

STEM Week	I'd Like to be a Robotics Engineer	Biomedical Engineering
Topic	Robotic Assistants	
Learning Outcomes	By completing the robotic assistants activity, students will be able to write simple code for a robot to assist maneuvering around a space and responding to inputs.	
ISTE Student Standards	<p>1.4 Innovative Designer - Students use a variety of technologies within a design process to identify and solve problems by creating new, useful, or imaginative solutions</p> <p>1.4a Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems.</p> <p>1.4b Students select and use digital tools to plan and manage a design process that considers design constraints and calculated risks.</p> <p>1.4c Students develop, test and refine prototypes as part of a cyclical design process.</p> <p>1.4d Students exhibit a tolerance for ambiguity, perseverance and the capacity to work with open-ended problems.</p> <p>1.5 Computational Thinker - Students develop and employ strategies for understanding and solving problems in ways that leverage the power of technological methods to develop and test solutions.</p> <p>1.5a Students formulate problem definitions suited for technology-assisted methods such as data analysis, abstract models, and algorithmic thinking in exploring and finding solutions.</p> <p>1.5c Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving.</p> <p>1.5d Students understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions.</p>	
MA STE Frameworks	<p>The Science and Engineering Practices</p> <ol style="list-style-type: none"> 1. Asking questions and defining problems 2. Developing and using models 3. Planning and carrying out investigations 4. Analyzing and interpreting data 5. Using mathematical and computational thinking 6. Constructing explanation and designing solutions 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information <p>ETS1. Engineering Design</p> <p>4.3-5-ETS1-3. Plan and carry out tests of one or more design features of a given model or prototype in which variables are controlled and failure points are considered to identify which features need to be improved. Apply the results of the</p>	

	<p>tests to redesign a model or prototype.</p> <p>4.3-5-ETS1-5(MA) Evaluate relevant design features that must be considered in building a model or prototype of a solution to a given design problem.</p> <p>6.MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution. Include potential impacts on people and the natural environment that may limit possible solutions.</p> <p>6.MS-ETS1-5(MA) Create visual representations of solutions to a design problem. Accurately interpret and apply scale and proportion to visual representations.</p> <p>6.MS-ETS1-6(MA). Communicate a design solution to an intended user, including design features and limitations of the solution.</p> <p>7.MS-ETS1-2. Evaluate competing solutions to a given design problem using a decision matrix to determine how well each meets the criteria and constraints of the problem. Use a model of each solution to evaluate how variations in one or more design features, including size, shape, weight, or cost, may affect the function or effectiveness of the solution.</p> <p>7.MS-ETS1-4. Generate and analyze data from interactive testing and modifications of a proposed object, tool, or process to optimize the object, tool, or process for its intended purpose.</p> <p>7.MS-ETS1-7(MA) Construct a prototype of a solution to a given design problem.</p>
Targeted Academic Language (vocabulary)	<p>artificial intelligence (AI) - the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings</p> <p>Robot - any automatically operated machine that replaces human effort, though it may not resemble human beings in appearance or perform functions in a humanlike manner.</p> <p>Coding or programming - involves writing instructions to communicate with machines</p>
Materials	<p>Paper</p> <p>Pencil</p> <p>Chromebook</p> <p>Root Robot (optional)</p>
Resources	<p>Root Robot coding app</p> <p>Design Sheet</p>

Essential Question	How do we use coding to automate robotic tasks?
Pre Guiding Questions	<p>What is a robot?</p> <p>How do we communicate with robots?</p> <p>What can robots do? What can they be used for?</p> <p>What can't robots do?</p> <p>Could robots someday be used as assistive technology?</p>
Instructional Procedure	<p>Introduction (10 minutes)</p> <ul style="list-style-type: none"> Begin the lesson by having a class discussion using the Pre-Guiding

	<p>questions. No correct answers are needed at this time - students should simply be sharing their current knowledge. Questions will be answered throughout the lesson.</p> <ul style="list-style-type: none"> ● Use the to introduce students <p>Lesson Development (75 minutes)</p> <ul style="list-style-type: none"> ● Students should be given the opportunity to explore coding on https://code.irobot.com/#/. They can opt to use block coding or text coding based on their level of coding experience. ● If you have access to Root robots, students can work with those. If not, the simulation on the iRobot site will work well too. ● You can either give the students a predetermined maze for the robot to maneuver through or allow the students some creative freedom. ● Students should focus on having the robot not only move along a certain path but respond to inputs. Example, if the robot drives over a red line it turns around and goes the opposite directions, but if it drives over a green line it makes a sound and continues forward. ● The possibilities for what they can code are endless so encourage them to try something simple to get the hang of it and then increase the difficulty of the task. They might start with a small maze and then progress to an obstacle course through the classroom. <p>Wrap Up/Closing (20 minutes)</p> <ul style="list-style-type: none"> ● Have students discuss the possible applications of using robots to assist humans with various disabilities from physical disabilities to learning disabilities.
Assessment	Final draft of code
Accommodations/ Differentiation	<ul style="list-style-type: none"> ● Read-aloud ● Scribing ● Peer support ● Google Translate
Reflection/Next Steps	<p>How will you know if the students retained any of the information presented today? Were the students engaged? If not, what could you do differently next session? If they were engaged, what specific parts of today's lesson worked well? Did you provide enough differentiation so that all students were able to work at their I</p>
Instructional Tips/ Strategies	<p>Do the activity yourself, before trying it with students. Keep the supplies organized throughout the activity Provide students with time checks throughout the activity</p>
Notes	