Unit 2 - Robotics

Content Area: **Template**
Course(s):
Time Period: **Full Year**
Length: **Full Year**
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Unit Overview

Students will be utilizing elementary coding to program robots to follow a series of algorithms and commands. The robots can be programmed using a computer, remote, or color-coded sequences created on paper. Students will develop sequential thinking, problem solving, fundamentals of coding, and ways to debug issues. Students will be using the robots through a series of lessons and cross curricular lessons to complete real problem-solving tasks.

Enduring Understandings

Students will gain an understanding of the ways robots are used to assist in everyday tasks.
Building background about jobs and tasks robots can complete.
Ways to format and construct code to program an object or computer to complete a specific task.
Designing specific code using color coded sequence.
Developing code using a computer program to program a robot to complete an authentic performance task.
Understand the technical components of how an Ozobot works and completes tasks.
Overcoming errors and debugging issues within a student constructed code.
Using mathematical reasoning to develop sequential thinking.

Essential Questions

In what jobs do robots assist?
What are some tasks robots can complete?
How do you care for special equipment like robots?
What are the ways we can program robots to follow commands?
Did your bot correctly follow their line and commands? Did they follow their code? Why or why not?
What is the most difficult part of getting Ozobot to follow the lines?
What is the difference between a symmetric and asymmetric color code?
What is the purpose of a color code?
How does Ozobot tell you the color it sees?
How would you help a classmate with programming an Ozobot?
What are ways you can debug errors in your codes?

Learning Objectives

Be able to learn how to care for and maintain technical equipment.
Build conceptual foundation for a variety of programming languages.

Be able to understand coding concepts like sequential thinking, syntax, and debugging.
Be able to create screen free coding programs for a robot.
Be able to have a robot follow a series of commands utilizing patterns and sequential thinking.
Utilize basic robotics to develop mathematical reasoning and language skills.
Use creativity to develop a variety of coding patterns.
Use Ozobots to solve a variety of problems and develop critical thinking.
Be able to see how coding and programming works firsthand.
Discover sequential coding by deconstructing the robot's actions compared to the written program.
Create a maze and code an algorithm to enable Botley to successfully navigate the maze.

Standards: Content

9.4.2.CI	Creativity and Innovation
9.1.2.CAP	Career Awareness and Planning
CS	Computing Systems
	Gathering and evaluating knowledge and information from a variety of sources, including global perspectives, fosters creativity and innovative thinking.
	Individuals use computing devices to perform a variety of tasks accurately and quickly. Computing devices interpret and follow the instructions they are given literally.
	Different types of jobs require different knowledge and skills.
	Brainstorming can create new, innovative ideas.
9.4.2.CI.1	Demonstrate openness to new ideas and perspectives (e.g., 1.1.2.CR1a, 2.1.2.EH.1, 6.1.2.CivicsCM.2).
8.1.2.CS.1	Select and operate computing devices that perform a variety of tasks accurately and quickly based on user needs and preferences.
9.1.2.CAP.1	Make a list of different types of jobs and describe the skills associated with each job.
	A computing system is composed of software and hardware.
	Income is received from work in different ways including regular payments, tips, commissions, and benefits.
9.4.2.CI.2	Demonstrate originality and inventiveness in work (e.g., 1.3A.2CR1a).
9.4.2.CT	Critical Thinking and Problem-solving
8.1.2.CS.2	Explain the functions of common software and hardware components of computing systems.
9.1.2.CAP.2	Explain why employers are willing to pay individuals to work.
	Describing a problem is the first step toward finding a solution when computing systems do not work as expected.
	There are benefits and drawbacks to being an entrepreneur.
8.1.2.CS.3	Describe basic hardware and software problems using accurate terminology.
9.1.2.CAP.3	Define entrepreneurship and social entrepreneurship.
9.4.2.CT.1	Gather information about an issue, such as climate change, and collaboratively brainstorm ways to solve the problem (e.g., K-2-ETS1-1, 6.3.2.GeoGI.2).
	Multiple solutions often exist to solve a problem.

9.1.2.CAP.4	List the potential rewards and risks to starting a business.
NI	Networks and the Internet
9.4.2.CT.2	Identify possible approaches and resources to execute a plan (e.g., 1.2.2.CR1b, 8.2.2.ED.3).
9.4.2.CT.3	Use a variety of types of thinking to solve problems (e.g., inductive, deductive).
	Computer networks can be used to connect individuals to other individuals, places, information, and ideas. The Internet enables individuals to connect with others worldwide.
8.1.2.NI.1	Model and describe how individuals use computers to connect to other individuals, places, information, and ideas through a network.
	An essential aspect of problem solving is being able to self-reflect on why possible solutions for solving problems were or were not successful.
	Digital artifacts can be owned by individuals or organizations.
8.1.2.NI.2	Describe how the Internet enables individuals to connect with others worldwide.
	Connecting devices to a network or the Internet provides great benefits, but care must be taken to use authentication measures, such as strong passwords, to protect devices and information from unauthorized access.
9.4.2.DC.1	Explain differences between ownership and sharing of information.
8.1.2.NI.3	Create a password that secures access to a device. Explain why it is important to create unique passwords that are not shared with others.
9.4.2.DC.2	Explain the importance of respecting digital content of others.
	Individuals should practice safe behaviors when using the Internet.
8.1.2.NI.4	Explain why access to devices need to be secured.
	Detailed examples exist to illustrate crediting others when incorporating their digital artifacts in one's own work.
9.4.2.DC.3	Explain how to be safe online and follow safe practices when using the internet (e.g., 8.1.2.NI.3, 8.1.2.NI.4).
	Computing technology has positively and negatively changed the way individuals live and work (e.g., entertainment, communication, productivity tools).
9.4.2.DC.4	Compare information that should be kept private to information that might be made public.
	An individual's digital footprint reflects the various actions an individual makes online, both positive and negative.
8.1.2.IC.1	Compare how individuals live and work before and after the implementation of new computing technology.
9.4.2.DC.5	Explain what a digital footprint is and how it is created.
	Digital communities allow for social interactions that can result in positive or negative outcomes.
	Individuals collect, use, and display data about individuals and the world around them.
8.1.2.DA.1	Collect and present data, including climate change data, in various visual formats.
9.4.2.DC.6	Identify respectful and responsible ways to communicate in digital environments.
	Young people can have a positive impact on the natural world in the fight against climate change.
	Computers store data that can be retrieved later. Data can be copied, stored in multiple locations, and retrieved.
9.4.2.DC.7	Describe actions peers can take to positively impact climate change (e.g., 6.3.2.CivicsPD.1).

8.1.2.DA.2	Store, copy, search, retrieve, modify, and delete data using a computing device.
	Data can be used to make predictions about the world.
	Individuals from different cultures may have different points of view and experiences.
8.1.2.DA.3	Identify and describe patterns in data visualizations.
9.4.2.GCA.1	Articulate the role of culture in everyday life by describing one's own culture and comparing it to the cultures of other individuals (e.g., 1.5.2.C2a, 7.1.NL.IPERS.5, 7.1.NL.IPERS.6).
8.1.2.DA.4	Make predictions based on data using charts or graphs.
	Individuals develop and follow directions as part of daily life. A sequence of steps can be expressed as an algorithm that a computer can process.
	Digital tools and media resources provide access to vast stores of information that can be searched.
8.1.2.AP.1	Model daily processes by creating and following algorithms to complete tasks.
9.4.2.IML.1	Identify a simple search term to find information in a search engine or digital resource.
	Real world information can be stored and manipulated in programs as data (e.g., numbers, words, colors, images).
	Digital tools can be used to display data in various ways.
8.1.2.AP.2	Model the way programs store and manipulate data by using numbers or other symbols to represent information.
9.4.2.IML.2	Represent data in a visual format to tell a story about the data (e.g., 2.MD.D.10).
	A variety of diverse sources, contexts, disciplines, and cultures provide valuable and necessary information that can be used for different purposes.
8.1.2.AP.3	Create programs with sequences and simple loops to accomplish tasks.
9.4.2.IML.3	Use a variety of sources including multimedia sources to find information about topics such as climate change, with guidance and support from adults (e.g., 6.3.2.GeoGI.2, 6.1.2.HistorySE.3, W.2.6, 1-LSI-2).
	Increases in the quantity of information available through electronic means have heightened the need to check sources for possible distortion, exaggeration, or misrepresentation.
	Information is shared or conveyed in a variety of formats and sources.
	Complex tasks can be broken down into simpler instructions, some of which can be broken down even further.
8.1.2.AP.4	Break down a task into a sequence of steps.
9.4.2.IML.4	Compare and contrast the way information is shared in a variety of contexts (e.g., social, academic, athletic) (e.g., 2.2.2.MSC.5, RL.2.9).
	People work together to develop programs for a purpose, such as expressing ideas or addressing problems. The development of a program involves identifying a sequence of events, goals, and expected outcomes, and addressing errors (when necessary).
	Digital tools make it possible to analyze and interpret data, including text, images, and sound. These tools allow for broad concepts and data to be more effectively communicated.
	Digital tools have a purpose.
8.1.2.AP.5	Describe a program's sequence of events, goals, and expected outcomes.
8.1.2.AP.6	Debug errors in an algorithm or program that includes sequences and simple loops.
9.4.2.TL.1	Identify the basic features of a digital tool and explain the purpose of the tool (e.g.,

	8.2.2.ED.1).
ED	Engineering Design
9.4.2.TL.2	Create a document using a word processing application.
	The mode of information can convey a message to consumers or an audience.
	Engineering design is a creative process for meeting human needs or wants that can result in multiple solutions.
9.4.2.TL.3	Enter information into a spreadsheet and sort the information.
8.2.2.ED.1	Communicate the function of a product or device.
9.4.2.TL.4	Navigate a virtual space to build context and describe the visual content.
9.4.2.TL.5	Describe the difference between real and virtual experiences.
8.2.2.ED.2	Collaborate to solve a simple problem, or to illustrate how to build a product using the design process.
	Sources of information are evaluated for accuracy and relevance when considering the use of information.
9.4.2.TL.6	Illustrate and communicate ideas and stories using multiple digital tools (e.g., SL.2.5.).
8.2.2.ED.3	Select and use appropriate tools and materials to build a product using the design process.
	Collaboration can simplify the work an individual has to do and sometimes produce a better product.
	Limitations (constraints) must be considered when engineering designs.
9.4.2.TL.7	Describe the benefits of collaborating with others to complete digital tasks or develop digital artifacts (e.g., W.2.6., 8.2.2.ED.2).
8.2.2.ED.4	Identify constraints and their role in the engineering design process.
	Human needs and desires determine which new tools are developed.
8.2.2.ITH.1	Identify products that are designed to meet human wants or needs.
8.2.2.ITH.2	Explain the purpose of a product and its value.
	Technology has changed the way people live and work. Various tools can improve daily tasks and quality of life.
8.2.2.ITH.3	Identify how technology impacts or improves life.
8.2.2.ITH.4	Identify how various tools reduce work and improve daily tasks.
8.2.2.ITH.5	Design a solution to a problem affecting the community in a collaborative team and explain the intended impact of the solution.
	Innovation and the improvement of existing technology involves creative thinking.
8.2.2.NT.1	Model and explain how a product works after taking it apart, identifying the relationship of each part, and putting it back together.
8.2.2.NT.2	Brainstorm how to build a product, improve a designed product, fix a product that has stopped working, or solve a simple problem.
	The use of technology developed for the human designed world can affect the environment, including land, water, air, plants, and animals. Technologies that use natural sources can have negative effects on the environment, its quality, and inhabitants. Reusing and recycling materials can save money while preserving natural resources and avoiding damage to the environment.
8.2.2.ETW.1	Classify products as resulting from nature or produced as a result of technology.
8.2.2.ETW.2	Identify the natural resources needed to create a product.
8.2.2.ETW.3	Describe or model the system used for recycling technology.

8.2.2.ETW.4	Explain how the disposal of or reusing a product affects the local and global environment.
	The availability of technology for essential tasks varies in different parts of the world.
8.2.2.EC.1	Identify and compare technology used in different schools, communities, regions, and parts of the world.

Standards: Interdisciplinary

2.OA	Operations and Algebraic Thinking
K-2-ETS1	Engineering Design
K-2-ETS1-1	Ask questions, make observations, and gather information about a situation people want to change (e.g., climate change) to define a simple problem that can be solved through the development of a new or improved object or tool.
2.OA.A	Represent and solve problems involving addition and subtraction
K.CC.A	Know number names and the count sequence
2.OA.A.1	Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.
K.CC.A.1	Count to 100 by ones and by tens.
K.CC.A.2	Count forward beginning from a given number within the known sequence (instead of having to begin at 1).
K.CC.B	Count to tell the number of objects
ETS1.A	Defining and Delimiting Engineering Problems
K.CC.B.4	Understand the relationship between numbers and quantities; connect counting to cardinality.
K.CC.B.4.a	When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object.
K-2-ETS1-2	Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.
ETS1.B	Developing Possible Solutions
K-2-ETS1-3	Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.
ETS1.C	Optimizing the Design Solution
K.G	Geometry
K.G.A	Identify and describe shapes (squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres)
K.G.A.1	Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as above, below, beside, in front of, behind, and next to.
K.G.B	Analyze, compare, create, and compose shapes
K.G.B.6	Compose simple shapes to form larger shapes.
1.G.A	Reason with shapes and their attributes
1.G.A.1	Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus

	non-defining attributes (e.g., color, orientation, overall size); build and draw shapes to possess defining attributes.
1.G.A.2	Compose two-dimensional shapes (rectangles, squares, trapezoids, triangles, half-circles, and quarter-circles) or three-dimensional shapes (cubes, right rectangular prisms, right circular cones, and right circular cylinders) to create a composite shape, and compose new shapes from the composite shape.
SL.PE.1.1	Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups.
SL.PE.1.1.A	Follow agreed-upon norms for discussions (e.g., listening to others with care, speaking one at a time about the topics and texts under discussion).
SL.PE.K.1	Participate in collaborative conversations with diverse partners about kindergarten topics and texts with peers and adults in small and larger groups.
SL.PE.K.1.A	Follow agreed-upon norms for discussions (e.g., listening to others with care and taking turns speaking about the topics and texts under discussion).
SL.II.K.2	Confirm understanding of a text read aloud or information presented orally or through other media by asking and answering questions about key details and requesting clarification if something is not understood.
SL.PE.2.1	Participate in collaborative conversations with diverse partners about grade 2 topics and texts with peers and adults in small and larger groups.
SL.AS.2.6	Produce complete sentences when appropriate to task and situation in order to provide requested detail or clarification.

Assessment Evidence

Formative	Collaborative Activities, Classwork, Discussion, Independent Class Assignment, Informal Observations of Students, Self-Assessments, Exit Tickets, Ozobot Edu Performance Tasks, OzoBlockly Challenges, Student Self-Assessment, Group Performance Challenges, Troubleshooting, Student Debugging, Group Discussions
Summative	Pre-Assessments, Written Responses, Projects
Alternative & Benchmark	Alternative – Project Based Learning, Graphic Organizers, Student Portfolio, assessment of oral responses Benchmark – Teacher generated project or assessment, Tests, Student portfolio/project
Assessment Evidence Resource	

Instructional Resources

Smartboard, Computers, iPads, websites and digital interactives/models, multi-media presentations, video streaming, Brain Pop, Microsoft 365, Ozobots, Ozobot Coding Reference Sheet, Code.Org tools, USB Charging Ports, Ozobot Color Code Chart, OzoBlocky Program, Botley, Botley classroom resource materials
Instructional Resource List

Curricular Mandates

Below are the curricular requirements as defined in NJ Administrative Code and Statute

	Amistad		Diversity, Equity, and Inclusion
	Holocaust		LGBT and Disabilities (Grades 6-12)
	Climate Change		Asian American & Pacific Islander

Social Emotional Learning (SEL) Competencies

NJ Social and Emotional Learning Competencies & Sub-Competencies

X	Self-Awareness	X	Relationship Skills
X	Responsible Decision-Making		Social Awareness
X	Self-Management		

21st Century Skills & Themes

X	Global and Cultural Awareness	X	Technology Literacy		Planning and Budgeting
X	Creativity and Innovation		Financial Institutions		Risk Management and Insurance
	Information and Media Literacy		Digital Citizenship		Economic and Government Influences
X	Critical Thinking and Problem Solving		Credit Profile		Career Awareness and Planning
	Civic Financial Responsibility		Financial Psychology		