NEPTUNE TOWNSHIP SCHOOL DISTRICT

Elementary STEM
Curriculum
Grades 3-5

NEPTUNE TOWNSHIP SCHOOL DISTRICT
Office of the Superintendent
60 Neptune Blvd.
Neptune, NJ 07753-4836

July 26, 2023 Document C1#1

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NEPTUNE TOWNSHIP SCHOOL DISTRICT

ELEMENTARY STEM CURRICULUM GRADES 3-5

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Curriculum

NEPTUNE TOWNSHIP SCHOOL DISTRICT

Elementary STEM
Grades 3-5

Acknowledgements

The Elementary STEM curriculum for Grades 3 through Grade 5 was developed through the dedicated efforts of Luke Tirrell, elementary STEM teacher; with guidance from the district's curriculum steering committee members, including Stacie Ferrara, Ed.D., STEM Supervisor, and Sally A. Millaway, Ed.D., Director of Curriculum, Instruction and Assessment.

This curriculum was written in alignment with the 2020 New Jersey Student Learning Standards for Computer Science and Design Thinking. The units are also aligned to New Jersey Student Learning Standards in Math (2016), English Language Arts (2016) and Career Readiness, Life Literacies, and Key Skills (2020). These learning plans have a hands-on, inquiry based approach to STEM education. The student-centered activities provide meaningful and engaging opportunities to increase students' problem solving skills. It is our hope that this curriculum will serve as a valuable resource for the staff members who teach this course, and that they will provide feedback and make recommendations for improvement.

NEPTUNE TOWNSHIP SCHOOL DISTRICT

DISTRICT MISSION STATEMENT

The primary mission of the Neptune Township School District is to prepare all of our students for a life-long learning process and to become confident, competent, socially, and culturally- conscious citizens in a complex and diverse world. It is with high expectations that our schools foster:

• A strong foundation in academic and modern technologies.

• A positive, equitable, and varied approach to teaching and learning.

• An emphasis on critical thinking skills and problem-solving techniques.

• A respect for and an appreciation of our world, its resources, and its diverse people.

• A sense of responsibility, good citizenship, and accountability.

• An involvement by the parents and the community in the learning process.

Neptune Township School District

Educational Outcome Goals

The students in the Neptune Township schools will become life-long learners and will:

- Become fluent readers, writers, speakers, listeners, and viewers with comprehension and critical thinking skills.
- Acquire the mathematical skills, understandings, and attitudes that are needed to be successful in their careers and everyday life.
- Understand fundamental scientific principles, develop critical thinking skills, and demonstrate safe practices, skepticism, and open-mindedness when collecting, analyzing, and interpreting information.
- Become technologically literate.
- Demonstrate proficiency in all New Jersey Student Learning Standards (NJSLS).
- Develop the ability to understand their world and to have an appreciation for the heritage of America with a high degree of literacy in civics, history, economics and geography.
- Develop a respect for different cultures and demonstrate trustworthiness, responsibility, fairness, caring, and citizenship.
- Become culturally literate by being aware of the historical, societal, and multicultural aspects and implications of the arts.
- Demonstrate skills in decision-making, goal setting, and effective communication, with a focus on character development.
- Understand and practice the skills of family living, health, wellness and safety for their physical, mental, emotional, and social development.
- Develop consumer, family, and life skills necessary to be a functioning member of society.
- Develop the ability to be creative, inventive decision-makers with skills in communicating ideas, thoughts and feelings.
- Develop career awareness and essential technical and workplace readiness skills, which are significant to many aspects of life and work.

INTEGRATED SOCIAL AND EMOTIONAL LEARNING COMPETENCIES

The following social and emotional competencies are integrated in this curriculum document:

Self-Awareness	
x	Recognize one's own feelings and thoughts
x	Recognize the impact of one's feelings and thoughts on one's own behavior
x	Recognize one's personal traits, strengths and limitations
x	Recognize the importance of self-confidence in handling daily tasks and challenges
Self-Management	
x	Understand and practice strategies for managing one's own emotions, thoughts and behaviors
x	Recognize the skills needed to establish and achieve personal and educational goals
x	Identify and apply ways to persevere or overcome barriers through alternative methods to achieve one's goals
Social Awareness	
x	Recognize and identify the thoughts, feelings, and perspectives of others
x	Demonstrate an awareness of the differences among individuals, groups, and others' cultural backgrounds
x	Demonstrate an understanding of the need for mutual respect when viewpoints differ
x	Demonstrate an awareness of the expectations for social interactions in a variety of setting
Responsible Decision Making	
x	Develop, implement and model effective problem solving and critical thinking skill
x	Identify the consequences associated with one's action in order to make constructive choices
x	Evaluate personal, ethical, safety and civic impact of decisions.
Relationship Skills	
x	Establish and maintain healthy relationships
x	Utilize positive communication and social skills to interact effectively with others
x	Identify ways to resist inappropriate social pressure
x	Demonstrate the ability to present and resolve interpersonal conflicts in constructive ways
x	Identify who, when, where, or how to seek help for oneself or others when needed

Unit Plan Title	Unit 1: Design Thinking
Suggested Time Frame	10-12 weeks (September, October, November)

Overview / Rationale

The design thinking unit introduces and progresses students through the design thinking framework, an innovative approach to problem-solving. This approach utilizes a methodology which requires the practitioner to truly understand the needs and preferences of potential end users of the products they endeavor to create. This empathy is critical to foster in elementary grade level students, and it is the centerpiece of student activities in design thinking. Students will be able to design, explain, and build solutions to problems discussed in collaboration with their peers in STEM class.

Stage 1 – Desired Results

Established Goals:

New Jersey Student Learning Standards for Design Thinking (2020)

8.2.5.NT.1 Troubleshoot a product that has stopped working and brainstorm ideas to correct the problem.

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.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.NT.2 Identify new technologies resulting from the demands, values, and interests of individuals, businesses, industries, and societies.

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.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.

8.2.5.NT.4 Identify how improvement in the understanding of materials science impacts technologies.

8.2.5.NT.3 Redesign an existing product for a different purpose in a collaborative team.

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

Essential Questions:

- What is the purpose of STEM?
- How does the Design Thinking process help STEM practitioners understand end users?
- Why does Design Thinking emphasize speed in the prototyping phase?
- How does embracing failure help students?
- How can testing results be checked to ensure product success?

Enduring Understandings:

Students will understand that...

- The purpose of STEM is to create products that solve problems in the real world.
- STEM practitioners must always consider the potential end users' needs and wants, in order to create products that people will actually use.
- The Design Thinking process is a framework that incorporates empathy to facilitate that consideration.
- The Design Thinking process promotes rapid prototyping as a means to get to a team's best idea most efficiently.
- Testing results should be compared to empathy data to ensure product success.
- Failure in STEM is a regular feature of the process, and it is understood to be a helpful tool for learning.

Knowledge:

Students will know…

- The Design Thinking process is a useful framework in STEM.
- The steps in the Design Thinking process are: empathize, define, ideate, prototype, and test.
- How to interview others to learn the most useful information towards identifying and solving a problem.
- How to clearly define a problem in order to be able to later measure a potential solution to that problem.
- Basic materials can be very useful in prototyping solution ideas.
- Companies use empathy to understand the interests and habits of potential end users when creating products.

Skills:

Students will be able to…

- Identify the steps of the Design Thinking process and the major elements of each step.
- Empathize with others by utilizing the interview process to determine needs, preferences, and habits.
- Define a problem someone else is experiencing which can be solved through design.
- Ideate in a group to generate possible solutions to the problem based on the information generated through empathy.
- Prototype the group's consensus idea by utilizing the rapid prototype method to quickly determine viability.

- Test the prototype versus the empathy information and defined problem to gauge the efficacy and likelihood for success.
- Incorporate all other STEM classroom and school norms into their Design Thinking work.
- Report to others, both in the STEM classroom and beyond, on their work in Design Thinking.

Interdisciplinary Connections

New Jersey Student Learning Standards in Career Readiness,Life Literacies, and Key Skills (2020)

8.1.5.AP.4: Break down problems into smaller, manageable sub-problems to facilitate program development.
8.1.5.DA.1: Collect, organize, and display data in order to highlight relationships or support a claim.
8.1.5.DA.3: Organize and present collected data visually to communicate insights gained from different views of the data.
9.1.5.CR.1: Compare various ways to give back and relate them to your strengths, interests, and other personal factors.
9.1.5.FP.5: Illustrate how inaccurate information is disseminated through various external influencers including the media, advertisers/marketers, friends, educators, and family members.
9.2.5.CAP.8: Identify risks that individuals and households face.
9.4.5.CI.1: Use appropriate communication technologies to collaborate with individuals with diverse perspectives about a local and/or global climate change issue and deliberate about possible solutions
9.4.5.CI.2: Investigate a persistent local or global issue, such as climate change, and collaborate with individuals with diverse perspectives to improve upon current actions designed to address the issue
9.4.5.CI.3: Participate in a brainstorming session with individuals with diverse perspectives to expand one's thinking about a topic of curiosity.
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9.4.5.CT.1: Identify and gather relevant data that will aid in the problem-solving process.
9.4.5.CT.2: Identify a problem and list the types of individuals and resources (e.g., school, community agencies, governmental, online) that can aid in solving the problem.
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.4: Model safe, legal, and ethical behavior when using online or offline technology.
9.4.5.IML.1: Evaluate digital sources for accuracy, perspective, credibility and relevance.
9.4.5.IML.2: Create a visual representation to organize information about a problem or issue.
9.4.5.IML.3: Represent the same data in multiple visual formats in order to tell a story about the data.
9.4.5.IML.6: Use appropriate sources of information from diverse sources, contexts, disciplines, and cultures to answer questions.
9.4.5.IML.7: Evaluate the degree to which information meets a need including social emotional learning, academic, and social.

New Jersey Student Learning Standards for Science (2020)]
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.

New Jersey Student Learning Standards for Mathematics (2016)
1 Make sense of problems and persevere in solving them.
2 Reason abstractly and quantitatively.
3 Construct viable arguments and critique the reasoning of others.
4 Model with mathematics.
5 Use appropriate tools strategically.

New Jersey Student Learning Standards in English Language Arts (2016)
NJSLSA.R1. Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
NJSLSA.W2. Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.
NJSLSA.SL1. Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
NJSLSA.SL2. Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.
NJSLSA.SL3. Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.

Student Resources
Technology: Chromebooks/laptops Desktop computers; STEM classroom building materials and general supplies **Texts:** Books in STEM classroom and school library
Teacher Resources
Technology: Chromebooks/laptops Desktop computers STEM classroom building materials and general supplies

Texts: books in STEM classroom, school library, and Neptune Township Public Library approved for use by administration

Slideshow: Presentation from Dr. Stacie Ferrara, Design Thinking in the Classroom: https://drive.google.com/file/d/1_5wceA3AEeRtJTpoV3kkivmxB1CgHExU/view?usp=sharing

Websites: Apps and Web sites approved for use by district administration: https://edprivacy.educationframework.com/Districts/main.aspx?districtid=30623

Videos: Overview of Design Thinking: https://www.youtube.com/watch?v=ldYzbV0NDp8&t=21s

30 Circle Challenge
https://www.ideo.com/blog/build-your-creative-confidence-thirty-circles-exercise

Stage 2 – Assessment Evidence

Formative Assessments:
Student Growth Assessment (SGO) content pre-assessments, teacher-created
30 Circle Challenge or similar pre-assessment (creativity phase), for Grade 5
10 or 15 Circle Challenge or similar pre-assessment (creativity phase), for Grades 3-4
STEM journal entries
Student-created interview questions (empathy phase)
Models created during prototype phase

Summative Assessments/Performance Tasks:
Teacher-created post-assessments
Student Growth Assessment (SGO) content pre-assessments, teacher-created
Students identify problems to solve by utilizing empathy/interview, then ideate within the Design Thinking process.
Students create builds within the Design Thinking process.
Students assess builds from their group and others within the Design Thinking process.

Stage 3 – Learning Plan

Ready Set Design (mixed bag)
I Am a Maker (building challenge)
30 Circle Challenge – then other shapes (creativity)
Cup Towers
Paper Playground
Marshmallow Spaghetti Challenge (tape, string)
Humpty Dumpty Design Challenge
Empathy Interviews
Ultimate Animal Design
Station Team Building Challenges

Unit Plan Title	Unit 2: Computer Science
Suggested Time Frame	10-12 weeks (December, January, February)

Overview / Rationale
The study of computer science enables students to think critically and systematically about leveraging technology to solve local and global issues. Students will experience authentic learning tasks that enable them to develop computational thinking skills; acquire and incorporate varied perspectives; and communicate with diverse audiences about the use and effects of computing in a STEM context.

Stage 1 – Desired Results

Established Goals:

New Jersey Student Learning Standards for Computer Science (2020)

Grade 3

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.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.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.

Grade 4

8.1.5.AP.4 Break down problems into smaller, manageable sub-problems to facilitate program development.
8.1.5.DA.3 Organize and present collected data visually to communicate insights gained from different views of the data.
8.1.5.CS.3 Identify potential solutions for simple hardware and software problems using common troubleshooting strategies.
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.NI.1 Develop models that successfully transmit and receive information using both wired and wireless methods.
8.1.5.DA.4 Organize and present climate change data visually to highlight relationships or support a claim.

Grade 5

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.
8.1.5.DA.5 Propose cause and effect relationships, predict outcomes, or communicate ideas using data.
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.
8.1.5.NI.2 Describe physical and digital security measures for protecting sensitive personal information.
8.1.5.DA.4 Organize and present climate change data visually to highlight relationships or support a claim.

Essential Questions:

- How do I solve a problem?
- What do computers do?
- How do I use data?
- How do I research information with technology?
- What is coding and what can you use coding to create?
- How does computer science relate to everyday life?
- What relationship does coding have with the terms software and hardware?

Enduring Understandings:

Students will understand that...

- People use computing devices to perform a variety of tasks accurately and quickly.
- A computing system is composed of hardware and software. Hardware consists of physical components, while software provides instructions for the system.
- Clearly describing a problem is the first step toward finding a solution.
- Computer networks can be used to connect people to other people, places, information, and ideas.
- Everyday digital devices collect and display data over time.
- People follow and create processes as part of daily life. Many of these processes can be expressed as algorithms that computers can follow.
- Computing technology has positively and negatively changed the way people live and work.

Knowledge:

Students will know…

- Standard input devices at an age-appropriate level.
- Basic operations involving a personal computer.
- Algorithms as a tool to solve problems.
- Functions of common software and hardware components.
- Available online sites to improve their coding skills in a safe digital environment.

Skills:

Students will be able to…

- Safely and correctly perform basic operations involving a personal computer.
- Create and follow increasingly complex algorithms to complete tasks.
- Create programs with increasingly sophisticated sequences and loops to accomplish tasks within coding apps.
- Describe a program's sequence of events, goals, and expected outcomes.

- Identify and describe increasingly complex patterns.
- Explain the functions of computer software and hardware components using accurate terminology.
- Debug errors in an algorithm.
- Describe how individuals use computers in STEM as a tool to solve problems.

Interdisciplinary Connections
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Student Resources
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Teacher Resources
Technology: Chromebooks/laptops Desktop computers Code.org site

Stage 2 – Assessment Evidence
Formative Assessments: STEM journal entries Observations Student feedback Q&A Test runs on coding modules ***Summative Assessments/Performance Tasks:*** Teacher-created post-assessments Completion of modules- Kodable

Stage 3 – Learning Plan
Students are shown how to use proper body position when using the computer. Code.org's Hour of Code apps are refreshed annually in the December Hour of Code week of online events, and students may access them year-round at school and/or at home, with or without an account. Code.org's suite of instructional activities require an account to track/record the progress of each student; they may also be accessed without an account, sans tracking. Kodable Basics: Level 1 Intro to Sequence Level 2 Intro to Conditions Level 3 Intro to Debugging Sequencing and Branching Level 1-2 Algorithms Sequencing and Branching Level 3/6 What are Conditions? Sequencing and Branching Level 8 Debugging Pattern and Repeats Level 1 Loops Pattern and Repeats Level 2/4 Loops Pattern and Repeats Level 7 Functions Pattern and Repeats Level 8/11 Functions Intro to Variables Level 1-2 Booleans Intro to Variables Level 4/6 Equality

Unit Plan Title	Unit 3: Engineering
Suggested Time Frame	10-12 Weeks (March, April, May)

Overview / Rationale
Students will explore engineering and science concepts that build upon the knowledge and experiences they have had, which enables them to connect to new concepts and skills and prepare them for the next stage of STEM exploration. Students will investigate and experiment with tools and materials and observe, analyze, and construct as they imagine and explore the world around them.

Stage 1 – Desired Results
Established Goals: **New Jersey Student Learning Standards for Design Thinking (2020)** 8.2.5.ED.1 Explain the functions of a system and its subsystems. 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 tradeoffs identified in the design process. 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.
Essential Questions: ● What do engineers do? ● How can I solve a problem? ● What materials can I use to solve problems? ● What are constraints?
Enduring Understandings: *Students will understand that...* ● A situation that people want to change or create can be approached as a problem to be solved through engineering. ● There are many ways to solve a problem, it is useful to compare and test designs. ● Technology is constantly changing to meet our needs. ● Resources and constraints are important factors when solving a problem. ● Failure in STEM is a regular feature of the process; it is understood to be a helpful tool for learning, not the sign of ineptitude many have internalized it to be.
Knowledge: *Students will know…* ● STEM classroom materials are not toys; they are very important to our work. ● Working together allows for more ideas and better structures. ● Engineers influence our lives by creating sustainable structures.

- Engineers do not all have the same demographic background; rather, they share a commitment to learning and applying best practices in building and innovating.

Skills:

Students will be able to…

- Solve a problem using the engineering design process (EDP).
- Draw scientific depictions of the world around them.
- Engage in increasingly sophisticated communication as they progress through our program, especially in the areas of planning (including brainstorming and assessing ideas) and evaluating builds (giving specific, relevant feedback with the right tone and sensitivity to others' development).
- Create increasingly complex structures as they progress through our program.

Interdisciplinary Connections

New Jersey Student Learning Standards in Career Readiness, Life Literacies, and Key Skills (2020)

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data.
9.4.5.IML.6: Use appropriate sources of information from diverse sources, contexts, disciplines, and cultures to answer questions.
9.4.5.IML.7: Evaluate the degree to which information meets a need including social emotional learning, academic, and social.

New Jersey Student Learning Standards for Science (2020)]
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.

New Jersey Student Learning Standards for Mathematics (2016)
1 Make sense of problems and persevere in solving them.
2 Reason abstractly and quantitatively.
3 Construct viable arguments and critique the reasoning of others.
4 Model with mathematics.
5 Use appropriate tools strategically.

New Jersey Student Learning Standards in English Language Arts (2016)
NJSLSA.R1. Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
NJSLSA.W2. Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.
NJSLSA.SL1. Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
NJSLSA.SL2. Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.
NJSLSA.SL3. Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.

Student Resources
Technology: Chromebooks/laptops Desktop computers; STEM classroom building materials and general supplies **Texts:** Books in STEM classroom and school library
Teacher Resources
Technology: Chromebooks/laptops

Desktop computers
STEM classroom building materials and general supplies

Stage 2 – Assessment Evidence
Formative Assessments: KWL chart STEM journal entries Q&A Student conference Student feedback Peer feedback ***Summative Assessments/Performance Tasks:*** Engineering builds

Stage 3 – Learning Plan
Windmill (The Boy Who Harnessed the Wind) Design and build a bridge (Iggy Peck) Helicopter/Airplane Challenge (Rosie Revere) Design and build a pasta rover Design and build a satellite Egg Drop Challenge Classroom building materials (in centers, stations, table setups, etc.) utilized by students individually and in groups of varying size assignments

Unit Plan Title	Unit 4: Sustainability
Suggested Time Frame	2-4 weeks (throughout school year, June)

Overview / Rationale
Gardening is educational and can develop many skills for students including: responsibility– from caring for plants; understanding– as they learn about cause and effect (for example, plants die without water, weeds compete with plants); self-confidence – from achieving their goals and enjoying the food they have grown; love of nature – a chance to learn about the outdoor environment in a safe and pleasant place; physical activity – doing something fun and productive; cooperation– including shared play activity and teamwork; creativity– finding new and exciting ways to grow food; and nutrition – learning about where fresh food comes from.

Stage 1 – Desired Results
Established Goals: **New Jersey Student Learning Standards for Design Thinking (2020)** 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.ETW.4 Explain the impact that resources, such as energy and materials used to develop technology, have on the environment. 8.1.5.DA.4 Organize and present climate change data visually to highlight relationships or support a claim.
Essential Questions: ● What do living things need to survive, stay healthy, and grow? ● What is a garden and what types of gardens exist? ● What plants do we eat? ● What fruits and vegetables can we grow in the garden?
Enduring Understandings: *Students will understand that...* ● Plants are living things ● Every part of a plant has an important function. ● Plants grow from seeds and need water, nutrients and light to live. ● Plants are all around us. ● There are many different types of plants. ● Plants are important for many reasons.
Knowledge: *Students will know…* ● Proper seed spacing for planting in the garden. ● Plants need water just like people and animals need water. ● The difference between edible and non-edible and understand how these concepts connect to a garden ● Properties of a garden.

- Parts of plants and their functions
- Properties of soil and why soil is important to plants.

Skills:

Students will be able to…

- Choose what to grow, how to grow it, and when to plant a fall and/or spring garden.
- Make observations of the properties of common objects in the garden.
- Identify plants in the garden
- Closely observe soil and practice tallying and reporting results of soil experiments.
- Construct a "bird's-eye-view" picture of a garden bed.
- Work together to make group decisions in planning a classroom garden.
- Plan, plant, and grow a garden based on a piece of children's literature.

Interdisciplinary Connections

New Jersey Student Learning Standards in Career Readiness, Life Literacies, and Key Skills (2020)

8.1.5.AP.4: Break down problems into smaller, manageable sub-problems to facilitate program development.
8.1.5.DA.1: Collect, organize, and display data in order to highlight relationships or support a claim.
8.1.5.DA.3: Organize and present collected data visually to communicate insights gained from different views of the data.
9.4.5.CI.1: Use appropriate communication technologies to collaborate with individuals with diverse perspectives about a local and/or global climate change issue and deliberate about possible solutions
9.4.5.CI.2: Investigate a persistent local or global issue, such as climate change, and collaborate with individuals with diverse perspectives to improve upon current actions designed to address the issue
9.4.5.CI.3: Participate in a brainstorming session with individuals with diverse perspectives to expand one's thinking about a topic of curiosity.
9.4.5.CT.1: Identify and gather relevant data that will aid in the problem-solving process.
9.4.5.CT.2: Identify a problem and list the types of individuals and resources (e.g., school, community agencies, governmental, online) that can aid in solving the problem.
9.4.5.CT.4: Apply critical thinking and problem-solving strategies to different types of problems such as personal, academic, community and global.

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Student Resources
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Teacher Resources
Technology: Chromebooks STEM classroom building materials and general supplies **Texts:** Books on gardening, plants and animals in school library **Materials:** soil, seeds, watering can, shovels, gloves https://growing-minds.org/garden-lesson-plans/ https://www.wholekidsfoundation.org/assets/documents/school-garden-lesson-plans.pdf https://dpi.wi.gov/sites/default/files/imce/team-nutrition/pdf/lets-plant-classroom-garden-lessons.pdf https://www.berkeleyschools.net/wp-content/uploads/2015/08/Garden-Based-Learning-Curriculum-Final-Package.pdf?5759fb

Stage 2 – Assessment Evidence
Pre-Assessments: Class discussion/Q&A on gardening topics Background knowledge of gardening Planning gardening design ***Formative Assessments:*** STEM journal entries

Student self assessments submitted through Google Apps

Summative Assessments:

Written reflection on gardening activities

Final student self assessments on group and/or individual work submitted through Google Apps

Stage 3 – Learning Plan

Utilize landscape features by school site:
Gables: garden beds, Bioswale/Rain garden
Green Grove: garden beds, orchard
Midtown**:** garden beds, rooftop garden, native plant meadow
Shark River Hills: garden beds, Sassafras Wood
Summerfield: garden beds, native plant garden beds, SummerWood, bioswale/rain garden

Grade 3
Review of previous gardening concepts: introduction to gardens, observing plants, signs of seasons, preparing the garden
Identify plant or animal species for further study
Utilize cross-curricular connections to plan site-based, grade level activity
Planting and observing

Grade 4
Review of previous gardening concepts: introduction to gardens, observing plants, signs of seasons, preparing the garden
Identify plant or animal species for further study
Utilize cross-curricular connections to plan site-based, grade level activity
Planting and observing
Mapping progress of all grade level plantings

Grade 5
Review of previous gardening concepts: introduction to gardens, observing plants, signs of seasons, preparing the garden
Identify plant or animal species for further study
Utilize cross-curricular connections to plan site-based, grade level activity
Planting and observing
Mapping progress of all grade level plantings

Accommodations and Modifications:
Below please find a list of suggestions for accommodations and modifications to meet the diverse needs of our students. Teachers should consider this a resource and understand that they are not limited to the recommendations included below.

An **accommodation** *changes* HOW *a student learns*; the change needed does not alter the grade-level standard. A **modification** *changes* WHAT *a student learns*; the change alters the grade-level expectation.

Special Education and 504 Plans
All modifications and accommodations must be specific to each individual child's IEP (Individualized Educational Plan) or 504 Plan.

- Pre-teach or preview vocabulary
- Repeat or reword directions
- Have students repeat directions
- Use of small group instruction
- Pair visual prompts with verbal presentations
- Ask students to restate information, directions, and assignments
- Repetition and time for additional practice
- Model skills/techniques to be mastered
- Extended time to complete task/assignment/work
- Provide a copy of class notes
- Strategic seating (with a purpose - eg. less distraction)
- Flexible seating
- Repetition and additional practice
- Use of manipulatives
- Use of assistive technology (as appropriate)
- Assign a peer buddy
- Emphasize key words or critical information by highlighting
- Use of graphic organizers
- Scaffold with prompts for sentence starters
- Check for understanding with more frequency
- Provide oral reminders and check student work during independent practice
- Provide home/school communication
- Teacher checks student STEM journals
- Provide student with clear expectations in writing and grading criteria for assignments (rubrics)

English Language Learners:
All modifications and accommodations should be specific to each individual child's LEP level as determined by the WIDA screening or ACCESS, utilizing the WIDA Can Do Descriptors.

- Pre-teach or preview vocabulary
- Repeat or reword directions
- Have students repeat directions

- Use of small group instruction
- Scaffold language based on their Can Do Descriptors
- Alter materials and requirements according to Can Do Descriptors
- Adjust number of paragraphs or length of writing according to their Can Do Descriptor
- TPR (Total Physical Response-Sheltered Instruction strategy) Demonstrate concepts through multi sensory forms such as with body language, intonation
- Pair visual prompts with verbal presentations
- Repetition and additional practice
- Model skills and techniques to be mastered
- Native Language translation (teacher, peer, assistive technology, bilingual dictionary)
- Emphasize key words or critical information by highlighting
- Use of graphic organizers
- Scaffold with prompts for sentence starters
- Check for understanding with more frequency
- Make vocabulary words available in a student created vocabulary notebook, vocabulary bank, Word Wall, or vocabulary ring (STEM journal)
- Extended time
- Select text complexity and tiered vocabulary according to Can Do Descriptors
- Projects completed individually or with partners
- Use online dictionary that includes images for words: http://visual.merriamwebster.com/.
- Use online translator to assist students with pronunciation: http://www.reverso.net/text_translation.aspx?lang=EN.

Students at Risk of Failure:

- Use of self-assessment rubrics for check-in
- Pair visual prompts with verbal presentations
- Ask students to restate information and/or directions
- Opportunity for repetition and additional practice
- Model skills/techniques to be mastered
- Extended time
- Provide copy of class notes
- Strategic seating with a purpose
- Provide students opportunity to make corrections and/or explain their answers
- Support organizational skills
- Check STEM journal
- Encourage student to proofread work
- Assign a peer buddy
- Vocabulary Sorts-students engage with the vocabulary word by sorting into groups of similar/different rather than memorizing definitions
- Provide “Realia” (real life objects to relate to the five senses) and ask questions relating to the senses
- Role Play-students create or participate in role playing situations or Reader’s Theater

- Moving Circle-an inside and outside circle partner and discuss, circles moves to new partner (Refer to Kagan Differentiated Strategies https://sirblois.files.wordpress.com/2016/09/cooperative-learning-activities.pdf)
- Gallery Walk-Objects, books, or student work is displayed. Students examine artifacts and rotate.
- Chunking-chunk reading, tests, questions, homework, etc to focus on particular elements.
- Note-taking -can be done through words, pictures, phrases, and sentences depending on level
- KWL (Know, Want to Know, Learned)/KWHL(Know, What to Know, How Will I Learn, learned)/KWLS (Know, Want to Know, Learned, Still Want to Know) /KWLQ (Know, What to Know, Learned, Questions I Still Have) Charts
- Corners Cooperative Learning Strategy: http://cooperativelearningstrategies.pbworks.com/w/page/28234420/Corners.
- Circle Map strategy- place the main topic in a small circle and add student ideas in a bigger circle around the topic. Students may use their native language with peers to brainstorm.
- Flexible grouping -as a whole class, a small group, or with a partner, temporary groups are created: http://www.teachhub.com/flexible-grouping-differentiated-instruction-strategy.
- Jigsaw Activities -cooperative learning in a group, each group member is responsible for becoming an "expert" on one section of the assigned material and then "teaching" it to the other members of the team: http://www.adlit.org/strategies/22371/.

High Achieving:

Extension Activities

- Allow for student choice from a menu of differentiated outcomes; choices grouped by complexity of thinking skills; variety of options enable students to work in the mode that most interests them
- Allow opportunities for peer leadership through pairings or small groups
- Allow students to pursue independent projects based on their individual interests
- Provide enrichment activities that include more complex material
- Allow opportunities for peer collaboration and team-teaching
- Set individual goals
- Conduct research and provide presentation of appropriate topics
- Provide students opportunity to design surveys to generate and analyze data to be used in discussion
- Allow students to move through the assignment at their own pace (as appropriate)

NEPTUNE TOWNSHIP SCHOOL DISTRICT
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