Unit 1 - STEAM is All Around Us: Coding and Robotics

Content Area: **Template**
Course(s):
Time Period: **Full Year**
Length: **Full Year**
Status: **Published**

Unit Overview

This unit will be reviewing and discussing coding and how it relates to mathematics. Students will be learning coding commands such as looping, events, sequencing, and elementary binary code. Students will be expanding on their knowledge of algorithms, nested loops, while loops, conditionals, elementary functions, and events as coding techniques. Students will be relating coding to introductory robotics as an application of coding. In addition, students will be expanding on their creativity, critical thinking, problem solving skills, and collaborative skills

Enduring Understandings

Students will learn fundamentals of interpreting and reading code.
Understanding ways to predict outcomes based on writing and reading coded instructions.
Identifying problems and overcoming mistakes by building persistence.
Discussing and relating ways coding and robotics are used throughout our everyday world.
Understanding the correlate between robotics and coding.
Being able to construct written code giving commands for robots to perform a task.
Student discussing and collaborating on a well-detailed plan to solve a problem using coding.
Discuss the importance of digital citizenship and the impact of a digital footprint

Essential Questions

How do you read code?
How can you predict outcomes from reading code?
What is ways code makes simple choices?
What are ways coding is used in our everyday world?
What is the importance of working together when developing code?
Why is it important to reflect on past mistakes?
How can system limitations affect project design?
What are reasons for having a well-detailed plan?
What is the importance of digital citizenship?

Learning Objectives

Develop an understanding of coding techniques such as building coding algorithms and functions, loops, and creating events.

Relating coding to real world applications.
Utilize coding to channel creativity to a variety of performance tasks relating to the arts.
Investigate different problem-solving techniques and overcome different tasks using their problem-solving skills.
Be able to investigation and use critical thinking skills to program a variety of materials.
Discuss the importance of persistence when coding and developing innovative ideas.
Be able to read coding programs and build connections.
Be able to predict outcomes of a variety of prewritten and student develop programs.
Understand there are many ways to solve problems.
Be able to reflect on past problems to guide them through new problems.
Understand the importance collaboration and communication plays in developing programs with coding and robotics.
Develop programs that respond to timed events
Develop programs that respond to user input.
Create animations with code.
Explain how system limitations can affect project design.
Describe how compromise can help keep a project on track and inspire creativity.
Draft and implement plans to resolve any issues in their code.
Articulate the design process and how it helped shape the finished culminating project.
Use Ozobots to solve a variety of problems and develop critical thinking

Standards: Content

9.4.2.CI	Creativity and Innovation
9.2.5.CAP	Career Awareness and Planning
CS	Computing Systems
	Computing devices may be connected to other devices to form a system as a way to extend their capabilities.
	An individual's passions, aptitude and skills can affect his/her employment and earning potential.
	Brainstorming can create new, innovative ideas.
9.2.5.CAP.1	Evaluate personal likes and dislikes and identify careers that might be suited to personal likes.
8.1.5.CS.1	Model how computing devices connect to other components to form a system.
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).
	Software and hardware work together as a system to accomplish tasks (e.g., sending, receiving, processing, and storing units of information).
9.2.5.CAP.2	Identify how you might like to earn an income.
9.4.2.CI.2	Demonstrate originality and inventiveness in work (e.g., 1.3A.2CR1a).
8.1.5.CS.2	Model how computer software and hardware work together as a system to accomplish tasks.
9.2.5.CAP.3	Identify qualifications needed to pursue traditional and non-traditional careers and occupations.
9.4.2.CT	Critical Thinking and Problem-solving

	Shared features allow for common troubleshooting strategies that can be effective for many systems.
9.2.5.CAP.4	Explain the reasons why some jobs and careers require specific training, skills, and certification (e.g., life guards, child care, medicine, education) and examples of these requirements.
	Critical thinkers must first identify a problem then develop a plan to address it to effectively solve the problem.
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).
	Income and benefits can vary depending on the employer and type of job or career.
8.1.5.CS.3	Identify potential solutions for simple hardware and software problems using common troubleshooting strategies.
NI	Networks and the Internet
9.2.5.CAP.5	Identify various employee benefits, including income, medical, vacation time, and lifestyle benefits provided by different types of jobs and careers.
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).
	Information needs a physical or wireless path to travel to be sent and received.
	There are a variety of factors to consider before starting a business.
9.2.5.CAP.6	Compare the characteristics of a successful entrepreneur with the traits of successful employees.
8.1.5.NI.1	Develop models that successfully transmit and receive information using both wired and wireless methods.
9.4.2.DC	Digital Citizenship
	Digital artifacts can be owned by individuals or organizations.
	Distinguishing between public and private information is important for safe and secure online interactions. Information can be protected using various security measures (i.e., physical and digital).
9.2.5.CAP.7	Identify factors to consider before starting a business.
9.4.2.DC.1	Explain differences between ownership and sharing of information.
8.1.5.NI.2	Describe physical and digital security measures for protecting sensitive personal information.
	Individuals can choose to accept inevitable risk or take steps to protect themselves by avoiding or reducing risk.
IC	Impacts of Computing
9.2.5.CAP.8	Identify risks that individuals and households face.
9.4.2.DC.2	Explain the importance of respecting digital content of others.
9.2.5.CAP.9	Justify reasons to have insurance.
	The development and modification of computing technology is driven by individual's needs and wants and can affect individuals differently.
	Individuals should practice safe behaviors when using the Internet.
8.1.5.IC.1	Identify computing technologies that have impacted how individuals live and work and describe the factors that influenced the changes.
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).

9.4.2.DC.4	Compare information that should be kept private to information that might be made public.
8.1.5.IC.2	Identify possible ways to improve the accessibility and usability of computing technologies to address the diverse needs and wants of users.
	An individual's digital footprint reflects the various actions an individual makes online, both positive and negative.
DA	Data & Analysis
	Data can be organized, displayed, and presented to highlight relationships.
9.4.2.DC.5	Explain what a digital footprint is and how it is created.
8.1.5.DA.1	Collect, organize, and display data in order to highlight relationships or support a claim.
	Digital communities allow for social interactions that can result in positive or negative outcomes.
9.4.2.DC.6	Identify respectful and responsible ways to communicate in digital environments.
	The type of data being stored affects the storage requirements.
8.1.5.DA.2	Compare the amount of storage space required for different types of data.
	Young people can have a positive impact on the natural world in the fight against climate change.
	Individuals can select, organize, and transform data into different visual representations and communicate insights gained from the data.
9.4.2.DC.7	Describe actions peers can take to positively impact climate change (e.g., 6.3.2.CivicsPD.1).
9.4.2.GCA	Global and Cultural Awareness
8.1.5.DA.3	Organize and present collected data visually to communicate insights gained from different views of the data.
8.1.5.DA.4	Organize and present climate change data visually to highlight relationships or support a claim.
	Individuals from different cultures may have different points of view and experiences.
	Many factors influence the accuracy of inferences and predictions.
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).
9.4.2.IML	Information and Media Literacy
8.1.5.DA.5	Propose cause and effect relationships, predict outcomes, or communicate ideas using data.
AP	Algorithms & Programming
	Digital tools and media resources provide access to vast stores of information that can be searched.
9.4.2.IML.1	Identify a simple search term to find information in a search engine or digital resource.
	Different algorithms can achieve the same result. Some algorithms are more appropriate for a specific use than others.
8.1.5.AP.1	Compare and refine multiple algorithms for the same task and determine which is the most appropriate.
	Digital tools can be used to display data in various ways.
	Programming languages provide variables, which are used to store and modify data.
9.4.2.IML.2	Represent data in a visual format to tell a story about the data (e.g., 2.MD.D.10).

8.1.5.AP.2	Create programs that use clearly named variables to store and modify data.
	A variety of diverse sources, contexts, disciplines, and cultures provide valuable and necessary information that can be used for different purposes.
	A variety of control structures are used to change the flow of program execution (e.g., sequences, events, loops, conditionals).
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).
8.1.5.AP.3	Create programs that include sequences, events, loops, and conditionals.
	Information is shared or conveyed in a variety of formats and sources.
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).
	Programs can be broken down into smaller parts to facilitate their design, implementation, and review. Programs can also be created by incorporating smaller portions of programs that already exist.
9.4.2.TL	Technology Literacy
8.1.5.AP.4	Break down problems into smaller, manageable sub-problems to facilitate program development.
	Digital tools have a purpose.
8.1.5.AP.5	Modify, remix, or incorporate pieces of existing programs into one's own work to add additional features or create a new program.
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).
	Individuals develop programs using an iterative process involving design, implementation, testing, and review.
8.1.5.AP.6	Develop programs using an iterative process, implement the program design, and test the program to ensure it works as intended.
9.4.2.TL.2	Create a document using a word processing application.
ED	Engineering Design
9.4.2.TL.3	Enter information into a spreadsheet and sort the information.
9.4.2.TL.4	Navigate a virtual space to build context and describe the visual content.
	Engineering design is a systematic and creative process of communicating and collaborating to meet a design challenge. Often, several design solutions exist, each better in some way than the others.
8.2.5.ED.1	Explain the functions of a system and its subsystems.
9.4.2.TL.5	Describe the difference between real and virtual experiences.
9.4.2.TL.6	Illustrate and communicate ideas and stories using multiple digital tools (e.g., SL.2.5.).
8.2.5.ED.2	Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models.
	Collaboration can simplify the work an individual has to do and sometimes produce a better product.
8.2.5.ED.3	Follow step by step directions to assemble a product or solve a problem, using appropriate tools to accomplish the task.
	Engineering design requirements include desired features and limitations that need to be considered.

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).
8.2.5.ED.4	Explain factors that influence the development and function of products and systems (e.g., resources, criteria, desired features, constraints).
8.2.5.ED.5	Describe how specifications and limitations impact the engineering design process.
8.2.5.ED.6	Evaluate and test alternative solutions to a problem using the constraints and trade-offs identified in the design process.
ITH	Interaction of Technology and Humans
	Societal needs and wants determine which new tools are developed to address real-world problems.
8.2.5.ITH.1	Explain how societal needs and wants influence the development and function of a product and a system.
	A new tool may have favorable or unfavorable results as well as both positive and negative effects on society. Technology spurs new businesses and careers.
8.2.5.ITH.2	Evaluate how well a new tool has met its intended purpose and identify any shortcomings it might have.
8.2.5.ITH.3	Analyze the effectiveness of a new product or system and identify the positive and/or negative consequences resulting from its use.
8.2.5.ITH.4	Describe a technology/tool that has made the way people live easier or has led to a new business or career.
NT	Nature of Technology
	Technology innovation and improvement may be influenced by a variety of factors. Engineers create and modify technologies to meet people's needs and wants; scientists ask questions about the natural world.
8.2.5.NT.1	Troubleshoot a product that has stopped working and brainstorm ideas to correct the problem.
8.2.5.NT.2	Identify new technologies resulting from the demands, values, and interests of individuals, businesses, industries, and societies.
8.2.5.NT.3	Redesign an existing product for a different purpose in a collaborative team.
8.2.5.NT.4	Identify how improvement in the understanding of materials science impacts technologies.
	The technology developed for the human designed world can have unintended consequences for the environment. Technology must be continually developed and made more efficient to reduce the need for non-renewable resources.
8.2.5.ETW.1	Describe how resources such as material, energy, information, time, tools, people, and capital are used in products or systems.
8.2.5.ETW.2	Describe ways that various technologies are used to reduce improper use of resources.
8.2.5.ETW.3	Explain why human-designed systems, products, and environments need to be constantly monitored, maintained, and improved.
8.2.5.ETW.4	Explain the impact that resources, such as energy and materials used to develop technology, have on the environment.
8.2.5.ETW.5	Identify the impact of a specific technology on the environment and determine what can be done to increase positive effects and to reduce any negative effects, such as climate change.
EC	Ethics & Culture
	Technological choices and opportunities vary due to factors such as differences in economic resources, location, and cultural values.

8.2.5.EC.1	Analyze how technology has contributed to or reduced inequities in local and global communities and determine its short- and long-term effects.

Standards: Interdisciplinary

3-5-ETS1	Engineering Design
3-5-ETS1-1	Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
	Asking Questions and Defining Problems
	Asking questions and defining problems in 3–5 builds on K–2 experiences and progresses to specifying qualitative relationships.
	Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost.
ETS1.A	Defining and Delimiting Engineering Problems
	Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account.
	Influence of Engineering, Technology, and Science on Society and the Natural World
	People's needs and wants change over time, as do their demands for new and improved technologies.
3-5-ETS1-2	Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
	Constructing Explanations and Designing Solutions
	Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.
	Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design problem.
ETS1.B	Developing Possible Solutions
	Research on a problem, such as climate change, should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions.
	At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs.
	Influence of Engineering, Technology, and Science on Society and the Natural World
	Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands.
3-5-ETS1-3	Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.
	Planning and Carrying Out Investigations
L.KL.5.1	Use knowledge of language and its conventions when writing, speaking, reading, or listening.
	Planning and carrying out investigations to answer questions or test solutions to problems

	in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.
	Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered.
ETS1.B	Developing Possible Solutions
	Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved.
ETS1.C	Optimizing the Design Solution
L.VL.5.2	Determine or clarify the meaning of unknown and multiple-meaning academic and domain-specific words and phrases based on grade 5 reading and content, choosing flexibly from a range of strategies.
	Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints.
L.WF.3.3	Demonstrate command of the conventions of writing including those listed under grade two foundational skills.
L.VL.4.2	Determine or clarify the meaning of unknown and multiple-meaning academic and domain-specific words and phrases based on grade 4 reading and content, choosing flexibly from a range of strategies.
RI.CR.5.1	Quote accurately from an informational text when explaining what the text says explicitly and make relevant connections when drawing inferences from the text.
L.KL.3.1	Use knowledge of language and its conventions when writing, speaking, reading, or listening.
L.VL.3.2	Determine or clarify the meaning of unknown and multiple-meaning academic and domain-specific words and phrases based on grade 3 reading and content, choosing flexibly from a range of strategies.
RI.CR.4.1	Refer to details and examples as textual evidence when explaining what an informational text says explicitly and make relevant connections when drawing inferences from the text.
RI.CR.3.1	Ask and answer questions and make relevant connections to demonstrate understanding of an informational text, referring explicitly to textual evidence as the basis for the answers.
3.G	Geometry
5.G	Geometry
3.G.A	Reason with shapes and their attributes
5.G.A	Graph points on the coordinate plane to solve real-world and mathematical problems
3.G.A.1	Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.
4.G	Geometry
5.G.A.1	Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., □-axis and □-coordinate, □-axis and □-coordinate).

4.G.A	Draw and identify lines and angles, and classify shapes by properties of their lines and angles
5.G.B	Classify two-dimensional figures into categories based on their properties
4.G.A.3	Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.
W.WR.4.5	Conduct short research projects that use multiple reference sources (print and non-print) and build knowledge through investigation of different aspects of a topic.
W.RW.4.7	Write routinely over extended time frames (with time for research and revision) and shorter time frames (a single sitting) for a range of tasks, purposes, and audiences.
SL.PE.4.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 4 topics and texts, building on others' ideas and expressing their own clearly.
SL.PE.4.1.D	Review the key ideas expressed and explain their own ideas and understanding in light of the discussion.
W.RW.3.7	Engage in independent and task-based writing for both short and extended periods of time, producing written work routinely.
SL.AS.4.6	Differentiate between contexts that call for formal English (e.g., presenting ideas) and situations where informal discourse is appropriate (e.g., small-group discussion); use formal English when appropriate to task and situation.
SL.UM.3.5	Use multimedia to demonstrate fluid reading at an understandable pace; add visual displays when appropriate to emphasize or enhance certain facts or details.
SL.AS.3.6	Speak in complete sentences when appropriate to task and situation in order to provide requested detail or clarification.

Assessment Evidence

Formative	Collaborative Activities, Homework, Classwork, Discussion, Independent Class Assignment, Informal Observations of Students, Interactive Notebooks, Self-Assessments, Exit Tickets, Lego Building Tasks, Teacher Constructed Games, Student Pre-Planning, Group Self-Assessment, Code.Org Courses.
Summative	Tests, Pre-Assessments, Quizzes, Written Responses, Projects, Group Projects Code.org "Dance Party", Code.org 4th Grade Project, Ozobot Maze Creation, Group Work Projects, Makey Makey Coding Projects
Alternative & Benchmark	Alternative – Project Based Learning, Graphic Organizers, Student Portfolio, Orally assessed 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, Makey Makey STEM Pack, 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

	Self-Awareness		Relationship Skills
	Responsible Decision-Making		Social Awareness
	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	X	Career Awareness and Planning
	Civic Financial Responsibility		Financial Psychology		