Scope and Sequence for Robotics: Grade 2

Programming and Building

Unit: Go-Bots

Students use wheel rotations to measure distances and turns and build arms for their NXT robots to pick up and put down items, throw a ball, and do jobs in the city of Robotropolis.

GRADE 2	LEARNER'S PERMIT	OPERATOR'S LICENSE	MISSION POINTS	ROBOTICS ENGINEER
Go-Bots!	**Programming concepts**: • Distance is measured in wheel rotations. • A rotation can be divided into 10 equal parts (tenths) for distances that are between whole numbers. • Move command settings for rotations and power tell the robot how far and how fast to go. • The robot follows the commands in order from left to right. • The "Wait for time" command makes the robot pause before going to the next command. • The program must be downloaded to the robot. • If the behavior is not what is intended, there is an error in the program or the robot's body (a part may be broken, disconnected or missing). **Tasks to complete:** • 2- and 3-step programs to go forward and backward; change speeds and incorporate sound.	**Programming concepts:** • Power must go to the B and C motors for the robot to move forward or backward in a straight line. • When one motor is on the robot turns. • The B motor turns the robot to the right; C motor turns it to the left. • Changing the number of rotations changes the turning distance. • Changing the power level changes the speed of the turn. • A quarter turn takes 1.2 rotations. • A half circle takes 2.4 rotations. • A full circle takes 4.6-4.8 rotations. **Tasks to complete:** • 3-step programs to obey traffic signs; make right, left, and U- turns; and park.	**Programming concepts**: • The A motor controls the arm. • One rotation of the A motor is a complete circle. • Moving the arm from out to up is a quarter of a circle or 0.25 rotations. • The arm must complete the rotations to go on to the next step of the program. • The program stalls and gives the message running if it can't complete the rotations. **Building concepts:** • Technic beams have round and/or cross-shaped holes. • It takes 2 connections to make beams with round holes rigid. • Cross-shaped holes are rigid with one connection. **Tasks to complete:** • Build and program simple arms to pick up and put down items and throw a ball.	**Independent programming and engineering challenges:** • Design and build an arm to deliver BOTX packages, catch a stray dog, plant trees, or clear rocks off the soccer field. • Plan and program a route through "Robotropolis" to accomplish the task.

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Academic Content, Deep Learning Proficiencies, and Ed Tech Standards

The eight-week Robotics unit provides students with the opportunity to apply STEM (Science, Technology, Engineering and Math) concepts and skills and develop and practice CFSD's Deep Learning Proficiencies required of 21st Century learners. Students work collaboratively and think critically and creatively in planning, testing, and refining programs; solving problems; and accomplishing engineering tasks.

GRADE 2	MATHEMATICS	SCIENCE	DEEP LEARNING PROFICIENCIES	EDUCATIONAL TECHNOLOGY
Go-Bots!	**Measurement and Data:** • 2.MD.1. Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter how far and how fast to go. • 2.MD.3. Estimate lengths using units of inches, feet, centimeters, and meters **Geometry:** • 2.G.3. Partition circles and rectangles into two, three, or four equal shares, describe the shares using the words halves, thirds, half of, a third of, etc., and describe the whole as two halves, three thirds, four fourths. Recognize that equal shares of identical wholes need not have the same shape. **Mathematical Practices:** • 2.MP.5. Use appropriate tools strategically. • 2.MP.6. Attend to precision.	**Scientific Inquiry:** • SC2.1d.2 Measures data using a suitable tool. **Interaction of Science and Society:** • SC2.2.3 Describes important technological contributions made by people, past and present.	**Collaboration**: ▪ Fulfills a variety of assigned tasks within a group or team structure, when individual role tasks or responsibilities are clearly defined. ▪ Explains own opinions and ideas to others within a team setting; listens to others' ideas and opinions; compares own opinions or ideas with others. ▪ Submits products that meet the specifications (quality, within a provided time frame) for the group tasks. ▪ Monitors individual progress in relation to an individual goal. **Critical Thinking and Problem Solving:** • Compares the results of an effective and ineffective solution to a problem. • Identifies basic errors in thinking or problem-solving process. **Creativity and Innovation:** • Perseveres in exploring ideas within a multi-step or labor-intensive process.	**Digital Citizenship:** • ET2.5.5 Discusses and demonstrates appropriate behavior for technology use and shows respect for technology equipment. **Technology Operations and Concepts:** • ET2.6.13 Transfers understanding of current symbols and icons to learning new technologies.