Crest Memorial School Curriculum and Pacing Guide	
Grades: 3, 4 & 5	Subject Area: STEM - Computer Science & Design Thinking
Adoption Date:	Revision Date: February 16, 2024

Mission and Vision Statements

Mission: Computer science and design thinking education prepares students to succeed in today's knowledge-based economy by providing equitable and expanded access to high-quality, standards-based computer science and technological design education

Vision: All students have equitable access to a rigorous computer science and design thinking education. Students will benefit from opportunities to engage in high-quality technology programs that foster their ability to:

- develop and apply computational and design thinking to address real-world problems and design creative solutions;
- engage as collaborators, innovators, and entrepreneurs on a clear pathway to success through postsecondary education and careers;
- navigate the dynamic digital landscape to become healthy, productive, 21st century global-minded individuals; and
- participate in an inclusive and diverse computing culture that appreciates and incorporates perspectives from people of different genders, ethnicities, and abilities.

Integration of Technology

• 9.4.5.TL.1: Compare the common uses of at least two different digital tools and identify the advantages and disadvantages of using each.

• 9.4.5.TL.2: Sort and filter data in a spreadsheet to analyze findings.

• 9.4.5.TL.3: Format a document using a word processing application to enhance text, change page formatting, and include appropriate images, graphics, or symbols.

• 9.4.5.TL.4: Compare and contrast artifacts produced individually to those developed collaboratively.

• 9.4.5.TL.5: Collaborate digitally to produce an artifact.

21st Century Skills

• 9.4.5.CT.3: Describe how digital tools and technology may be used to solve problems.
• 9.4.5.CT.4: Apply critical thinking and problem-solving strategies to different types of problems such as personal, academic, community and global

• 9.4.5.DC.3: Distinguish between digital images that can be reused freely and those that have copyright restrictions.
• 9.4.5.DC.4: Model safe, legal, and ethical behavior when using online or offline technology (e.g., 8.1.5.NI.2).
• 9.4.5.DC.5: Identify the characteristics of a positive and negative online identity and the lasting implications of online activity.
• 9.4.5.DC.7: Explain how posting and commenting in social spaces can have positive or negative consequences.
• 9.4.5.DC.8: Propose ways local and global communities can engage digitally to participate in and promote climate action

Career Education

• 9.2.5.CAP.1: Evaluate personal likes and dislikes and identify careers that might be suited to personal likes.
• 9.2.5.CAP.3: Identify qualifications needed to pursue traditional and non-traditional careers and occupations.
• 9.2.5.CAP.4: Explain the reasons why some jobs and careers require specific training, skills, and certification and examples of these requirements.

Interdisciplinary Connection

Science - NJSLS
5-ESS3-1 Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources, environment, and address climate change issues.

(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.
• 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.
• 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.

Accommodations and Modifications	
Special Education	● Follow 504/IEP accommodations ● Ask yes/no questions ● Simplify task directions ● Provide oral and written directions ● Small group instruction ● Use of graphic organizers
English Language Learners	● Create visual word wall with labels ● Highlight and define important vocabulary ● Ask yes/no questions ● Assign a buddy ● Use of visual aids ● Group projects ● Use of translation dictionaries ● Provide a Word Bank ● Reduce amount of work required ● Provide hands-on activities and explanations ● Provide picture labels with both English and other language ● Allow extended time for project and test/quiz completion. ● Reduce multiple choices to two. ● Offer book choices written in native language
Students At-Risk of Failure	● Adjust time for completion ● Allow verbalization before writing ● Use audio materials when necessary ● Restate, reword, clarify directions ● Re-teach concepts using small groups ● Provide educational “breaks” as necessary ● Chunking content into “digestible bites” ● Shorten assignments to focus on mastery concept ● Consistent use of behavior management techniques. ● Assignment, Project, and Assessment Modification Based on Individual Student Needs
Gifted and Talented	● Student Choice ● Provide independent learning activities ● Mentor/teach other students ● Ask students higher level questions ● Provide opportunities for open-ended, self-directed activities, or offer higher-level learning opportunities ● Offer students opportunities to present their understanding of a topic in different ways

	● Assignment, Project, and Assessment Modification Based on Individual Student Needs
Students with 504 Plans	● Allow verbalization before writing ● Restate, reword, clarify directions ● Re-teach concepts using small groups ● Provide educational “breaks” as necessary ● Chunking content into “digestible bites” ● Shorten assignments to focus on mastery concept ● Reduced amount of work ● Preferential seating

Assessments	
Formative	● Planning/Design Page ● Lesson quick checks (Exit tickets) ● Teacher Observation & Questioning ● KWL Chart
Summative	● Oral Presentation ● End of unit test/reflection ● Google Classroom Slides ● Project Presentation
Benchmark	● End of project presentation ● Project Rubric
Alternative	● Performance Tasks ● Projects ● Choice Board

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- Ozobots

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Pacing Guide

Impacts of Technology on Ethics & Culture	2 Days
Engineering Design	10 Days
Biomimicry	4 Days
Algorithms & Programming	10 Days
Networks and the Internet	5 Days
Research Project	2 Days

Impacts of Technology on Ethics & Culture

Unit Learning Goals
Impacts of Technology on Ethics & Culture The development and modification of computing technology is driven by an individual's needs and wants and can affect individuals differently. Technological choices and opportunities vary due to factors such as differences in economic resources, location, and cultural values. Technological choices and opportunities vary due to factors such as differences in economic resources, location, and cultural values. 8.1.5.IC.1: Identify computing technologies that have impacted how individuals live and work and describe the factors that influenced the changes. 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. 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.

Core Instructional Materials	Supplemental Materials
● Chromebook ● Internet	● Google Slides ● Teacher made planning paper

Daily Targets	NJSLS Performance Expectations	Instructional Activities
Day 1 How does old vs. new technology affect our life (Good & Bad)?	8.1.5.IC.1: 8.1.5.IC.2: 8.2.5.EC.1:	4th & 5th Grade - Impacts of Technology Sort - Class discussion: think about a technology invention or innovation that has most impacted your life (good or bad) Google Slide - Independently, use the planning paper to research the technology invention focusing on how it has improved our way of life
Day 2 How has technology advanced?	8.1.5.IC.1: 8.1.5.IC.2: 8.2.5.EC.1:	- Independently, use the planning paper to continue researching a technology invention - Create a presentation with information from

		research focusing on the evolution of the technology choice - Student reflection questions: 1. Describe possible ways to improve the accessibility and usability of computing technologies to address the diverse needs and wants of users. 2. Think about how technology has helped or made things unfair for people in your community and around the world. Then, think about how it affects people now and in the future.

Inclusive concepts
● Students will work in groups or pairs to foster a sense of belonging, respect for others and responsibility. ● This teaches accountability for ensuring everyone feels included, helping students become thoughtful and inclusive community members. ● Encouraging responsibility for personal actions, promoting teamwork and collaboration, and respecting each person’s viewpoint.

Engineering Design

Unit Learning Goals	
Engineering Design "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." Engineering design requirements include desired features and limitations that need to be considered.	
8.2.5.ED.1: Explain the functions of a system and its subsystems. 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. 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. 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. 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. 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. 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.	**Hoop Glider** Students will design and test a hoop glider, identifying and explaining the functions of its system and subsystems. They will collaborate to evaluate and improve their designs based on performance data. **Bucket Tower** Students will apply the engineering design process to construct a bucket tower that can hold the maximum number of items, and evaluate the stability and capacity of their designs through testing. **Franken Bridge** Students will design and construct a bridge using popsicle sticks and clothespins, ensuring it meets specified height and load requirements. They will evaluate the bridge's performance, considering constraints and trade-offs in the engineering design process. **Shady Structure** (Climate Change) Students will design and construct a model of a shady structure to keep a toy penguin cool, using knowledge of system functions and material properties. They will evaluate their designs based on criteria such as effectiveness, resource use, and adherence to constraints. **Basketball Hoop** Students will design and construct a model basketball net system that returns the ball, demonstrating understanding of system functions and subsystems. They will evaluate and refine their designs based on constraints and trade-offs, using sketches or models to support their solutions. **Boat Float** Students will design and construct a boat using given materials that

	successfully floats and supports an increasing number of pennies without sinking. **Lego Wind Car** Students will design and construct a functional lego car powered by a paper sail, demonstrating understanding of system functions and subsystems. They will evaluate and optimize their designs by testing different sail shapes and sizes, considering constraints and trade-offs.

Core Instructional Materials	Supplemental Materials
● Chromebook ● Internet	● Building/Crafting Supplies ● Google Slides

Hoop Glider Design Lab

By the end of this lesson, students will be able to build a hoop glider, explain how it works, and make it fly farther by improving the design.

Daily Targets	NJSLS Performance Expectations	Instructional Activities
Day 1 Define the Engineering Design Process. Students will design and test a hoop glider, identifying and explaining the functions of its system and subsystems. They will collaborate to evaluate and improve their designs based on performance data.	8.2.5.ED.1 8.2.5.ED.2 8.2.5.ED.3 8.2.5.ED.4 8.2.5.ED.5 8.2.5.ED.6 3-5-ETS1-1 3-5-ETS1-2 3-5-ETS1-3	- Warm-up: Ask students to brainstorm what they notice about a simple paper airplane Systems and Subsystems: - Describe how the glider consists of a straw (body) and two paper hoops (wings). Discuss how each part contributes to the glider's flight. Engineering Design Process Overview: - Introduce the engineering design process: Ask, Imagine, Plan, Create, Test, and Improve. - Students follow the design process to build, test & improve hoop gliders Closing Reflection Questions: 1. What is one change you made to your hoop glider to improve its flight?

		2. How did the subsystems of your hoop glider work together to help it fly?

Bucket Tower Design Lab

By the end of this project, students will be able to design and build a tower with buckets that can hold as many items as possible and test to see how well my tower works.

Daily Targets	NJSLS Performance Expectations	Instructional Activities
Day 1 - Identify the problem and brainstorm potential solutions for building a bucket tower - Develop a plan and begin constructing the bucket tower - Conduct tests to evaluate the effectiveness of the bucket tower holding the most items - Analyze the results and refine the design to enhance performance	8.2.5.ED.1 8.2.5.ED.2 8.2.5.ED.3 8.2.5.ED.4 8.2.5.ED.5 8.2.5.ED.6 3-5-ETS1-1 3-5-ETS1-2 3-5-ETS1-3	- Each grade level has a different budget for supplies and level of constraints for the project. Look at some examples and examine what students think would work well and what they would improve on. - Students follow the design process to plan, build, test & reflect on their bucket towers. - *Build:* Students gather their materials and start constructing a bucket tower. Help students focus on what specific parts of their design are working or not working. - *Test:* Students measure how far off the table their tower is, then count how many objects their bucket can hold. - *Redesign or Improve* If their design did not work, they get a chance to improve their project. Ask, what didn't work, how could they make it longer, wider, etc. If students are successful, ask them to critically assess which aspects of their solution could be improved. - *Reflection* It is helpful for the students to reflect on their experience once the activity is over. Questions to ask could include: What went well? What didn't work? What would you do differently next time? Students answer reflection questions online, then we review as a class.

Franken Bridge Design Lab

By the end of this lesson, students will be able to build a bridge with popsicle sticks and clothespins that holds a block and is taller than two inches, and explain how they made it work.

Daily Targets	NJSLS Performance Expectations	Instructional Activities
Day 1 Students will design and construct a bridge using popsicle sticks and clothespins, ensuring it meets specified height and load requirements. They will evaluate the bridge's performance, considering constraints and trade-offs in the engineering design process.	8.2.5.ED.1 8.2.5.ED.2 8.2.5.ED.3 8.2.5.ED.4 8.2.5.ED.5 8.2.5.ED.6 3-5-ETS1-1 3-5-ETS1-2 3-5-ETS1-3	- Warm-up: Ask students to brainstorm what they notice about a simple bridge made from popsicle sticks and clothespins. Systems and Subsystems: - Explain the concept of systems and subsystems using a real-world example. Relate this to the bridge project, identifying the bridge as a system with subsystems like the deck, supports, and joints. - *Build:* Instruct students to construct their bridge using popsicle sticks and clothespins. Remind them to follow their revised designs and ensure the bridge is taller than two inches. - *Test:* Have students test their bridges by placing a block on top. Observe if the bridge holds the block without collapsing. - *Redesign or Improve* If their design did not work, they get a chance to improve their project. Ask, what didn't work, how could they make it longer, wider, etc. If students are successful, ask them to critically assess which aspects of their solution could be improved. - *Reflection:* Ask students to evaluate their bridge's performance. Encourage them to consider what worked well and what could be improved. 1. How did the subsystems of your bridge contribute to its overall function? 2. What was one trade-off you made in your bridge design, and why?

Shady Structure Design Lab

By the end of this lesson, students will be able to create a model of a shady structure to keep a toy penguin cool and explain why the design works well.

Daily Targets	NJSLS Performance Expectations	Instructional Activities
Day 1 Students will design and construct a model of a shady structure to keep a toy penguin cool, using knowledge of system functions and material properties. They will evaluate their designs based on criteria such as effectiveness, resource use, and adherence to constraints.	8.2.5.ED.1 8.2.5.ED.2 8.2.5.ED.3 8.2.5.ED.4 8.2.5.ED.5 8.2.5.ED.6 3-5-ETS1-1 3-5-ETS1-2 3-5-ETS1-3	- Warm-up: Ask students to brainstorm what they notice about a toy penguin in direct sunlight versus another penguin under a shady structure. - Discuss the properties of translucent and opaque materials. Use examples like sunglasses (translucent) and umbrellas (opaque) to illustrate how these materials affect light and temperature. - Students follow the design process to plan, build, test & reflect on their shady structures. - *Build:* Instruct students to construct their shady structure using available materials. - *Test:* Have students test their structures by placing them under the lamp and adding the toy penguin under the shade. Then, observing the temperature change over a set period. Encourage them to record their observations. - Reflect: Ask students to evaluate their designs based on effectiveness, resource use, and adherence to constraints. Prompt them to consider what worked well and what could be improved. How did the materials you chose affect the temperature under your shady structure? What was one challenge you faced in designing your structure, and how did you overcome it?

Basketball Hoop Design Lab

By the end of this lesson, students will be able to create a model basketball net that returns the ball and explain how its parts work together.

Daily Targets	NJSLS Performance Expectations	Instructional Activities
Day 1 Students will design and construct a model basketball net system that returns the ball, demonstrating understanding of system functions and subsystems. They will evaluate and refine their designs based on constraints and trade-offs, using sketches or models to support their solutions.	8.2.5.ED.1 8.2.5.ED.2 8.2.5.ED.3 8.2.5.ED.4 8.2.5.ED.5 8.2.5.ED.6 3-5-ETS1-1 3-5-ETS1-2 3-5-ETS1-3	- Warm-up: Ask students to brainstorm what they notice about a simple machine, such as a lever or pulley system. Guide the conversation towards noticing how different parts work *Build:* Students construct their model basketball net using the available materials. - *Test:* Have students test their Basketball Hoops with ping pong balls. - *Reflection:* Ask students to evaluate their designs based on effectiveness, resource use, and adherence to constraints. Prompt them to consider what worked well and what could be improved.

Boat Float Design Lab

By the end of this lesson, students will be able to build a boat that not only floats but can also carry as many pennies as possible, and students will figure out what design works best by testing and improving the boat.

Daily Targets	NJSLS Performance Expectations	Instructional Activities
Boat Float Day 1 Identify the problem and brainstorm potential solutions for building a boat that floats. Develop a plan and begin constructing the boat.	8.2.5.ED.1 8.2.5.ED.2 8.2.5.ED.3 8.2.5.ED.4 8.2.5.ED.5 8.2.5.ED.6	- Warm-up: Ask students to brainstorm what they notice about some examples of boats, then examine what they think would work well and what they would improve on. - Students follow the design process to plan, build, test & reflect on their shady structures.

	3-5-ETS1-1 3-5-ETS1-2 3-5-ETS1-3	- *Build:* Students gather their materials and start constructing boats. Help students focus on what specific parts of their design are working or not working.
Day 2 Conduct tests to evaluate the effectiveness of the boat holding the most pennies. Analyze the results and refine the design to enhance performance.	8.2.5.ED.1 8.2.5.ED.2 8.2.5.ED.3 8.2.5.ED.4 8.2.5.ED.5 8.2.5.ED.6 3-5-ETS1-1 3-5-ETS1-2 3-5-ETS1-3	- *Test:* Students place boats into tubs of water to see if their boat floats. Then add pennies to see how many pennies their boat can hold. - *Reflection:* Ask students to evaluate their designs based on effectiveness, resource use, and adherence to constraints. Prompt them to consider what worked well and what could be improved. Questions to ask could include: What went well? What didn't work? What would you do differently next time? Students answer reflection questions online, then we review as a class.

Lego Wind Car Design Lab

By the end of this lesson, students will be able to build a lego car with a paper sail and test how well it moves, while figuring out the best sail design.

Daily Targets	NJSLS Performance Expectations	Instructional Activities
Boat Float Day 1 Students will design and construct a functional lego car powered by a paper sail, demonstrating understanding of system functions and subsystems. They will evaluate and optimize their designs by testing different sail shapes and sizes, considering constraints and trade-offs.	8.2.5.ED.1 8.2.5.ED.2 8.2.5.ED.3 8.2.5.ED.4 8.2.5.ED.5 8.2.5.ED.6 3-5-ETS1-1 3-5-ETS1-2 3-5-ETS1-3	- Warm-up: Ask students to brainstorm what they notice about a sailboat and a car. - Think: Consider how the shape and size of a sail might affect the movement of their lego car. Think about the concepts of force and aerodynamics. - Students follow the design process to plan, build, test & reflect on their shady structures. - *Build*: Instruct students to construct their lego cars with paper sails. Remind them to consider the size and shape of the sail in relation to the car's weight and size.
Day 2 Conduct tests to evaluate the effectiveness of the Lego wind car.	8.2.5.ED.1 8.2.5.ED.2 8.2.5.ED.3 8.2.5.ED.4	- *Test:* Students place their cars in front of a fan to test how far the wind pushes the sail. Encourage them to measure and record the distance traveled.

Analyze the results and refine the design to enhance performance.	8.2.5.ED.5 8.2.5.ED.6 3-5-ETS1-1 3-5-ETS1-2 3-5-ETS1-3	- *Reflection:* Ask students to evaluate their designs based on effectiveness, resource use, and adherence to constraints. Prompt them to consider what worked well and what could be improved. Questions to ask could include: How did the shape and size of your sail affect your lego car's movement?

Inclusive concepts
● Students will work in groups or pairs to foster a sense of belonging, respect for others and responsibility. ● This teaches accountability for ensuring everyone feels included, helping students become thoughtful and inclusive community members. ● Encouraging responsibility for personal actions, promoting teamwork and collaboration, and respecting each person’s viewpoint.

Biomimicry

Biomimicry Unit Learning Goals
Students will analyze how biomimicry can address societal needs by evaluating a biomimetic product's effectiveness and identifying its environmental impact. They will also describe how biomimicry has led to new technologies that improve daily life. By the end of this lesson, students will be able to explain how nature-inspired designs solve real-world problems and make life better.

Effects of Technology on the Natural World	Nature of Technology	Interaction of Technology and Humans
"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."	"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."	Societal needs and wants determine which new tools are developed to address real-world problems. "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.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.	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.	8.2.5.ITH.1: Explain how societal needs and wants influence the development and function of a product and a system. 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.

Core Instructional Materials	Supplemental Materials
● Chromebook ● Internet	● Google Slides

Daily Targets	NJSLS Performance Expectations	Instructional Activities
Day 1: What is Biomimicry? How have we used it to solve problems and how has it impacted our daily lives?	8.2.5.ETW.1 8.2.5.ETW.2 8.2.5.ETW.3 8.2.5.ETW.4 8.2.5.ETW.5 8.2.5.NT.1 8.2.5.NT.2 8.2.5.NT.3 8.2.5.NT.4 8.2.5.ITH.1 8.2.5.ITH.2 8.2.5.ITH.3 8.2.5.ITH.4 5-ESS3-1	- Warm-up: Ask students to brainstorm what they notice about a series of images depicting natural phenomena and human-made products inspired by them (e.g., a bird and an airplane, a lotus leaf and a water-repellent surface). - Define Biomimicry: Explain biomimicry as the practice of designing products and systems inspired by nature. Use examples like Velcro, inspired by burrs. Discuss how these designs solve human problems by mimicking natural solutions. - Analyze and Reflect: Facilitate a discussion on how biomimicry can lead to new technologies. Ask students to brainstorm other natural phenomena that could inspire innovations. Encourage them to consider the potential positive and negative environmental impacts of these innovations.
Day 2: Students examine how biomimetic products address societal needs and its environmental impact. Students consider both the effectiveness and any shortcomings of the product. Students highlight how nature-inspired designs can lead to innovative solutions.	8.2.5.ETW.1 8.2.5.ETW.2 8.2.5.ETW.3 8.2.5.ETW.4 8.2.5.ETW.5 8.2.5.NT.1 8.2.5.NT.2 8.2.5.NT.3 8.2.5.NT.4 8.2.5.ITH.1 8.2.5.ITH.2 8.2.5.ITH.3 8.2.5.ITH.4 5-ESS3-1	- Warm Up: Match biomimetic product with its living thing counterpart, discuss the pairs. (Different sets for each grade level) - Think: Present students with a biomimetic product, such as Velcro. Ask them to individually think about how this product addresses societal needs and its environmental impact. - Connect: Facilitate a class discussion connecting these insights to the broader concept of biomimicry. Highlight how nature-inspired designs can lead to innovative solutions. - Reflect: Ask students to reflect on how biomimicry can inspire future technologies. Encourage them to think about potential new applications.
Days 3 & 4: Students research a natural phenomenon and	8.2.5.ETW.1 8.2.5.ETW.2 8.2.5.ETW.3	- Research and Design: Assign students to research a natural phenomenon and design a product inspired by it. Provide resources and examples to guide their research.

design a product inspired by it. Students present their products. Reflection questions.	8.2.5.ETW.4 8.2.5.ETW.5 8.2.5.NT.1 8.2.5.NT.2 8.2.5.NT.3 8.2.5.NT.4 8.2.5.ITH.1 8.2.5.ITH.2 8.2.5.ITH.3 8.2.5.ITH.4 5-ESS3-1	- Plan: Have students sketch or create a simple prototype of their biomimetic design using available materials. Encourage creativity and practicality. - Evaluation: Ask students to evaluate their design's potential effectiveness and environmental impact. Have them write a brief explanation of how their design addresses societal needs. - Reflection: Ask students to answer these questions: How does biomimicry help solve real-world problems? Give an example of a biomimetic product and its impact on society.

Inclusive concepts
● Advanced learners: Encourage deeper exploration by having students research additional biomimetic products and their societal impacts. Challenge them to propose improvements or alternative applications for existing designs. Facilitate group discussions on the ethical implications of biomimicry in technology. ● Striving learners: Provide additional visual aids and simplified examples of biomimicry. Pair them with peers for collaborative tasks to enhance understanding. Offer guided questions to help them focus on key concepts and encourage them to express ideas through drawings or models.

Algorithms & Programming

Unit Learning Goals	
Algorithms & Programming Different algorithms can achieve the same result. Some algorithms are more appropriate for a specific use than others. Programming languages provide variables, which are used to store and modify data. A variety of control structures are used to change the flow of program execution (e.g., sequences, events, loops, conditionals). 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. Individuals develop programs using an iterative process involving design, implementation, testing, and review. 8.1.5.AP.1: Compare and refine multiple algorithms for the same task and determine which is the most appropriate. 8.1.5.AP.2: Create programs that use clearly named variables to store and modify data. 8.1.5.AP.3: Create programs that include sequences, events, loops, and conditionals. 8.1.5.AP.4: Break down problems into smaller, manageable sub-problems to facilitate program development. 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. 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.	**Data & Analysis** Data can be organized, displayed, and presented to highlight relationships. The type of data being stored affects the storage requirements. Individuals can select, organize, and transform data into different visual representations and communicate insights gained from the data. Many factors influence the accuracy of inferences and predictions. 8.1.5.DA.1: Collect, organize, and display data in order to highlight relationships or support a claim. 8.1.5.DA.2: Compare the amount of storage space required for different types of data. 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. 8.1.5.DA.5: Propose cause and effect relationships, predict outcomes, or communicate ideas using data.

Core Instructional Materials	Supplemental Materials
● Chromebook ● Internet ● Ozobots Teacher Materials CodeCombat Jr Pacing Guide Code Combat Jr Curriculum & Slides	● Websites: CodeCombat Jr https://codecombat.com/ ● Google Slides

CodeCombat Jr.

Daily Targets	NJSLS Performance Expectations	Instructional Activities
3rd Grade		
Day 1: Sequences, Algorithms & Patterns ● Describe how algorithms can solve problems. ● Use code to write a computer program. ● Predict what comes next in a pattern. Module A1	8.1.5.AP.1: 8.1.5.AP.2: 8.1.5.AP.3:	- CodeCombat Jr. Teacher Slides - Logging in, navigating - Independent practice - Extension activity for early finishers
Day 2: Arguments & Algorithms ● Use arguments to change the direction my pet will move. ● Use arguments to change the number of steps my pet will move. Module A2	8.1.5.AP.1: 8.1.5.AP.2: 8.1.5.AP.3:	- CodeCombat Jr. Teacher Slides - Independent practice - Extension activity for early finishers
Day 3: Complex Arguments (Hit) & Debugging - Visualizing Data ● Use a new ability with my pet. ● Debug my code. ● Try coding with word blocks. Module B1	8.1.5.AP.1: 8.1.5.AP.2: 8.1.5.AP.3: 8.1.5.AP.4: 8.1.5.DA.1: 8.1.5.DA.2: 8.1.5.DA.3: 8.1.5.DA.4: 8.1.5.DA.5:	- CodeCombat Jr. Teacher Slides - Independent practice - Collecting & Visualizing Data Slides - Worksheet - Count & Graph - Extension activity for early finishers - Cut & Glue: Design a Level
4th Grade		
Day 4: Complex Arguments (Spin) - Number sentences, compare & Contrast ● Use the spin ability with my pet. ● Use both hit and spin to defeat enemies.	8.1.5.AP.1: 8.1.5.AP.2: 8.1.5.AP.3:	- CodeCombat Jr. Teacher Slides - Independent practice - Same or Different, How Many Hits Activity - Extension activity for early finishers - Design a pet

Module B2		
Day 5: Complex Arguments (Zap), Decomposition - Graphing Data ● Use the zap ability with my pet. ● Use both zap and hit to defeat big enemies. ● Decompose a task into steps. Module C1	8.1.5.AP.1: 8.1.5.AP.2: 8.1.5.AP.3: 8.1.5.AP.4: 8.1.5.DA.1: 8.1.5.DA.2: 8.1.5.DA.3: 8.1.5.DA.4: 8.1.5.DA.5:	- CodeCombat Jr. Teacher Slides - Independent practice - Graphing Data - Extension activity for early finishers
Day 6: Intro to Loops - Number Line ● Describe how loops are used in our daily lives. ● Use a loop within a program. Module C2	8.1.5.AP.3:	- CodeCombat Jr. Teacher Slides - Independent practice - Loopy Cycle, What's Missing Activities - Extension activity for early finishers - Design a World
Day 7: Complex Loops & Patterns - Multiplication Arrays ● Identify the pattern core. ● Predict what comes next in a pattern. ● Use two loops within a program. Module D1	8.1.5.AP.3:	- CodeCombat Jr. Teacher Slides - Independent practice - Island Arrays Activities - Extension activity for early finishers - Pixel Art, Pattern Practice
Day 8: Intro to Conditionals - Geometry flowcharts ● Describe how conditionals are used in our everyday lives. ● Help my pet make a decision using an if-statement. Module D2	8.1.5.AP.1: 8.1.5.AP.2: 8.1.5.AP.3: 8.1.5.AP.4:	- CodeCombat Jr. Teacher Slides - Independent practice - If/Then: Dress the Pet Activity - Extension activity for early finishers - Quadrilaterals Activities
5th Grade		
Day 9: Complex Conditionals - Comparing Numbers	8.1.5.AP.1: 8.1.5.AP.2: 8.1.5.AP.3:	- CodeCombat Jr. Teacher Slides - Independent practice - Extension activity for early finishers

Module E1	8.1.5.AP.4:	
Day 10: Intro to Variables - Math Puzzles Module E2	8.1.5.AP.1: 8.1.5.AP.2: 8.1.5.AP.3: 8.1.5.AP.4:	- CodeCombat Jr. Teacher Slides - Independent practice - Extension activity for early finishers
Day 11: Complex Structures - Conditionals, variables & Loops - Coordinate Conditionals - Compare & Contrast Sequences Stories Module F1	8.1.5.AP.1: 8.1.5.AP.2: 8.1.5.AP.3: 8.1.5.AP.4: 8.1.5.AP.5: 8.1.5.AP.6:	- CodeCombat Jr. Teacher Slides - Independent practice - Extension activity for early finishers
Day 12: Complex Structures - Conditionals, variables & Loops - Coordinate Games - Choose your own variable story Module F2	8.1.5.AP.1: 8.1.5.AP.2: 8.1.5.AP.3: 8.1.5.AP.4: 8.1.5.AP.5: 8.1.5.AP.6:	- CodeCombat Jr. Teacher Slides - Independent practice - Extension activity for early finishers

Ozobots

Daily Targets	NJSLS Performance Expectations	Instructional Activities
Day 1: Ozobots **Introduction to Color Codes 05: Skills Check 1** Students check their understanding of using Color Codes to program their bot to move in set directions, change speed, and complete special moves to show a sequence of events and move through a maze.	8.1.5.AP.1: 8.1.5.AP.2: 8.1.5.AP.3: 8.1.5.AP.4: 8.1.5.AP.5: 8.1.5.AP.6:	Lesson Plan Link - Students will read sentences to determine the directions their bot should travel through a maze and the actions their bot should demonstrate. - Students will draw Color Codes to program their bot to move in a specific direction and at a set speed or to perform a special move.
Day 2: Ozobots **Exploring the Engineering Process** Students will construct a model of the steps of the	8.1.5.AP.1: 8.1.5.AP.2: 8.1.5.AP.3: 8.1.5.AP.4:	Lesson Plan Link - Cut out your engineering design process steps. - Glue the engineering design process steps next to each

engineering design process and use ozocodes to represent each step in the process. Students should have some knowledge of the engineering design process prior to this lesson being completed.	8.1.5.AP.5: 8.1.5.AP.6:	corresponding code on your path. - Use your coding markers to complete the path and corresponding codes. - Run your ozobot around the path to create a model of the engineering design process.
Day 3: Ozobots **How to Catch a Turkey** This is a companion lesson to go along with the book How to Catch a Turkey, students will create a turkey (Ozobot) trap!	8.1.5.AP.1: 8.1.5.AP.2: 8.1.5.AP.3: 8.1.5.AP.4: 8.1.5.AP.5: 8.1.5.AP.6:	Lesson Plan Link - Read the book How to Catch a Turkey by Adam Wallace illustrated by Andy Elkerton. Explain to the students that they will create their own turkey trap. A good trap should be camouflaged so that the turkey (Ozobot) doesn't run away. - Students will create a camouflaged trap, decorate their Ozobot to look like a turkey and create a path into the trap.
Day 4: Ozobots **Ozobot Christmas Coding Adventure** Students use Ozobot robots to complete Christmas challenges. They explore basic coding skills, tackle themed challenges, and problem-solving in a fun, holiday-themed setting.	8.1.5.AP.1: 8.1.5.AP.2: 8.1.5.AP.3: 8.1.5.AP.4: 8.1.5.AP.5: 8.1.5.AP.6:	Lesson Plan Link - Each Student uses the marker to guide the Ozobot through a Christmas tree maze, delivering presents to Santa. - Students share their Christmas-themed Activity Sheet and briefly explain the coding challenges they completed. - Discuss the importance of problem-solving, collaboration, and creativity in coding and robotics. - Ask students to reflect on what they learned during the activity and how they can apply these skills in other areas.
Day 5: Ozobots **Earth's Rotation/Revolution** - Students will demonstrate how the Earth revolves around the sun using color codes. - Students will demonstrate how the Earth rotates on its axis using color codes.	8.1.5.AP.1: 8.1.5.AP.2: 8.1.5.AP.3: 8.1.5.AP.4: 8.1.5.AP.5: 8.1.5.AP.6:	Lesson Plan Link - Review Earth's rotation and orbit through Crash Course Kids YouTube video. Ozobot Rotation/Revolution Challenge: - Create Earth's rotation on its axis using color codes. - Create Earth's revolution around the sun using color codes.
Day 6: Ozobots **Shamrock Coding**	8.1.5.AP.1: 8.1.5.AP.2: 8.1.5.AP.3:	Lesson Plan Link - Students determine where they would like for their Ozobot to

- Students will learn about lines and codes that will make the Ozobot perform certain tasks. - Students will design, draw and color in their own coding maps for their Ozobot to follow.	8.1.5.AP.4: 8.1.5.AP.5: 8.1.5.AP.6:	start on their line and where they want to place the codes they would like for their Ozobot to follow. - Students use their prior knowledge of Ozobot Color Codes to program their bot to move in a specific direction and at a set speed or to perform a special move. - The goal is to use at least two direction codes, two speeds and two special moves.

Inclusive concepts
● Students will work in groups or pairs to foster a sense of belonging, respect for others and responsibility. ● This teaches accountability for ensuring everyone feels included, helping students become thoughtful and inclusive community members. ● Encouraging responsibility for personal actions, promoting teamwork and collaboration, and respecting each person's viewpoint.

Networks and the Internet

Unit Learning Goals	
Networks and the Internet Information needs a physical or wireless path to travel to be sent and received. 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). 8.1.5.NI.1: Develop models that successfully transmit and receive information using both wired and wireless methods. 8.1.5.NI.2: Describe physical and digital security measures for protecting sensitive personal information.	**Computing Systems** Computing devices may be connected to other devices to form a system as a way to extend their capabilities. Software and hardware work together as a system to accomplish tasks (e.g., sending, receiving, processing, and storing units of information). Shared features allow for common troubleshooting strategies that can be effective for many systems. 8.1.5.CS.1: Model how computing devices connect to other components to form a system. 8.1.5.CS.2: Model how computer software and hardware work together as a system to accomplish tasks. 8.1.5.CS.3: Identify potential solutions for simple hardware and software problems using common troubleshooting strategies.

Core Instructional Materials	Supplemental Materials
● Chromebook ● Internet	● Websites : Google Interland & Space Shelter ● Google Slides ● Code.org video explaining the internet

Daily Targets	NJSLS Performance Expectations	Instructional Activities
Day 1: Describe physical and digital security measures for protecting sensitive personal information.	8.1.5.NI.1: 8.1.5.NI.2:	* 5th Grade - Space Shelter Game - Details - Space Shelter is an interactive game about online security which is fun and accessible to anyone. - Students pick an astronaut, answer the questions and play games to learn about physical and digital security

Day 2 & 3: (Two weeks) Describe physical and digital security measures for protecting sensitive personal information. Distinguishing between public and private information is important for safe and secure online interactions.	8.1.5.NI.1: 8.1.5.NI.2:	* Grades 3rd - 5th - Interland Game - Curriculum - Students will help their fellow Internauts combat badly behaved hackers, phishers, oversharers, and bullies by practicing the skills they need to be good digital citizens. - Day 1: Start on the same island ”Kind Kingdom”
Day 4 & 5: (Two Weeks) Information needs a physical or wireless path to travel to be sent and received. Describe physical and digital security measures for protecting sensitive personal information.	8.1.5.NI.1: 8.1.5.NI.2: 8.1.5.CS.1: 8.1.5.CS.2: 8.1.5.CS.3:	* Grades 4th & 5th - Build a Computer - Watch the video on the different parts of a computer - Match the definition to the name of the computer part - Students color, cut, & glue to build their own laptops

Inclusive concepts
● Students will work in groups or pairs to foster a sense of belonging, respect for others and responsibility. ● This teaches accountability for ensuring everyone feels included, helping students become thoughtful and inclusive community members. ● Encouraging responsibility for personal actions, promoting teamwork and collaboration, and respecting each person’s viewpoint.

Research Projects

5th STEM Career Project: Football Hall of Fame

Unit Learning Goals
Research Project Students will identify and describe how televised professional football has influenced the creation of new careers in STEM. They will also evaluate their personal interests to identify potential STEM careers related to sports broadcasting and technology. Student-facing objective: By the end of this lesson, I'll be able to explain how football on TV has created new jobs in STEM and think about which of these jobs might be a good fit for me. **Standards** • 8.1.5.IC.1: Identify computing technologies that have impacted how individuals live and work and describe the factors that influenced the changes. • 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. • 9.2.5.CAP.1: Evaluate personal likes and dislikes and identify careers that might be suited to personal likes. • 9.2.5.CAP.3: Identify qualifications needed to pursue traditional and non-traditional careers and occupations. • 9.2.5.CAP.4: Explain the reasons why some jobs and careers require specific training, skills, and certification and examples of these requirements.

Core Instructional Materials	Supplemental Materials
● Chromebook ● Internet	● Google Slides

Daily Targets	NJSLS Performance Expectations	Instructional Activities
Days 1 & 2 <u>Introduction to Careers in STEM and Football Broadcasting</u>	• 8.1.5.IC.1: • 8.2.5.ITH.4: • 9.2.5.CAP.1: • 9.2.5.CAP.3: • 9.2.5.CAP.4:	- Warm-up: Ask students to brainstorm what they notice about a short video clip of a football game broadcast. "What do you notice about the technology used in the broadcast?" "What do you wonder about the jobs involved in making this broadcast happen?"

		<u>Introduction to Careers in STEM and Football Broadcasting</u> - Begin with a brief discussion on how televised football has evolved with technology. Highlight careers such as camera operators, sound engineers, and data analysts. Use real-world examples to illustrate how these roles contribute to a broadcast. Discuss how technology like instant replay and graphics enhance the viewing experience. - Facilitate a discussion on how these careers require specific skills and training. Ask students to consider what personal interests align with these careers. - Reflection: Students reflect on which career discussed might interest them and why. Encourage them to think about the skills they would need to pursue it. **Independent practice** - Research a STEM career related to football broadcasting. Use the internet or library resources to find information to add to their planning page. - Student use planning page to make Google Slide presentation - Finally students present their slides to the class. - Reflection**:** Answer these questions: How has technology in football broadcasting created new career opportunities in STEM? Which STEM career related to football broadcasting interests you the most, and why?

Inclusive concepts
Advanced learners Encourage deeper exploration by having students research emerging technologies in sports broadcasting, such as AI or machine learning, and their potential impact on future careers. Challenge them to present their findings to the class, focusing on how these technologies could transform the industry. **Striving learners** Provide additional support by offering a simplified list of STEM careers in sports broadcasting with brief descriptions. Pair them with a peer mentor for the "Think, Pair, Share" activity to facilitate understanding. Use visual aids to illustrate how technology is used in football broadcasting to make connections clearer.