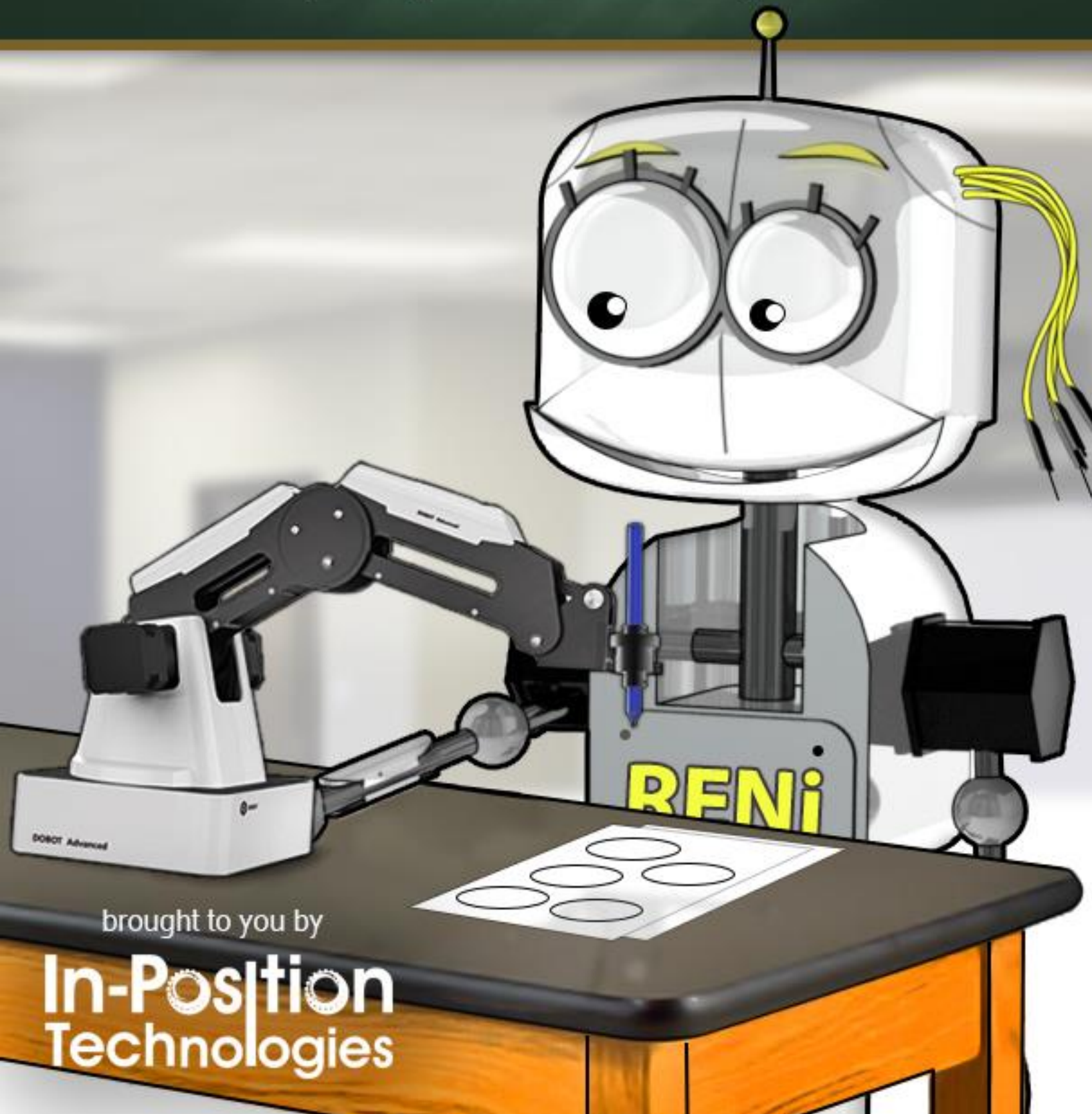
LESSON: INTRODUCTION

Exploring the Dobot Magician



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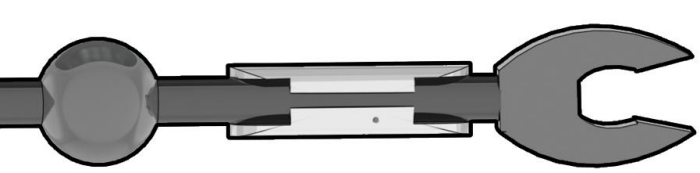


DOBOT INTRODUCTION AND EXPLORATION

Provided by In-Position Technologies **www.dobot.us**

LESSON GOAL:

Before engineers can begin using tools placed in front of them, they must learn the safety precautions and how to get those tools to run properly. This Dobot is more than another tool. It can “Do” anything the creator can think up and create. The object of this lesson is to explore this new machine and a few of its capabilities. The lingo found in the Dobot industry is not as important to know as is the ability to implement the machine and its modalities in a competent manner, but both aspects will allow the teacher, the learner and anyone in the Dobot community to communicate in a productive and worthwhile manner.

LESSON SYNOPSIS:

Lesson will cover the essential components of the Dobot that will be important to know when operating the device. Students will use inquiry-based learning to determine the role of identified features on the Dobot. They will also be operating the robot to perform basic commands, which will test the students’ ability to follow simple instructions. Each student will complete iterative tests and attempt to improve upon their approach to the tasks before them to attain the best results possible.

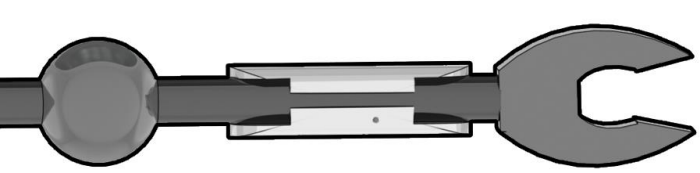
GRADE LEVELS:

6^{th}-8^{th}

NGSS PERFORMANCE EXPECTATION:

Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success. MS-ETS1-3

NGSS CORE IDEA:




ETS1.B: Developing Possible Solutions
A solution needs to be tested, and then modified on the basis of the test results in order to improve it. (MS-ETS1-4)

ETS1.C: Optimizing the Design Solution
The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. (MT-ETS1-4)

MATERIALS:

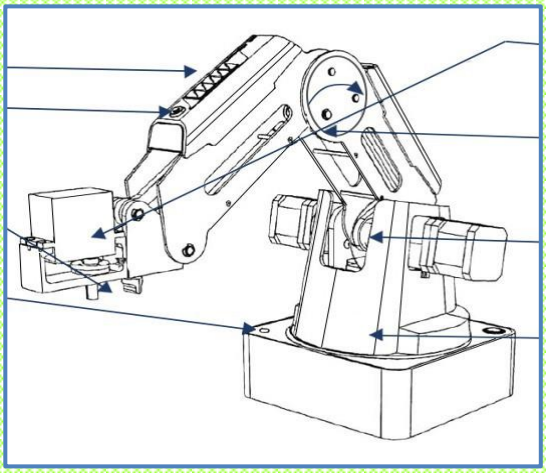
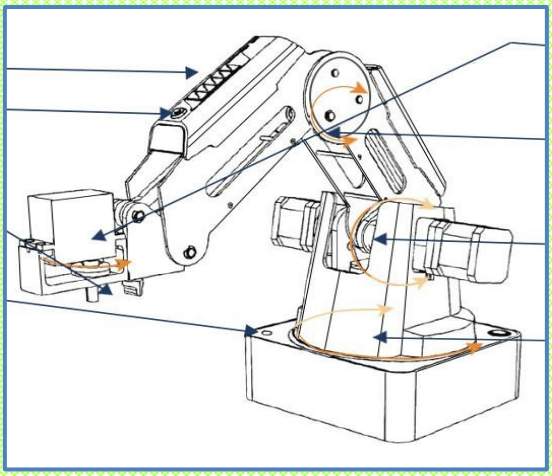
5 Sheets of paper for each student
1 Time-keeping instrument (stop watch, clock, etc.) for every two students
1 Dobot Magician User Manual (Physical Copy)
1 Dobot Magician User Manual (PDF Download)

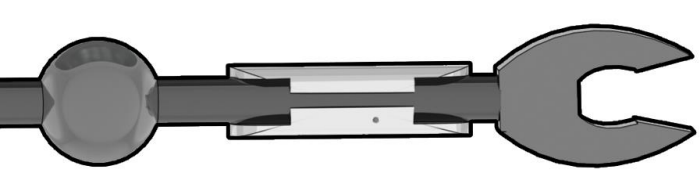
PLEASE READ THE DOBOT MAGICIAN USER MANUAL (PHYSICAL COPY) AND THE DOBOT MAGICIAN USER MANUAL- TUTORIAL (PDF DOWNLOAD) BEFORE PROCEDING WITH THIS LESSON PLAN

LESSON PLAN:

INQUIRY QUESTION: If you were to play a game on the computer or any gaming system, what are some things you would need to know to be able to move the character/ object in the game?
The students may give various answers. Make sure that they understand that before playing the game it is necessary to know which buttons will move the character/ object being controlled by the player. In a similar way, it is also necessary for the user of the Dobot to know how the robot is controlled and how it functions before we can do things like use the laser engraver, the 3D printer and drawing modalities.

Use the diagrams below to answer the following questions.



INQUIRY QUESTION: Using your knowledge of robots, electronics and even basic human anatomy, what do you think are the correct names of the items with arrows pointed to?

What do you think are the names of the body parts of the Dobot where the rotating arrows are found?

ACTIVITY 1:

1. Students will number their paper 1-8.
2. They will write the possible labels for the Dobot
3. Compare results with peers
4. Discuss possible labels and come to a consensus of a group or class label for each arrow
5. Compare results with pg. 2 “Robot Arm Introduction” in physical copy of Dobot Magician User Manual
6. Discuss why the name “joint” was given to each of the four joints found on the Dobot Arm
7. Show the students the End-Effectors (pg. 3) and briefly explain their functions
8. Show the students the coordinate system of the Dobot (pg. 4)
9. Challenge them to think why two axes (x,y) would be less effective than three axes (x,y and z) and what that third axis would do. (Refer back to the Coordinate System on pg. 4)
10. Explain that x-axis moves arm front and back, y-axis moves arm side to side, and z-axis, moves arm up and down.

ACTIVITY 2:

1. Open Dobot Studio to the Teaching and Playback Section. Display the Operational Panel.
2. Connect the Dobot
3. Students should be ready to record observations
4. Ask students to click one of the positive Joint or Linaer Jog buttons. Other students record any observations. Rotate students’ roles.

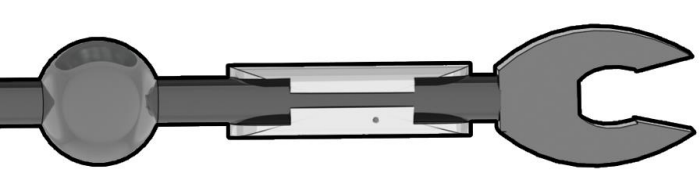
FOLLOW-UP QUESTION:

What are the similarities and differences between the movement made by the z-axis and the movement made by the 2nd Joint (J2)?

ACTIVITY 3:

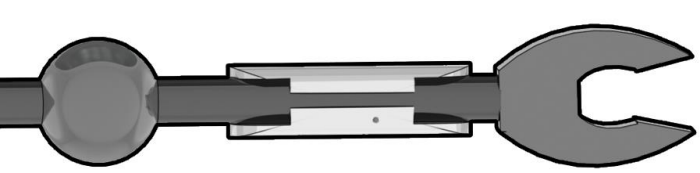
1. Attach the Writing and Drawing End Effector to the Dobot.
2. Each student will draw 5 circles about 3 inches in diameter at random locations on their paper.
3. Students will draw a data table on the back side of their paper like the table below:table where they can write the different steps that were successful and jot down any observations they made.

Here is an example of a basic table:




	Test 1	Test 2	Test 3
Accuracy (out of 5 attempts)			
Accuracy (out of 5)			
Circle 1 Completion Time			
Circle 2 Completion Time			
Circle 3 Completion Time			
Circle 4 Completion Time			
Circle 5 Completion Time			
Speed Percentage			

4. The student operating the Dobot (Student 1) will exchange papers with their partner (Student 2).
5. Student 1 will be given 1 minute to navigate the Dobot Arm to each of the 5 circles.
6. Each time the student is ready to begin and each time he or she places the end effector pen in a new circle, Student 1 will inform Student 2.
7. Student 2 will be observing and recording the amount of time it takes to complete the task.
8. After each test is complete, the student will reflect on their performance using the questions in the Questions for Reflection and Improvement section found below. Encourage Student 1 to have a different speed percentage for each test run.



QUESTIONS FOR REFLECTION AND IMPROVEMENT

Engineers are always trying to improve their performance to obtain the best results possible. Use the following questions to guide meaningful conversations between peers and to incite higher order thinking.

1. Looking at your data, which test was the most successful?
2. What factors played a role in making your best test run so successful?
3. How will you change your approach this time around to get better results?
4. What helpful insights have you gained about controlling the Joint and Liner Jog operations that can help you perform better the next time you use the Dobot?

CONCLUSION:

Engineers are always looking for ways to innovate and improve. Collecting and analyzing data is one of the reasons that they are able to innovate and improve so quickly. Without testing multiple times they would have to rely on memory alone. Today the students completed the objective placed before them. That is, to analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success (MS-ETS1-3). Iterations and improvement will be a common theme throughout the Dobot lessons. The students will obtain the tools necessary to become independent, innovative thinkers, just like engineers at Dobot and I.P. Technologies!