a robot?" Lead to a short discussion of defining a robot and how it differs from other machines. "How is this robot different than other robots?" and "How is it similar to other robots?"
    d. ***Optional (most teachers will have already opened the packages and done this step).*** If you have new packages, you can show the video of opening the package. Explain that students may not have a dual package, but the single package is similar: https://www.youtube.com/watch?v=twD-4cKKEKA

2. **Explain Worksheets and Grading.** (5 minutes)
    a. Say "Before we can start playing with the Ozobots, there are a couple of things we need to handle. First, we will be using worksheets in this class to document our work. Each lesson will have a worksheet."
    b. Hand out the activity worksheet for this lesson or direct students to the website and how to open the word processing documents online.
    c. If using worksheets for grades, provide the rubric you will use for grading. Also explain any other grade producing activities, such as quizzes and competitions.
    d. If you are using a pre-test and post-test, explain those, and optionally give the pre-test now (requires extra time).

3. **Activity 1: Team Assignments** (5 to 10 minutes)
    a. Divide the class up into teams of 2 or 3 (depending on how many students there are per robot). *(optional – let students choose teams)*
    b. Say "We will be working with the robots in teams. Look at the team assignments. Please move so that your team is together."
    c. Explain how the robots and team materials are stored and what each team will do at the beginning of the class to retrieve the robots and what they will do at the end of the class to store the robots.
    d. Say "There are different roles for people in each team. Each member of the team will take turns in each role, so that we all have experience with each role. This is helping to preparing us for these types of jobs."
    e. Pass out Handout – Robot Team Roles, write the roles on the board, and go through each, answering any questions. Let's go through this now and fill out what role you will play each day. You have 4 minutes."

Class Session 2 - 30 to 45 Minutes

4. **Activity 2: Robot Operation** (10 minutes)
    a. Hand out the robots. Make sure each team has robots and the "playground" paper maze that comes in the robot package.
    b. Say "This is not a toy. So we need to handle the Ozobot robots with care. First, let's take it out and turn it on" Demonstrate how to take the robot out of the case and how to turn the robot on and off using the button on the side. Direct students to turn off the robot when it is not in use.
    c. Say "For our first activity, let's try out the robots to see how they operate and also begin practicing the team roles.
    d. First, each person takes a turn being the robot technician and figure out how to operate and control the robot. We will start with the paper playground that came in the Ozobot package. Each person will turn the robot on, place it on a line someplace on the maze and let it run for about a minute. If it goes off the maze, they will gently put it back on the maze. Then they will turn it off. Then the next person takes a turn.
    e. Those who are not the robot technician, play the role of scientist. Look at the lines in the maze and the actions of the robot and start making observations and create some hypothesis of what is controlling the robot. For example, how does it know to turn? If it turns around, how did it know to do that? You can discuss this amongst yourselves.
    f. After operating the robot and being scientists, now everyone takes on the role of media specialist and reporter. Use the worksheet and document the operation of the robot and your hypothesis of what is controlling the robot. This activity is 9 minutes."

5. **Activity 3: Ozobot Follows Lines** (10 minutes)
    a. Make sure each team has paper and markers and the handout – Drawing Lines for Ozobot.
    b. Say "For our next activity, let's play the role of a programmer. A programmer controls the robot.
    c. In this activity we control the robot movement by drawing lines. We will start with white paper and draw some black lines. Draw a black line (about 1/4", 6mm in width) on a white piece of paper. Try straight, curved, and lines at angles. Use the handout Drawing Lines for Ozobot to see the method for drawing lines so that Ozobot can read them. We will get much more into drawing lines later, but for now just try some simple lines.
    d. After some lines are drawn, then take turns playing the role of robot technician and try the operation of the robot on the lines. Turn Ozobot on by pressing the button on the side. Place Ozobot on the line and observe what happens.
    e. If Ozobot does not follow a line, or gets stuck, take on the role of the engineer. Look at the lines that are on the paper, review the handout showing methods for drawing the lines, and then solve the problem to change the lines so the robot will follow them, and try the robot again.
    f. Those who are not the robot technician, play the role of scientist. Look at the lines and the actions of the robot and start making observations and

create some hypothesis of what is controlling the robot. You can discuss this amongst yourselves.

g. Once again, everyone takes on the role of media specialist and reporter. Use the worksheet and document the operation of the robot and your hypothesis of what is controlling the robot. This activity is 9 minutes."

6. **Conclusion:** (10 minutes)
   a. Go from team to team and discuss what students wrote down for their observations and their hypothesis of what is controlling the robot. Express that they will discover as the class progresses how the robot is actually controlled. Review the scientific method and how it applies to this activity. Review the roles and how they played the roles.
   b. Provide direction on storage and retrieval of the robots and team materials as the class wraps up.
   c. Decide on whether the class will do the enrichment activity and give students direction on how to complete it either as a homework assignment or taking one or two days extra class time.

Differentiations:

Grades 3-4: More explanation may be required of the scientific method and the term hypothesis, depending on prior exposure to these concepts. More explanation of the term programming and how it is a method of control may be needed. More explanation of the careers and the roles to be played for each career may be needed.

Grades 4-5: More emphasis can be placed on the roles to be played, and students can conduct research on these careers and discuss the roles if extra time is available, or as homework.

The Enrichment activity in the worksheet may be given for extra credit for Grades 4-5. Or the whole class may participate and the enrichment can be the next day's lesson, or assigned later.

Assessments:

Grading Rubrics (to be developed)
Pre and Post Test (to be developed)

Lesson 01 Worksheet ANSWER KEY

Answer these questions: (examples of appropriate responses, other responses may also be appropriate)

1. What is Ozobot?
   A small robot that follows lines and can be programmed.

   a. How is it different than other robots?
   It is smaller. It doesn't have arms. It can't fight. It can't talk.

   b. How is it similar to other robots?
   It moves with wheels. It follows lines. It has a shell to protect it. It can be programmed.

2. Describe what happened in Activity 1.
   We divided up into teams and filled out the team roles sheet.
   a. Who is on your Ozobot team?
   Student names
   b. Did you complete the handout? If not, why not?
   Yes. (If no – it may be because they did not understand it and require further directions.)

3. Explain these team roles:
   a. Programmer

   The programmer plans an action and creates the activities for controlling the robot.

   b. Robot technician

   The robot technician takes care of the robot, operates it, turns it on and off, places it on the lines, stores it in the box, charges it, etc.

   c. Scientist
   A scientist uses the scientific method to construct a hypothesis, and then designs experiments, and observes and documents what happened during the experiment.

   d. Engineer

   Engineers are problem solvers. They see a problem and propose solutions to solve it, and then try the solutions until the problem is solved.

   e. Reporter

   A reporter writes about the experience of working with the robot, and reports the facts and observations made by the scientist.

   f. Media specialist
   A media specialist takes pictures or video or draws to document the experience of working with the robot.

4. Describe what happened in Activity 2.
   We finally got to play with the robot! We operated the robot.

   a. What did the robot technician do?
   Operated the robot. Turn the robot on, place it on a line someplace on the maze and let it run for about a minute. If it goes off the maze, they put it back on the maze. Then turned it off.

   b. What did the scientist do?
   Made observations and created a hypothesis of what is controlling the robot. Asked questions how does it know to turn? If it turns around, how did it know to do that?

   c. What did the media specialist and reporter do?
   Wrote answers in the worksheet.

5. Describe what happened in Activity 3.
   We drew lines and the robot followed them.
   a. How do you need to draw lines so that Ozobot will follow them?
   It needs lines that are drawn a particular width about a ¼ inch wide – not too thin, not too thick, not inconsistent. Curves and Intersections.
   b. What kinds of lines will it not follow?
   Not too thin, not too thick, not inconsistent. The curves have to be wide enough for the robot to make a turn, so the lines cannot be too close

   c. What colors of lines will Ozobot follow? Black, Red, Green, Blue, Orange, and maybe Yellow (depends on light conditions).

   d. How do you know? What evidence or observation did you make?
   We tried drawing lines and put Ozobot on them and it followed them.

6. Explain the scientific method we will use in this class.
   Ask a question, do research, develop a hypothesis, test with experiments, analyze results, draw conclusions, ask if hypothesis is true or false, report results.

7. How is Ozobot controlled? What is your hypothesis?
   The colors of lines tell it to move. The colors tell it to turn on its lights. The sensors underneath detect the colors of the lines. Different colors tell it to do different things.

8. Define programming as it pertains to Ozobot.
   Drawing lines or using other methods to control the robot.

9. What was fun or exciting about this lesson?

   Reflection – any answer is appropriate

10. Did you have any difficulties with this lesson? If yes, describe them and how you overcame them.

Reflection – any answer is appropriate

11. Was there anything that you would change about this lesson? What should the next group of student know?

Reflection – any answer is appropriate

Team Assignments Sheet

	Team Identity	Student 1	Student 2	Student 3
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				

Student Instructions:

Question: What is Ozobot and how will we use it?
Overview: This lesson introduces the Ozobot and also the teamwork process and use of handouts for the class.

Objectives:

1. Describe what Ozobot is and how it operates.
2. Describe some of the roles of programmer, robot technician, scientist, engineer, reporter, and media specialist
3. Form a team, learn about team roles, and decide the roles to be played in the team for each class session.
4. Demonstrate use of the online lessons, using worksheets and handing in worksheets.
5. Demonstrate understanding of the scientific method and how it will be used in this class.
6. Demonstrate how to draw lines such that Ozobot can follow them.

Activities:

1. **Background: (5 minutes)**
   What is Ozobot? Watch this video to learn more about Ozobot: https://youtu.be/zm_H8HXWFZ4 (2 Minutes)
   Ozobot is a miniature smart robot that can follow lines or roam around freely and detect colors. It is also the world's smallest programmable educational robot. We will learn hands-on about robotics and coding while applying STEAM concepts. Ozobot is a fun way to learn while being engaged and playing. We will start controlling Ozobot with visual color codes using markers on a piece of paper and then on a tablet using Apps. Ozobot will show off its moves as we create dance routines with the OzoGroove App. Then we will use OzoBlocky (a programming language similar to Scratch) to control it.

2. **Activity 1: Team Assignments and Roles (10 minutes)**
   How will we work with Ozobot? We can work alone or in teams. While completing the activities, we will be playing different roles. Each person in the team will take a turn at the different roles. Use the Team Handout and write in the roles each person will take for each lesson. Read the roles and instructions.

   For example, if you are a programmer for the first lesson, then you will be the robot technician for the next lesson. Keep a printed copy of this list with the team notebook and team materials. When starting a new lesson, refer to the handout for the team member roles for that lesson. If someone is absent, modify the team role assignments for that lesson.

3. **Activity 2: Robot Operation (10 minutes)**
   a. Find the "playground" paper maze that comes in the robot package.
   b. In this activity we will try out the robots to see how they operate and also begin practicing the team roles.

c. Each person takes a turn being the robot technician and figure out how to operate and control the robot. Each person will turn the robot on, place it on a line someplace on the maze and let it run for about half a minute. If it goes off the maze, they will gently put it back on the maze. Then they will turn it off. Then the next person takes a turn.

d. Those who are not the robot technician, play the role of scientist. Look at the lines in the maze and the actions of the robot and start making observations and create some hypothesis of what is controlling the robot. For example, how does it know to turn? If it turns around, how did it know to do that? You can discuss this amongst yourselves.

e. After operating the robot and being scientists, now everyone takes on the role of media specialist and reporter. Use the worksheet and document the operation of the robot and your hypothesis of what is controlling the robot.

4. **Activity 3: Ozobot Follows Lines (10 minutes)**

a. Practice the role of a programmer. A programmer controls the robot.

b. In this activity we control the robot movement by drawing lines. We will start with white paper and draw some black lines. Draw a black line (about 1/4", 6mm in width) on a white piece of paper. Try straight, curved, and lines at angles. Use the handout Drawing Lines for Ozobot to see the method for drawing lines so that Ozobot can read them. We will get much more into drawing lines later, but for now just try some simple lines.

c. After some lines are drawn, then take turns playing the role of robot technician and try the operation of the robot on the lines. Turn Ozobot on by pressing the button on the side. Place Ozobot on the line and observe what happens.

d. If Ozobot does not follow a line, or gets stuck, take on the role of the engineer. Look at the lines that are on the paper, review the handout showing methods for drawing the lines, and then solve the problem to change the lines so the robot will follow them, and try the robot again.

e. Next try different colors of lines. Once again, practice the roles of programmer, technician, and engineer.

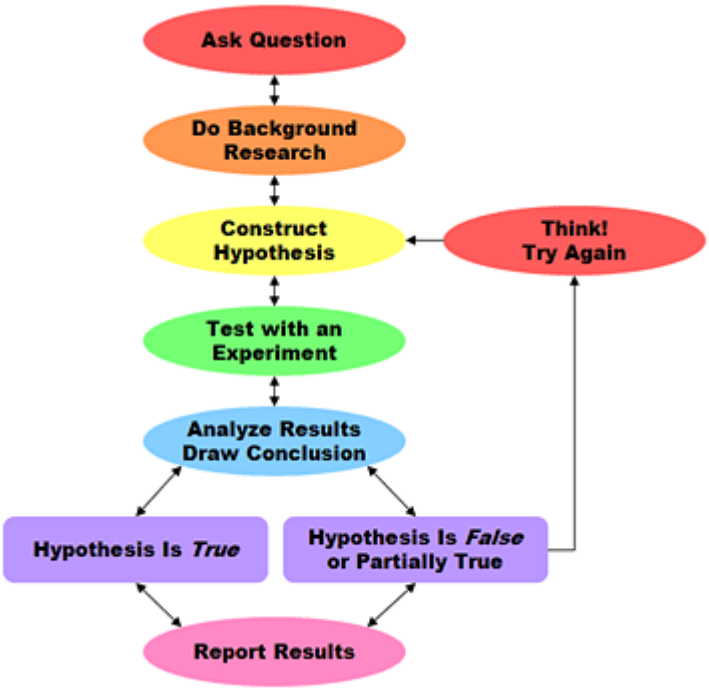
f. Those who are not the robot technician, play the role of scientist. Look at the lines and the actions of the robot and start making observations and create a hypothesis of what is controlling the robot, and what is controlling the lights on the robot. You can discuss this amongst yourselves.

g. Everyone takes on the role of media specialist and reporter. Use the worksheet and answer the questions. Document the operation of the robot and your hypothesis of what is controlling the robot.

Handouts:

Handout 1: Robot Team Roles

1. The programmer plans an action and creates the activities for controlling the robot. A programmer may use programming code or other mechanisms (such as drawing lines or codes to follow) that work for a particular robot.
2. The robot technician takes care of the robot and operates it. This includes turning on the robot, and putting it in place to perform the actions that the programmer created, or the experiment that the scientist designed. This person also performs calibrations, makes sure the robot is charged, turns off the robot, and stores it away properly.
3. A scientist uses the scientific method to construct a hypothesis, and then designs experiments, and observes and documents what happened during the experiment. They draw conclusions from the results of the experiment, and report the results. Scientists use math and science principles.
4. A media specialist takes pictures or video or draws to document the experience of working with the robot.
5. A reporter writes about the experience of working with the robot, and reports the facts and observations made by the scientist. Reporters use proper language, check spelling, write well, and edit their work.
6. Engineers are problem solvers. They see a problem and propose solutions to solve it, and then try the solutions until the problem is solved. Engineers use drawings, logic, math, and science when solving problems.



THE SCIENTIFIC METHOD

Handout: Robot Team Roles Assignment

Lesson / Date	Programmer	Robot Technician	Media Specialist	Reporter	Scientist	Engineer
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						

Instructions:

Write the names of each person in the column for the role they will play for that lesson. Take turns with each role.

For Teams with 2 members:

Take turns with roles of programmer or robot technician. Take turns with roles of media specialist or reporter. Take turns with roles of scientist and engineer. (A = team member 1, B = team member 2)

Lesson	Programmer	Robot Technician	Media Specialist	Reporter	Scientist	Engineer
1	A	B	A	B	A	B
2	B	A	B	A	B	A
3	A	B	A	B	A	B
4	B	A	B	A	B	A

For Teams with 3 members:

Take turns with roles of programmer or robot technician or media specialist. Take turns with roles of reporter, or engineer, or scientist. Here is an example:

(A = team member 1, B = team member 2, C= team member 3)

Lesson	Programmer	Robot Technician	Media Specialist	Reporter	Scientist	Engineer
1	A	B	C	A	B	C
2	B	C	A	B	C	A
3	C	A	B	C	A	B
4	A	B	C	A	B	C
5	B	C	A	B	C	A
6	C	A	B	C	A	B

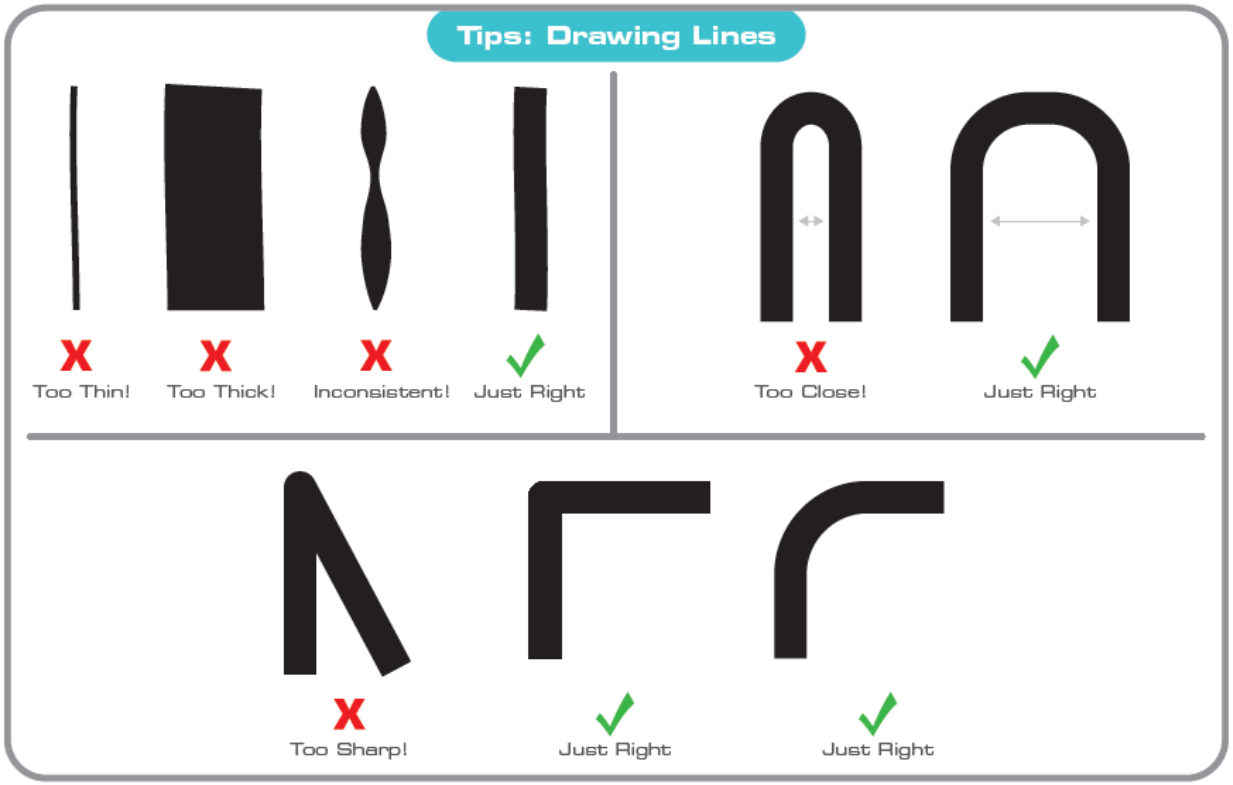
Handout 2: Drawing Lines For Ozobot

Method: Draw lines using wide tipped markers. Blow on the line and let it dry before placing Ozobot on it. This is so the marker ink doesn't get on Ozo's wheels or the tiny sensors underneath, which can keep it from working.

Tip1: Ozobot can detect lines of different colors. But it needs lines that are drawn a particular width – not too thin, not too thick, not inconsistent.

Tip 2: Ozobot can also go around curves, but the curves have to be wide enough for the robot to make a turn, so the lines cannot be too close.

Tip 3: Ozobot can also turn at an intersection, but the angle of the line in the intersection cannot be too sharp.



Lesson 01 Worksheet

Answer these questions:

1. What is Ozobot?
    a. How is it different than other robots?
    b. How is it similar to other robots?
2. Describe what happened in Activity 1.
    a. Who is on your Ozobot team?
    b. Did you complete the handout? If not, why not?
3. Explain these team roles:
    g. Programmer
    h. Robot technician
    i. Scientist
    j. Engineer
    k. Reporter
    l. Media specialist
4. Describe what happened in Activity 2.
    a. What did the robot technician do?
    b. What did the scientist do?
    c. What did the reporter and media specialist do?
5. Describe what happened in Activity 3.
    a. How do you need to draw lines so that Ozobot will follow them?

b. What kinds of lines will it not follow?

c. What colors of lines will Ozobot follow?

d. How do you know? What evidence or observation did you make?

6. Explain the scientific method we will use in this class.
7. How is Ozobot controlled? What is your hypothesis?
8. Define programming as it pertains to Ozobot.
9. What was fun or exciting about this lesson?
10. Did you have any difficulties with this lesson? If yes, describe them and how you overcame them.
11. Was there anything that you would change about this lesson? What should the next group of student know?

Enrichment Activity: (This is optional. Confirm this is assigned before doing it.)

1. **Real World Applications of Robots.**
   A lot of line-following robots are used in factories, warehouses, hospitals and even restaurants! Some of the earliest Automated Guided Vehicles (AGVs) were line following mobile robots. They might follow a visual line painted or embedded in the floor or ceiling or an electrical wire in the floor.

   The first AGV was invented in the 1950s and at the time it was simply a tow truck that followed a wire in the floor. Today, AGVs are used in nearly every industry: transporting materials for assembly lines, products in warehouses, but also food in restaurants or medicine in hospitals.

   Part A: Research. Look up "line following robots" and then "mobile robots" using your favorite Internet search engine. Find information and pictures of robots in industry that follow lines. You may also find videos. You may discover robots that are used in offices, warehouses, factories, hospitals, restaurants, and even homes. Do not include educational robots or toys. Choose one or two robots that are of interest to you.

   Part B: Choose How to Communicate. Choose a communication method to explain and describe your chosen robot(s). Your method may be writing a paper, acting out a story, creating a poster, creating a work of art, creating a presentation, developing a song, developing a class lesson, or some other creative endeavor.

STOP - Your instructor must approve the robot chosen and the communication method chosen before continuing.

Part C: Develop your Communication. In your description, include answers to the Who, What, When, Where, Why, and How. For example: Who uses it? What is it? What does it do? When is it used? Where is it used? Why is it used? or Why was it developed? How does it operate? and How is it used? You may add other questions.

Part D: Editing. Edit your work to make it presentable and your best work. Is it easy to read? Is the spelling and grammar correct? Does it flow well? Does it look good? Will others be able to understand it?

Part E: Presentation. Present your work to the class.