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| Lesson Title | Robot Movement Lab |
| Length of Lesson | 1 Day |
| Created By | Dustin Spayde |
| Subject | Robotics |
| Grade Level | 11-12 |
| State Standards | |
| DOK Level | DOK 4 |
| DOK Application | Design, Create, Apply Concepts, Analyze, Critique, Connect |
| National Standards | 9-12: A(Inquiry), E (technology) |
| Graduate Research Element | Developing Automated Systems |

Student Learning Goal:

National Science Education Standards of Content 9-12

A (Inquiry): Identify questions and concepts that guide scientific investigations.

E (Science and Technology): Abilities of technological design: propose designs and choose between possible solutions, implement a proposed solution, evaluate the solution and its consequences, communicate the problem, process, and solution; Understanding about science and technology

Materials Needed (supplies, hand-outs, resources): A Lego Mindstorms NXT kit per 2-3 students, Access to computers (one for each group) with USB ports and the RobotC software (or other compatible language) installed on each, black tape.

Lesson Performance Task/Assessment:

Each team will demonstrate their final programs, which should enable their robot to move forward using all of the different methods.

Lesson Relevance to Performance Task and Students:

An automated vehicle such as this could easily be found in many factories and ports around the world. Developing its navigation system is an applicable task for a many engineering fields.

Anticipatory Set/Capture Interest:

Have the instructor make the robot run in a straight line for a few feet then stop. Ask the class, "How did the robot know to stop where it did?" (Time and Distance), "How did the robot know to go straight?" (by making both motors move forward at the same time).

Guided Practice:



Day One: Students will be tasked with making their robots move forward in various ways and understanding the advantages and disadvantages of each method. Included in the teacher notes are the methods to be used and their pro and cons.

Independent Practice:

Students will program their robot to perform each of the methods. They will present their programs running each of the methods to the instructor for credit. Student will complete a worksheet describing the pro and cons of each method.

Remediation and/or Enrichment:

Remediation: individual IEP; partner help throughout lesson; shorten parts of assignment; focus upon smaller elements of the process

Enrichment/Extension:

Set up a seminar in which students explain the design of their programs to the rest of the class.

Check(s) for Understanding:

Day One: As a class can the students list some of the immediate pro and cons?

Closure:

Ask which method is the best and why?

Possible Alternate Subject Integrations:

*Math – can manipulate mathematical expressions to isolate needed variables

*Programming – Basic logic and algorithm models

Teacher Notes:

Method 1 (Timing Method)

Power both motors and then place a wait command afterwards.

Method 2 (Timed Sync Method)

Sync Both motors, power the master motor, place a wait command afterwards

Method 3 (Encoder Guess Method)

Set both motor encoders to 0, set both motor encoder targets, power both motors, place a wait command afterwards (long enough for the robot to finish moving)



Method 4 (Synced Encoder Method)

Sync both motors, set master motor encoder to 0, set master motor encoder target, power master motor, place a wait command afterwards (long enough for the robot to finish moving)

Method 5 (Encoder Method)

Set both motor encoders to 0, set both motor encoder targets, power both motors, place a idle while loop afterwards set to run as long as both motor's run states and not idle.