Scope and Sequence for Robotics: Grade 4

Programming and Building

Unit: Auto-Bots

Students use sensors and loops and if-then programming to give their EV3 robots the ability to respond to traffic lights and detect obstacles and create a self-driving zoo tour.

GRADE 4	LEARNER'S PERMIT	OPERATOR'S LICENSE	MISSION POINTS	ROBOTICS ENGINEER
Auto-Bots!	**Programming concepts:** • The EV3 brick and EV3 software use tabs for organizing programs and functions. • Programs are organized in "project" files. • The display and sound commands access image and sound files. • The "move steer" command is the best choice for moving frontwards and backwards in a straight line. • Negative power reverses direction. • Distance can be measured in seconds or rotations. • The distance the robot goes in seconds is different at every speed. • The distance the robot goes in rotations is the same at every speed. **Tasks to complete:** • Multi-step programs with image display, sounds, and timed motion.	**Programming concepts:** • "Wait for sensor" commands (color, touch and ultrasonic) can be used to initiate or terminate actions. • The move command is set for "on" and "off" with sensors. • The "move tank" command allows different power level settings for each motor. • Turning the wheels in opposite directions at the same speed makes the sharpest spin turn. • A 90° spin turn takes .55 rotations. **Building:** • The color sensor can swivel into a forward facing position to detect color in front of the robot. • A wide touch sensor bumper helps with alignment. **Tasks to complete:** • Programs with sensor navigation and response.	**Programming concepts:** • The "if then" or "switch" command gives the robot the ability to respond to the unexpected for collision avoidance and line tracking. • Complex programming tasks are planned, tested and debugged one step at a time. • Long programs can be broken into smaller lines of code for easier viewing. **Tasks to complete:** • Programs with obstacle detection and response.	**Independent programming and engineering challenges:** • Design a self-guided zoo tour with sound and stops for animal viewing and obstacle avoidance.

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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 4	MATHEMATICS	SCIENCE	DEEP LEARNING PROFICIENCIES	EDUCATIONAL TECHNOLOGY
Auto-Bots!	**Number and Operations – Fractions:** • 4.NF.6. Use decimal notation for fractions with denominators 10 or 100. For example, rewrite 0.62 as 62/100; describe a length as 0.62 meters; locate 0.62 on a number line diagram. • 4.NF.7. Compare two decimals to hundredths by reasoning about their size. **Measurement and Data:** • 4.MD.1. Know relative sizes of measurement units within one system of units. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. • 4.MD.5. Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement. **Mathematical Practices:** • 4.MP.1. Make sense of problems and persevere in solving them. • 4.MP.5. Use appropriate tools strategically. • 4.MP.6. Attend to precision.	**Interaction of Science and Society:** • SC4.2.1 Describes how diverse people and/or cultures, past and present, have made important contributions to scientific innovation. • SC4.2.2 Describes science-related career opportunities. • SC4.2.3 Describes the benefits and risks of science and technology on the lives of people. **Physical Science - Interactions of Matter:** • SC4.8.1 Explains that electricity flowing in circuits can produce light, heat, motion, sound, and magnetic effects.	**Collaboration:** ▪ Fulfills various basic roles and responsibilities in order to complete a task. ▪ Uses strategies to respectfully resolve conflicts with another team member. ▪ Completes individual action items to achieve the team goals. ▪ Submits products that meet the specifications for the group tasks. ▪ Acts upon feedback that suggests changes or revisions to work, based upon provided criteria for success. **Critical Thinking and Problem Solving:** • Uses established criteria to identify errors in the thinking or problem-solving process. **Creativity and Innovation:** • Integrates ideas from others with own ideas in order to address the problem or task. • Assesses the quality of the performance and creative process in response to feedback and/or established criteria.	**Technology Operations and Concepts:** • ET4.6.14 Transfers understanding of current input/output devices and symbols and icons to learning new technologies.