NEPTUNE CITY SCHOOL DISTRICT

Elementary STEM
Curriculum
Grade K-5

NEPTUNE CITY SCHOOL DISTRICT
Office of the Chief School Administrator, Principal
210 West Sylvania Avenue
Neptune City, NJ 07753

The Neptune City School District is appreciative and proud to accept and align the curriculum of the Neptune Township School District to properly prepare the Neptune City students for successful integration into the Neptune Township High School Educational Program.

August 1, 2022 Document *

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SCHOOL DISTRICT MISSION STATEMENT

The Neptune City School District, in partnership with the parents and the community, will support and sustain an excellent system of learning, promote pride in diversity, and expect all students to achieve the New Jersey Student Learning Standards at all grade levels to become responsible and productive citizens.

NEPTUNE CITY SCHOOL DISTRICT

ELEMENTARY STEM
CURRICULUM
GRADE K-5

Table of Contents

Curriculum

Grade 3 - Theme: Environmental Impacts on Humans

Grade 4 - Theme: Human Impact on the Environment

Grade 5 - Theme: Exploring the Expanding Universe

NEPTUNE TOWNSHIP SCHOOL DISTRICT

STEM (Science, Technology, Engineering, and Math) Curriculum

Acknowledgements

The STEM Curriculum guide was developed for the Neptune Township Elementary Schools through the efforts of Nicole Bruntz and Kristen Marlatt in cooperation with the Curriculum Steering Committee, inclusive of Heba Abdo, Supervisor of STEM and Sally A. Millaway, Ed.D., Director for Curriculum, Instruction and Assessment.

Ms. Bruntz and Ms. Marlatt are to be commended for their dedication in formatting this curriculum into UbD and their expertise in the area of STEM. This curriculum guide offers a comprehensive and integrated approach to all the areas of STEM. Each grade level centers around one guiding theme through which students engage deeply throughout the year.

This creates a rich and deep progression throughout all of K-5 that is fully aligned to the New Jersey Student Learning Standards for Science (NJSLS-S) and for Technology (NJSLS-T), but also integrates the companion standards of English Language Arts and Mathematics. Beginning in Kindergarten, students are encouraged to engage in the Engineering Design Process (EDP) through which they learn to inquire about the natural world and use design thinking to approach it. They also use structured conversations and "Productive Talk" to think critically about their ideas and the ideas of others. These conversations are recorded in student journals and classroom charts and are supported by the use of classroom rubrics.

NEPTUNE TOWNSHIP SCHOOL DISTRICT

DISTRICT MISSION STATEMENT

The primary mission of the Neptune Township School District is to prepare students for a life-long learning process 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 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 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.

Kindergarten STEM		Kindergarten Pacing Guide
Note: STEM is a weekly course taught by the Elementary STEM teacher.		
Unit		**Number of Days**
1.	Introduction to STEM	**9 days**
2.	Castles	**6 days**
3.	Boats	**6 days**
4.	Amazon	**6 days**
5.	Ocean Exploration	**6 days**
6.	Moon and Space	**6 days**
	Enrichment (during PLC time)	During Enrichment, activities can be extended correlating to the appropriate unit. The time devoted to Enrichment per grade level may vary by school building. Specific Enrichment extensions are included in each unit. In addition, block coding can be implemented during any open sessions using coding websites, Lego Robotics, Alex Toys coding tools, and other coding manipulatives.

Kindergarten STEM	Theme: Exploration of our World

Thematic Overview
Students will be introduced to 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. Throughout the year, these concepts will be taught through interactive activities and engaging lessons from castles to animals to space that align directly with the Kindergarten Tools of the Mind units and the Magic Treehouse book series. Students will investigate and experiment with tools and materials and observe, analyze, and construct as they imagine and explore the world around them. Throughout the thematic units, students will practice student-student, student-teacher discourse that encourages classroom conversations utilizing structured question stems.

Unit Title: Introduction to STEM	Duration: 9 days

Stage 1-Desired Results	
Essential Questions	**Enduring Understandings**
What do scientists and engineers do?	Scientists explore the world around us. A special kind of scientist, called an engineer, creates tools and technologies that help us interact with our world.
Why is science important in our daily lives?	Science is found everywhere. We can understand the world around us because it follows rules and patterns.
How can I solve scientific problems?	Scientists keep trying to solve problems using the Engineering Design Process. Engineering is difficult and it does not always work the first time.
What materials can I use in my classroom?	

New Jersey Student Learning Standards for Science

K-PS2-1. Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.
K-2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
K-2-ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.
K-2-ETS1-3. Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

Interdisciplinary Standards:

New Jersey Student Learning Standards for English Language Arts

W.K.2. Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic.
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.
SL.K.1. Participate in collaborative conversations with diverse partners about *kindergarten topics and texts* with peers and adults in small and larger groups.

A. Follow agreed-upon norms for discussions (e.g., listening to others with care and taking turns speaking about the topics and texts under discussion).
B. Continue a conversation through multiple exchanges.

SL.K.3. Ask and answer questions in order to seek help, get information, or clarify something that is not understood.
SL.K.4. Describe familiar people, places, things, and events and, with prompting and support, provide additional detail.
SL.K.5. Add drawings or other visual displays to descriptions as desired to provide additional detail.
SL.K.6. Speak audibly and express thoughts, feelings, and ideas clearly.

Interdisciplinary Standards:

New Jersey Student Learning Standards for Math

Mathematical Practices

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.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning

New Jersey Student Learning Standards for Technology

8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.

A. Technology Operations and Concepts: *Students demonstrate a sound understanding of technology concepts, systems and operations.*

B. Creativity and Innovation: *Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.*

F: Critical thinking, problem solving, and decision making: *Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.*

8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

A. The Nature of Technology: Creativity and Innovation *Technology systems impact every aspect of the world in which we live.*

C. Design: *The design process is a systematic approach to solving problems.*

In these unit plans, the following 21st Century Life and Careers skills are addressed:				
Check ALL that apply – **21st Century Themes**			**Indicate whether these skills are:** ● **E – Encouraged** ● **T – Taught** ● **A – Assessed**	
			Career Ready Practices	
9.1	**Personal Financial Literacy**		E	CRP1. Act as a responsible and contributing citizen and employee.
	Income and Careers		ETA	CRP2. Apply appropriate academic and technical skills.
	Money Management			CRP3. Attend to personal health and financial well-being.
	Credit and Debt Management		ETA	CRP4. Communicate clearly and effectively and with reason.
	Planning, Saving, and Investing		E	CRP5. Consider the environmental, social and economic impacts of decisions.
	Becoming a Critical Consumer		ETA	CRP6. Demonstrate creativity and innovation.
	Civic Financial Responsibility			CRP7. Employ valid and reliable research strategies.
	Insuring and Protecting		ET	CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
9.2	**Career Awareness, Exploration, and Preparation**			CRP9. Model integrity, ethical leadership and effective management.
	Career Awareness			CRP10. Plan education and career paths aligned to personal goals.
X	Career Exploration		ETA	CRP11. Use technology to enhance productivity.
	Career Preparation		ET	CRP12. Work productively in teams while using cultural global competence.

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

_____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

_____Recognize and identify the thoughts, feelings, and perspectives of others
_____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
_____Demonstrate an awareness of the expectations for social interactions in a variety of settings

Responsible Decision Making

__x__Develop, implement and model effective problem solving and critical thinking skills
__x__Identify the consequences associated with one's action in order to make constructive choices
_____Evaluate personal, ethical, safety and civic impact of decisions

Relationship Skills

_____Establish and maintain healthy relationships
__x__Utilize positive communication and social skills to interact effectively with others
_____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

Student Learning Targets / Objectives	
Students will know… ● STEM materials are not toys. They play important functions in our classroom. ● Working together allows for more ideas and better structures. ● Engineers influence our lives by creating sustainable structures.	**Students will be able to…** ● Solve a problem using the engineering design process (EDP). ● Draw scientific depictions of the world around them. ● Engage in productive talk.

STAGE 2 – ASSESSMENT EVIDENCE	
Common Summative Assessments	Performance Task- Students explore classroom materials and build a simple tower using straws and tape. They must work together using the engineering design process to do so. ● Teacher will facilitate and question students as they work, explaining and modeling stations throughout investigation. <u>Differentiation:</u> ▪ Students will be provided with visual directions, T-chart, hands-on materials, and rubric to complete each station.
Formative Assessments	Class Discussions Do Now Questions

STAGE 3 – LEARNING PLAN

Activity 1- Welcome to the STEM Classroom

Objective:

- Name the components of the STEM classroom.
- Accurately take out and put away STEM materials.
- Record information gathered throughout discussion on class chart.

Activities:

- Introduce students to the STEM classroom and the materials that will be used throughout the year. Practice using materials correctly, cleaning them up correctly, moving with purpose throughout the classroom, working with elbow partners, etc.
- Remind students of "science eyes" activities from the PreK classroom. Allow students to use their science eyes to depict scientific materials in the classroom.
- Teacher will facilitate material stations and question students as they work and investigate.

Activity 2- Straw Build

Objective:

- Investigate the EDP, exploring the steps (ask, imagine, plan, create, improve, communicate).
- Engage in productive talk about the design challenge.

Activities:

- Students work with group following the EDP to complete the design challenge of creating a tall tower with simple materials.
- Students will use the EDP to try once, then use productive talk to talk through what worked and didn't and try again. Analyze and discuss groups' designs and execution of the task (productive talk-teacher facilitated student talk, not teacher lead talk, https://inquiryproject.terc.edu/index.html).
- Participate and work with partner/group to complete the challenge.
- Teacher will introduce, explain, and facilitate activity as students work in groups. Teacher will questions groups as they work with the EDP to solve the problem. Teacher will guide students through questions.

Differentiation:

- EDP allows multiple entry points and multiple ways to demonstrate understandings.

UNIT RESOURCES

Supplies
Straws, tape, paper, crayons

Books:
Jack and Annie/Magic Treehouse Series

Enrichment:

- Coding: coding websites, Lego Robotics, Alex Toys coding tools, and other coding manipulatives based on school materials

Unit Title: Castles	Duration: 6 days

Stage 1-Desired Results	
Essential Questions	**Enduring Understandings**
What are some structures that might support a building (castle)?	There are many designs that can be used to create a supportive structure.
Why should a structure be supportive/strong?	A structure that is supportive and strong will last a longer time.
	Engineers are people who work together to design and create structures.

New Jersey Student Learning Standards for Science
K-PS2-1. Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object. K-2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool. K-2-ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. K-2-ETS1-3. Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

Interdisciplinary Standards:
New Jersey Student Learning Standards for English Language Arts
RL.K.1. With prompting and support, ask and answer questions about key details in a text (e.g., who, what, where, when, why, how). RI.K.1. With prompting and support, ask and answer questions about key details in a text. NJSLSA.W7. Conduct short as well as more sustained research projects, utilizing an inquiry-based research process, based on focused questions, demonstrating understanding of the subject under investigation. W.K.2. Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic. 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. SL.K.1. Participate in collaborative conversations with diverse partners about *kindergarten topics and texts* with peers and adults in small and larger groups. C. Follow agreed-upon norms for discussions (e.g., listening to others with care and taking turns speaking about the topics and texts under discussion). D. Continue a conversation through multiple exchanges. SL.K.2. Confirm understanding of a text read aloud or information presented orally or through other media by asking and answering questions about key details and requesting clarification if something is not understood. SL.K.3. Ask and answer questions in order to seek help, get information, or clarify something that is not understood. SL.K.4. Describe familiar people, places, things, and events and, with prompting and support, provide additional detail. SL.K.5. Add drawings or other visual displays to descriptions as desired to provide additional detail. SL.K.6. Speak audibly and express thoughts, feelings, and ideas clearly.

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Counting and Cardinality K.CC

A. Know number names and the count sequence.

B. Count to tell the number of objects.

Measurement and Data K.MD

A. Describe and compare measurable attributes.

B. Classify objects and count the number of objects in each category.

Geometry K.G

A. Identify and describe shapes (squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres).

B. Analyze, compare, create, and compose shapes.

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B. Creativity and Innovation: *Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.*

C. Communication and Collaboration: *Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.*

D. Digital Citizenship: *Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.*

E: Research and Information Fluency: *Students apply digital tools to gather, evaluate, and use information.*

F: Critical thinking, problem solving, and decision making: *Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.*

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A. The Nature of Technology: Creativity and Innovation *Technology systems impact every aspect of the world in which we live.*

C. Design: *The design process is a systematic approach to solving problems.*

D. Abilities for a Technological World: *The designed world is the product of a design process that provides the means to convert resources into products and systems.*

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_____Identify ways to resist inappropriate social pressure
__x__Demonstrate the ability to present and resolve interpersonal conflicts in constructive ways
_____Identify who, when, where, or how to seek help for oneself or others when needed

Student Learning Targets / Objectives	
Students will know… ● Castles are used as a protective structure. ● Materials have different properties: hard, flexible, soft, etc. ● Different materials can be used to build a structure. ● Some materials are better suited for building over others. ● Working together allows for more ideas and better structures. ● Engineers influence our lives by creating sustainable structures.	**Students will be able to…** ● Solve a problem using the engineering design process (EDP). ● Design (through illustrations) and develop a structure of their castle ● Build a castle using specific. materials and design plan. ● Investigate various materials and describe physical properties. ● Identify materials that are best suited for building(?). ● Work together to build a structure that resembles a castle. ● Use images and read stories (see resources) to help gather/imagine ideas for designs.

<table>
<tr><th colspan="2">STAGE 2 – ASSESSMENT EVIDENCE</th></tr>
<tr><td>Common Summative Assessments</td><td>Performance Task- Students explore and discuss castle images, books, and building materials, for students to identify, illustrate, and discuss different castles, parts of the castle, and draw a blueprint of their own castle structures.
● Teacher will facilitate and question students as they work, explaining and modeling stations throughout investigation.

<u>Differentiation:</u>
▪ Students will be provided with visual directions, T-chart, hands-on materials, and rubric to complete each station.

Performance Task- Students design and build a castle. Students follow the EDP to complete the steps in order to design, create, test, and analyze their structure. Students incorporate best materials needed for stable castle structure.
● Teacher will facilitate and question students as they work, explaining and modeling different strategies throughout build.

<u>Differentiation:</u>
▪ High-Achieving: Students will focus on creating a sturdy and stable structure including all parts of a castle.
▪ ELL/Extra Support: The assessment is very hands-on, however students in need of more support will be provided with specific material, individual assistance, and/or a separate rubric checklist to guide build including at least 1 aspect of a castle.</td></tr>
<tr><td>Formative Assessments</td><td>Class Activities- Castle Exploration
● Various media (videos, images) showing types of castles
● Discussion and creation of chart on book and personal knowledge of castles
● Hands-on investigation of materials that can be used to build a castle
Class Discussions
Do Now Questions

Class Activities- Castle Structure
● Students work with partner using the EDP to develop a design that resembles a full castle, including parts of a castle
● Students use design and materials to create a castle structure that is sturdy
● Students communicate and collaborate with partner to complete challenge.
● Students discuss their design and how they would change their build and design based on structure’s sturdiness.</td></tr>
</table>

	Class Discussions Do Now Questions

STAGE 3 – LEARNING PLAN
Activity 1- Castle Exploration **Objective:** • Investigate and classify different kinds of materials based on their physical properties. • Analyze, compare, and discuss how castles are similar and different from another castle's parts. • Record information gathered throughout discussion on class chart **Activities:** • Introduce topic with video/images, discussion of books, and questions to gather what students know about topic. Questions: What are some parts of a castle? What are castle used for? What are some materials we can use to build a castle structure? • Introduce materials investigation station for students to work in. Students will work with partner/group to investigate different types of materials and their properties. • Teacher will facilitate material stations and question students as they work and investigate.
Activity 2- Castle Build **Objective:** ● Investigate the EDP, exploring the steps (ask, imagine, plan, create, improve, communicate) to build a castle. Students will make connections to prior lessons concerning observable materials and designs of castles to design and build castle structure. **Activities:** ● Students work with group following the EDP to complete the design challenge of designing and building a castle structure. ● Brainstorm and illustrate a castle design, including parts of the castle. ● Work with partner to gather materials needed and build castle, including parts of the castle from design. ● Share ideas with group and class, how did we build our castle, why we chose certain materials, what happened to our structure, can it be improved. ● Analyze and discuss groups' designs and execution of the task (productive talk-teacher facilitated student talk, not teacher lead talk, https://inquiryproject.terc.edu/index.html). ● Participate and work with partner/group to complete the challenge.

- Teacher will introduce, explain, and facilitate activity as students work in groups. Teacher will questions groups as they work with the EDP to solve the problem. Teacher will guide students through questions.

Differentiation:

- EDP allows multiple entry points and multiple ways to demonstrate understandings.

UNIT RESOURCES

Supplies

Paper, cards, toothpicks, wood pieces, popsicle sticks, cardboard, tape, blocks, trays, construction paper, chenille stems

Books:

Jack and Annie Series
Everything Castles, National Geographic Series
Castle: How it Works, by David Macauley

Enrichment:

- Catapult Build- create and build a working catapult to launch materials over a castle.
- Shield/Armor Build- create and build armor and shields used by knights.
- Working Drawbridge- create and build a working drawbridge (could be class project).

Unit Title: Boats	Duration: 6 days

Stage 1-Desired Results	
Essential Questions	**Enduring Understandings**
Why do some objects sink and other objects float?	Being heavy or light does not change if an object sinks or floats. Sinking and floating is controlled by how dense an object is. That means how tight or loose the insides of the object are stuck together.
How do boats hold heavy objects and float on water?	Changing the shape of a material may affect its ability to sink of float.

New Jersey Student Learning Standards for Science
PS2-1. Plan and conduct an investigation to compare the effects of different strengths or different ections of pushes and pulls on the motion of an object. 2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to ange to define a simple problem that can be solved through the development of a new or improved object tool. 2-ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object ps it function as needed to solve a given problem. 2-ETS1-3. Analyze data from tests of two objects designed to solve the same problem to compare the engths and weaknesses of how each performs.

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RL.K.1. With prompting and support, ask and answer questions about key details in a text (e.g., who, what, where, when, why, how). RI.K.1. With prompting and support, ask and answer questions about key details in a text. NJSLSA.W7. Conduct short as well as more sustained research projects, utilizing an inquiry-based research process, based on focused questions, demonstrating understanding of the subject under investigation. W.K.2. Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic. 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. SL.K.1. Participate in collaborative conversations with diverse partners about *kindergarten topics and texts* with peers and adults in small and larger groups. E. Follow agreed-upon norms for discussions (e.g., listening to others with care and taking turns speaking about the topics and texts under discussion). F. Continue a conversation through multiple exchanges. SL.K.2. Confirm understanding of a text read aloud or information presented orally or through other media by asking and answering questions about key details and requesting clarification if something is not understood. SL.K.3. Ask and answer questions in order to seek help, get information, or clarify something that is not understood. SL.K.4. Describe familiar people, places, things, and events and, with prompting and support, provide additional detail. SL.K.5. Add drawings or other visual displays to descriptions as desired to provide additional detail. SL.K.6. Speak audibly and express thoughts, feelings, and ideas clearly.

Interdisciplinary Standards:
New Jersey Student Learning Standards for Math

Mathematical Practices

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.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning

Counting and Cardinality K.CC

A. Know number names and the count sequence.

B. Count to tell the number of objects.

Measurement and Data K.MD

A. Describe and compare measurable attributes.

B. Classify objects and count the number of objects in each category.

Geometry K.G

A. Identify and describe shapes (squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres).

B. Analyze, compare, create, and compose shapes.

New Jersey Student Learning Standards for Technology
8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge. A. Technology Operations and Concepts: *Students demonstrate a sound understanding of technology concepts, systems and operations.* B. Creativity and Innovation: *Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.* C. Communication and Collaboration: *Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.* D. Digital Citizenship: *Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.* E: Research and Information Fluency: *Students apply digital tools to gather, evaluate, and use information.* F: Critical thinking, problem solving, and decision making: *Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.* 8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment. A. The Nature of Technology: Creativity and Innovation *Technology systems impact every aspect of the world in which we live.* C. Design: *The design process is a systematic approach to solving problems.*

In these unit plans, the following 21st Century Life and Careers skills are addressed:				
Check ALL that apply – **21st Century Themes**			**Indicate whether these skills are:** ● **E – Encouraged** ● **T – Taught** ● **A – Assessed**	
			Career Ready Practices	
9.1	**Personal Financial Literacy**		E	CRP1. Act as a responsible and contributing citizen and employee.
	Income and Careers		ETA	CRP2. Apply appropriate academic and technical skills.
	Money Management			CRP3. Attend to personal health and financial well-being.
	Credit and Debt Management		ETA	CRP4. Communicate clearly and effectively and with reason.
	Planning, Saving, and Investing		E	CRP5. Consider the environmental, social and economic impacts of decisions.
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9.2	**Career Awareness, Exploration, and Preparation**			CRP9. Model integrity, ethical leadership and effective management.
	Career Awareness			CRP10. Plan education and career paths aligned to personal goals.
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	Career Preparation		ET	CRP12. Work productively in teams while using cultural global competence.

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
_____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
_____Recognize and identify the thoughts, feelings, and perspectives of others
_____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
_____Demonstrate an awareness of the expectations for social interactions in a variety of settings

Responsible Decision Making
__x__Develop, implement and model effective problem solving and critical thinking skills
__x__Identify the consequences associated with one's action in order to make constructive choices
_____Evaluate personal, ethical, safety and civic impact of decisions

Relationship Skills
_____Establish and maintain healthy relationships
__x__Utilize positive communication and social skills to interact effectively with others
_____Identify ways to resist inappropriate social pressure
__x__Demonstrate the ability to present and resolve interpersonal conflicts in constructive ways
_____Identify who, when, where, or how to seek help for oneself or others when needed

Student Learning Targets / Objectives	
Students will know… ● Some materials float while others sink. ● Size does not matter if an object can float or sink. ● Materials have different properties: hard, flexible, soft, etc. ● Different materials can be used to build a structure that floats. ● Objects push water out of the way to float. ● Weight is one factor that makes an object sink or float. ● An object that sinks falls below the water, an object that floats stays about the water. ● Matter is composed of different properties. ● Some materials are better suited for building a boat over others. ● Working together allows for more ideas and better structures.	**Students will be able to…** ● Investigate STEM through the engineering design process (EDP) to solve problems. ● Design (through illustrations) and develop a boat structure. ● Build a boat to meet criteria using specific materials and design plan. ● Investigate various materials/shapes/weights and explain its ability to sink or float. ● Identify materials that are best suited for boat build. ● Work together to build a structure that resembles a boat. ● Use images and story to help gather/imagine ideas for designs.

STAGE 2 – ASSESSMENT EVIDENCE	
Common Summative Assessments	Performance Task- Students explore and discuss boat images, books, building materials, in order to identify, illustrate, and discuss different boat, shapes and, and how they can design/build their own structure. ● Teacher will facilitate and question students as they work, explaining and modeling stations throughout investigation. <u>Differentiation:</u> ▪ Students will be provided with visual directions, T-chart, hands-on materials, and rubric guides to complete each station. Performance Task- Students design and build a boat to solve challenge. Students follow the EDP to complete the steps in order to design, create, test, and analyze their structure. Students incorporate best materials needed for boat to stay afloat. ● Teacher will facilitate and question students as they work, explaining and modeling different strategies throughout the build. <u>Differentiation:</u> ▪ High-Achieving: Students will focus on creating a sturdy and stable structure that floats including all elements of challenge (needs to hold specific amount of weight without sinking). ▪ ELL and Learners with Other Needs: The assessment is very hands-on, however students in need of more support will be provided with specific material, individual assistance, and separate rubric checklist to guide build include at least half weight for boat to hold.
Formative Assessments	Class Activities- Boat Materials Exploration ● Various media (videos, images) showing types boats and designs ● Discussion and creation of chart on book and personal knowledge of boats and materials ● Hands-on investigation of materials that can be used to build their boat Class Discussions Do Now Questions Class Activities- Boat Design Structure ● Students work with partner using the EDP to develop a design that solves boat challenge

	● Students use design and materials to create a boat structure that is sturdy and floats ● Students communicate and collaborate with partner to complete challenge. ● Students discuss their design and how they would change their build and design based on materials used and buoyance of material. Class Discussions Do Now Questions

STAGE 3 – LEARNING PLAN
Activity 1- Boat Materials Exploration **Objective:** • Investigate and classify different kinds of materials based on their physical properties and ability to float. • Analyze, compare, and discuss how boats are similar and different from each other, how can the boat float. • Record information gathered throughout on class chart. **Activities:** • Introduce topic with video/images, discussion of books, and questions to gather what students know about topic. Questions: What allows a boat to float? What happens when we add weight to the boat? What are some materials we can use to build a boat that will float and carry people? • Introduce materials investigation station for students to work in. Students will work with partner/group to investigate different types of materials and their ability to sink/float. • Teacher will facilitate material stations and question students as they work and investigate.
Activity 2- Boat Build **Objective:** ● Investigate the EDP, exploring the steps (ask, imagine, plan, create, improve, communicate) to build a boat. Students will make connections to prior lessons concerning observable materials and designs of boats to design and build boat structure to solve the challenge. **Activities:** ● Students work with group following the EDP to complete the design challenge of designing and building a boat structure. ● Brainstorm and illustrate a boat design. ● Work with partner to gather materials needed and build boat that can hold weight. ● Make a prediction based on design and build on how much weight boat will hold.

- Share ideas with group and class, how did we build our boat, why we chose certain materials, what happened to our structure, can it be improved?
- Analyze and discuss groups' designs and execution of the task (productive talk).
- Participate and work with partner/group to complete the challenge.
- Teacher will introduce, explain, and facilitate activity as students work in groups. Teacher will questions groups as they work with the EDP to solve the problem. Teacher will guide students through questions.

Differentiation:

- EDP allows multiple entry points and multiple ways to demonstrate understandings.

UNIT RESOURCES
Supplies Foil, Styrofoam, plastic bubble wrap, wooden sticks, large bowls, water, and counting bears (or equivalent), card, cardboard, plastic wrap, tape, cork **Books:** Jack and Annie Series Who Sank the Boat by Pamela Allen The Toy Boat by Randell de Seve **Enrichment:** Boat Build: Design and build boat using only recycled materials. Computer Skills: Beginning working and using computer, introduction to coding. ● Kodables.com ● Code.org

Unit Title: The Amazon	**Duration: 6 days**

Stage 1-Desired Results	
Essential Questions	**Enduring Understandings**
Why might the rainforest be an important to humans as well as other living things?	Tropical rainforest have a very unique environment.
Why might it be important to know an area's climate when building a structure?	Tropical rainforest have a variety of plant and animal life.

	Humans need to understand the world around them to create safe stable structures to protect from weather and environment.

New Jersey Student Learning Standards for Science
K-ESS3-1. Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live. K-ESS3-2. Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather. K-2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool. K-2-ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. K-2-ETS1-3. Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

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SL.K.1. Participate in collaborative conversations with diverse partners about *kindergarten topics and texts* with peers and adults in small and larger groups.

G. Follow agreed-upon norms for discussions (e.g., listening to others with care and taking turns speaking about the topics and texts under discussion).
H. Continue a conversation through multiple exchanges.

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D. Digital Citizenship: *Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.*

E: Research and Information Fluency: *Students apply digital tools to gather, evaluate, and use information.*

F: Critical thinking, problem solving, and decision making: *Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.*

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_____Establish and maintain healthy relationships
__x__Utilize positive communication and social skills to interact effectively with others
_____Identify ways to resist inappropriate social pressure
__x__Demonstrate the ability to present and resolve interpersonal conflicts in constructive ways
_____Identify who, when, where, or how to seek help for oneself or others when needed

Student Learning Targets / Objectives

Students will know…	**Students will be able to…**
● Many animals and plants live in the rainforest. ● People can use materials from the rainforest to build a house for protection. ● Materials have different properties: hard, flexible, soft, etc. ● Different materials can be used to build a structure. ● Some materials are better suited for building over others. ● Some materials and designs are better suited to keep water out of structure. ● Working together allows for more ideas and better structures. ● Engineers influence our lives by creating sustainable structures.	● Investigate the rainforest and animals, plants of the rainforest through a series of stories, images, and videos. ● Investigate STEM through the engineering design process to solve problems. ● Design (through illustrations) and develop a structure of their treehouse design. ● Build the treehouse structure using specific materials and design plan. ● Investigate various materials and describe physical properties. ● Identify materials that are best suited for building. ● Work together to build a structure that resembles a treehouse. ● Include aesthetics such as camouflage; use checklist rubric to complete build. ● Use images and read stories to help gather/imagine ideas for designs.

STAGE 2 – ASSESSMENT EVIDENCE	
Common Summative Assessments	Performance Task- Students explore and discuss rainforest images (animals/plants/weather), book. Introduced to rainforest treehouse build, building materials; students begin to identify, illustrate, and discuss different treehouses, parts of the house, and how/where they can design/build their structure. ● Teacher will facilitate and question students as they work, explaining and modeling stations throughout the investigation. <u>Differentiation:</u> ▪ Students will be provided with visual directions, T-chart, hands-on materials, and rubric to complete each station. Performance Task- Students design and build a treehouse for protection from animals and weather. Students follow the EDP to complete the steps in order to design, create, test, and analyze their structure. Students incorporate best materials needed for weather proof and stable structure. ● Teacher will facilitate and question students as they work, explaining and modeling different strategies throughout the build. <u>Differentiation:</u> ▪ High-Achieving: Students will focus on creating a sturdy weather proof structure including different aspects of the treehouse (camouflage, position of house, protection from animals). ▪ ELL/Extra Support: The assessment is very hands-on, however students in need of more support will be provided with specific material, individual assistance, a separate rubric checklist to guide build that includes at least 1 aspect of a treehouse.
Formative Assessments	Class Activities- Rainforest Exploration ● Various books/images/videos showing inside the rainforest. ● Images/designs of house/treehouse. ● Discussion and creation of chart about Magic Treehouse book and knowledge of about rainforest and treehouse. ● Hands-on investigation of materials that can be used to build a waterproof treehouse. Class Discussions Do Now Questions Class Activities- Treehouse Structure ● Students work with partner using the EDP to develop and build a treehouse prototype.

	● Students use design and materials to create a treehouse structure that is water proof and stable. ● Students communicate and collaborate with partner to complete challenge. ● Students discuss their design and how they would change their build and design based on testing outcome. Class Discussions Do Now Questions

STAGE 3 – LEARNING PLAN
Activity 1- Rainforest Exploration **Objective:** • Investigate and classify different kinds of materials that are best for treehouse build. • Analyze, compare, and discuss a treehouse and structure of a treehouse. • Discuss and record information on rainforest animals/plants/weather. • Record information gathered throughout the session on class chart. **Activities:** • Introduce topic with read aloud/images/video, discussion of books, and questions to gather what students know about topic. Questions: Why might we need shelter in a rainforest? How could we build a shelter in the rainforest? Which would be the best location to put our shelter? • Introduce materials investigation station . Students will work with partner/group to investigate different types of materials, their properties, and how they can use them. • Teacher will facilitate materials, stations, and question students as they work and investigate.
Activity 2- Treehouse Build **Objective:** ● Investigate the EDP, exploring the steps (ask, imagine, plan, create, improve, communicate) to build a treehouse. Students will make connections to prior lessons concerning the rainforest, best materials for protection and build, designing the treehouse, and build treehouse structure. **Activities:** ● Students work with group following the EDP to complete the design challenge of designing and building a treehouse structure. ● Brainstorm and illustrate a treehouse design, including parts of the treehouse. ● Work with partner to gather materials needed and build treehouse. ● Share ideas with group and class: how did we build our treehouse, why we chose certain materials, what happened to our structure when tested, can it be improved. ● Analyze and discuss groups' designs and execution of the task (productive talk).

- Participate and work with partner/group to complete the challenge.
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Differentiation:

- EDP allows multiple entry points and multiple ways to demonstrate understandings.

UNIT RESOURCES

Supplies

Paper, cards, toothpicks, wood pieces, popsicle sticks, cardboard, tape, blocks, foil, construction paper, chenille sticks, plastic

Books:

Jack and Annie Series
The Great Kapok Tree by Lynne Cherry
Explore My World Rainforest National Geographic
Nature's Green Umbrella by Gail Gibbons

Enrichment:

- Animal Build- Using various materials student will build and create an animal, trying to incorporate a moving part.
- Umbrella Build-Design and create an umbrella that would shield animals or people from rain in the rainforest.

Unit Title: Ocean Exploration	Duration: 6 days

Stage 1-Desired Results	
Essential Questions	**Enduring Understandings**
Why would we (humans) want to know about the deep ocean?	Knowing about the world around allows us to see how everything is connected to each other. A change in one thing can have an effect on several other events.
How might we research and investigate new things about the deep ocean and the animals and plants that live there?	Technology allows us to build and design tools for ocean exploration.
	The world would be very different without technology.

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Counting and Cardinality K.CC

A. Know number names and the count sequence.

B. Count to tell the number of objects.

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A. Describe and compare measurable attributes.

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	Becoming a Critical Consumer		ETA	CRP6. Demonstrate creativity and innovation.
	Civic Financial Responsibility			CRP7. Employ valid and reliable research strategies.
	Insuring and Protecting		ET	CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
9.2	**Career Awareness, Exploration, and Preparation**			CRP9. Model integrity, ethical leadership and effective management.
	Career Awareness			CRP10. Plan education and career paths aligned to personal goals.
X	Career Exploration		ETA	CRP11. Use technology to enhance productivity.
	Career Preparation		ET	CRP12. Work productively in teams while using cultural global competence.

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

_____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

_____Recognize and identify the thoughts, feelings, and perspectives of others
_____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
_____Demonstrate an awareness of the expectations for social interactions in a variety of settings

Responsible Decision Making

__x__Develop, implement and model effective problem solving and critical thinking skills
__x__Identify the consequences associated with one's action in order to make constructive choices
_____Evaluate personal, ethical, safety and civic impact of decisions

Relationship Skills

_____Establish and maintain healthy relationships
__x__Utilize positive communication and social skills to interact effectively with others
_____Identify ways to resist inappropriate social pressure
__x__Demonstrate the ability to present and resolve interpersonal conflicts in constructive ways
_____Identify who, when, where, or how to seek help for oneself or others when needed

Student Learning Targets / Objectives	
Students will know… ● Many animals and plants live in the ocean. ● The ocean is a large ecosystem. ● People depend on the ocean for many things. ● The ocean is a delicate ecosystem with many resources. ● We use technology to research and discover new things about the ocean and the animals/plants that live there. ● A scientist that studies the ocean is an oceanographer. ● Different materials can be used to build a structure. ● Some materials are better suited for building over others. ● Some materials and designs are better suited to keep water out of structure. ● Working together allows for more ideas and better structures. ● Engineers influence our lives by creating technologically advanced devices.	**Students will be able to…** ● Research and develop a tool used for ocean exploration. ● Design (through illustrations) and develop a prototype of their submarine design. ● Build a submarine prototype using specific materials and design plan. ● Identify materials that are best suited for build. ● Work together to build a structure that resembles a submarine. ● Include parts of the submarine, use checklist rubric to complete build. ● Use images and story to help gather/imagine ideas for designs.

STAGE 2 – ASSESSMENT EVIDENCE	
Common Summative Assessments	Performance Task- Students explore and discuss ocean images (animals/plants/landforms) and Magic Treehouse book. Introduced to ocean submarine build, building materials; students begin to identify, illustrate, and discuss different submarines, parts of the vessel, and how/why they will use their submarine. ● Teacher will facilitate and question students as they work, explaining and modeling stations throughout investigation. <u>Differentiation:</u> ▪ Students will be provided with visual directions, T-chart, hands-on materials, and rubric to complete each station. Performance Task- Students design and build a submarine prototype to study the ocean floor and animals/plants of the ocean. Students follow the EDP to complete the steps in order to design, create, test, and analyze their prototype. Students incorporate best materials and design needed for submarine prototype. ● Teacher will facilitate and question students as they work, explaining and modeling different strategies throughout build. <u>Differentiation:</u> ▪ High-Achieving: Students will focus on creating a usable underwater submarine prototype including various parts of the submarine. ▪ ELL/Extra Support: The assessment is very hands-on, however students in need of more support will be provided with specific material, individual assistance, separate rubric checklist to guide build, build will include at least 1 aspect of the submarine and does not need to include under water component.
Formative Assessments	Class Activities- Ocean/Submarine Exploration ● Various books/images/videos showing under the ocean, parts of the ocean. ● Images/designs of submarines. ● Discussion and creation of chart on book and knowledge of ocean and submarines. ● Hands-on investigation of materials that can be used to build a suitable underwater submarine. Class Discussions Do Now Questions Class Activities- Submarine Prototype

	● Students work with partner using the EDP to develop and build a submarine prototype. ● Students use design and materials to create a submarine structure that is submersible and includes parts of a submarine. ● Students communicate and collaborate with partner to complete challenge. ● Students discuss their design and how they would change their build and design based on testing outcome. Class Discussions Do Now Questions

STAGE 3 – LEARNING PLAN

Activity 1- Ocean/Submarine Exploration

Objective:

- Investigate and classify different kinds of materials best for submarine build.
- Analyze, compare, and discuss a submarine and structure/parts of a submarine.
- Discuss and record information on the ocean: ocean levels, animals, plants, and landforms of the ocean.
- Record information gathered throughout discussions on class chart.

Activities:

- Introduce topic with read aloud/images/video, discussion of books, and questions to gather what students know about topic. Questions: Why might we need/want to study the ocean? What could we build to let us study the deep ocean? What are the different parts of a submarine we may want to include?
- Introduce materials investigation station for students to work in. Students will work with partner/group to investigate float/sink, different types of materials, their properties, and how they can use them.
- Observe the different levels of the ocean water, animals/plants that live in certain areas.
- Teacher will facilitate materials, stations, and question students as they work and investigate.

Activity 2- Submarine Build

Objective:

- Investigate the EDP, exploring the steps (ask, imagine, plan, create, improve, communicate) to design and build a submarine. Students will make connections to prior lessons concerning the ocean, best materials and set up for build, design submarine, and build submarine prototype.

Activities:

- Students work with group following the EDP to complete the design challenge of designing and building a submarine prototype.
- Brainstorm and illustrate a submarine design, including parts of the submarine vessel.
- Work with partner to gather materials needed and build prototype.

- Share ideas with group and class, how did we build our submarine, did we incorporate all the parts of the submarine, why we chose certain materials, what happened to our structure when tested, can it be improved.
- Analyze and discuss groups' designs and execution of the task (productive talk).
- Participate and work with partner/group to complete the challenge.
- Teacher will introduce, explain, and facilitate activity as students work in groups. Teacher will questions groups as they work with the EDP to solve the problem. Teacher will guide students through questions.

Differentiation:

- EDP allows multiple entry points and multiple ways to demonstrate understandings.

UNIT RESOURCES
Supplies Water bottle, straw, tube, water, tub, tape, weights, cardboard, paper, chenille sticks, flashlight (optional), construction paper, markers **Books:** Jack and Annie Series Papa's Mechanical Fish by Candence Fleming Super Submarines by Tony Mitten Flying Deep: Climb inside deep sea submersible Alvin by Michelle Cusolito **Enrichment:** ● Periscope- Design and build a periscope that can be used in a tank of water. ● Ocean Animal Projects (sharks, whales, etc.)- create ocean animals out of recycled materials. ● Blubber experiment- Investigate what blubber feels like and how it keeps an animal warm.

Unit Title: Moon and Space	**Duration: 6 days**

Stage 1-Desired Results	
Essential Questions	**Enduring Understandings**
Why would we (humans) want to know about the moon and space?	Learning about space and the moon gives us information about our planet Earth, from how craters were formed to tides of our oceans.

How might we research and investigate about the moon and space from Earth?	Technology allows us to build and design tools for space exploration, such as, space shuttles, rovers, space landers, telescopes, space stations.
	The world would be very different without technology.

New Jersey Student Learning Standards for Science
-2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to hange to define a simple problem that can be solved through the development of a new or improved bject or tool. -2-ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object elps it function as needed to solve a given problem. -2-ETS1-3. Analyze data from tests of two objects designed to solve the same problem to compare the rengths and weaknesses of how each performs.

Interdisciplinary Standards:
New Jersey Student Learning Standards for English Language Arts
RL.K.1. With prompting and support, ask and answer questions about key details in a text (e.g., who, what, where, when, why, how). RI.K.1. With prompting and support, ask and answer questions about key details in a text. NJSLSA.W7. Conduct short as well as more sustained research projects, utilizing an inquiry-based research process, based on focused questions, demonstrating understanding of the subject under investigation. W.K.2. Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic. 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. SL.K.1. Participate in collaborative conversations with diverse partners about *kindergarten topics and texts* with peers and adults in small and larger groups. K. Follow agreed-upon norms for discussions (e.g., listening to others with care and taking turns speaking about the topics and texts under discussion). L. Continue a conversation through multiple exchanges. SL.K.2. Confirm understanding of a text read aloud or information presented orally or through other media by asking and answering questions about key details and requesting clarification if something is not understood. SL.K.3. Ask and answer questions in order to seek help, get information, or clarify something that is not understood. SL.K.4. Describe familiar people, places, things, and events and, with prompting and support, provide additional detail. SL.K.5. Add drawings or other visual displays to descriptions as desired to provide additional detail. SL.K.6. Speak audibly and express thoughts, feelings, and ideas clearly.

Interdisciplinary Standards:
New Jersey Student Learning Standards for Math
Mathematical Practices 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. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning. Counting and Cardinality K.CC A. Know number names and the count sequence. B. Count to tell the number of objects. Measurement and Data K.MD A. Describe and compare measurable attributes. B. Classify objects and count the number of objects in each category. Geometry K.G A. Identify and describe shapes (squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres). B. Analyze, compare, create, and compose shapes.

New Jersey Student Learning Standards for Technology

8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.

A. Technology Operations and Concepts: *Students demonstrate a sound understanding of technology concepts, systems and operations.*

B. Creativity and Innovation: *Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.*

C. Communication and Collaboration: *Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.*

D. Digital Citizenship: *Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.*

E: Research and Information Fluency: *Students apply digital tools to gather, evaluate, and use information.*

F: Critical thinking, problem solving, and decision making: *Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.*

8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

A. The Nature of Technology: Creativity and Innovation *Technology systems impact every aspect of the world in which we live.*

C. Design: *The design process is a systematic approach to solving problems.*

In these unit plans, the following 21st Century Life and Careers skills are addressed:				
Check ALL that apply – **21st Century Themes**			**Indicate whether these skills are:** ● **E – Encouraged** ● **T – Taught** ● **A – Assessed**	
			Career Ready Practices	
9.1	**Personal Financial Literacy**		E	CRP1. Act as a responsible and contributing citizen and employee.
	Income and Careers		ETA	CRP2. Apply appropriate academic and technical skills.
	Money Management			CRP3. Attend to personal health and financial well-being.
	Credit and Debt Management		ETA	CRP4. Communicate clearly and effectively and with reason.
	Planning, Saving, and Investing		E	CRP5. Consider the environmental, social and economic impacts of decisions.
	Becoming a Critical Consumer		ETA	CRP6. Demonstrate creativity and innovation.
	Civic Financial Responsibility			CRP7. Employ valid and reliable research strategies.
	Insuring and Protecting		ET	CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
9.2	**Career Awareness, Exploration, and Preparation**			CRP9. Model integrity, ethical leadership and effective management.
	Career Awareness			CRP10. Plan education and career paths aligned to personal goals.
X	Career Exploration		ETA	CRP11. Use technology to enhance productivity.
	Career Preparation		ET	CRP12. Work productively in teams while using cultural global competence.

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
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__x__Recognize one's personal traits, strengths and limitations
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_____Understand and practice strategies for managing one's own emotions, thoughts and behaviors
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Social Awareness

_____Recognize and identify the thoughts, feelings, and perspectives of others
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__x__Develop, implement and model effective problem solving and critical thinking skills
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Relationship Skills

_____Establish and maintain healthy relationships
__x__Utilize positive communication and social skills to interact effectively with others
_____Identify ways to resist inappropriate social pressure
__x__Demonstrate the ability to present and resolve interpersonal conflicts in constructive ways
_____Identify who, when, where, or how to seek help for oneself or others when needed

Student Learning Targets / Objectives	
Students will know… ● The moon has different phases throughout the month. ● The moon has craters that form when other rocks hit the moon's surface. ● The moon revolves around the Earth. ● The moon can be seen at night. ● We use spaceships to visit the moon. ● People have landed on the moon. ● The moon is made of rock and ice. ● We use technology to research and discover new things about the moon and space. ● A scientist who is trained to travel in space is called an astronaut. ● Different materials can be used to build a space craft structure. ● Some materials and designs are better suited to build a spaceship. ● Working together allows for more ideas and better structures. ● Engineers influence our lives by creating technologically advanced devices.	**Students will be able to…** ● Record and recognize moon phases. ● Explain and create craters on the moon. ● Compare the earth and moon. ● Communicate facts about the moon and space verbally and through images. ● Research and develop a tool used for space exploration. ● Design (through illustrations) and develop a prototype of their space lander design. ● Build a space lander prototype using specific materials and design plan. ● Identify materials that are best suited for build. ● Work together to build a structure that resembles a space lander. ● Include parts of the space lander, use checklist rubric to complete build. ● Use images and story to help gather/imagine ideas for designs.

STAGE 2 – ASSESSMENT EVIDENCE	
Common Summative Assessments	Performance Task- Students explore and discuss moon, moon phases, craters, and space through books, videos, and images. Students rotate through stations to identify, illustrate, and discuss the moon and space. ● Teacher will facilitate and question students as they work, explaining and modeling stations throughout investigation. <u>Differentiation:</u> ▪ Students will be provided with visual directions, T-chart, hands-on materials, and rubric to complete each station. Performance Task- Students design and build a space lander prototype that lands gently on the ground. Students follow the EDP to complete the steps in order to design, create, test, and analyze their prototype. Students incorporate best materials and design needed for space lander prototype. ● Teacher will facilitate and question students as they work, explaining and modeling different strategies throughout build. <u>Differentiation:</u> ▪ High-Achieving: Students will focus on creating a space lander that falls gently, incorporating various parts of a space lander. ▪ ELL/Extra Support: The assessment is very hands-on, however students in need of more support will be provided with specific material, individual assistance, separate rubric checklist to guide build, and build will include at least 1 aspect of the space lander.
Formative Assessments	Class Activities- Moon Exploration ● Various books/images/videos showing moon, phases of moon, craters on moon. ● Images/designs of space landers. ● Hands-on investigation to explore the moon, its phases, and craters. ● Illustrate and discuss findings. Class Discussions Do Now Questions Class Activities- Space Lander Prototype ● Students work with partner using the EDP to develop and build a space lander prototype. ● Students use design and materials to create a space lander that lands and includes the different parts.

	● Students communicate and collaborate with partner to complete challenge. ● Students discuss their design and how they would change their build and design based on testing outcome. Class Discussions Do Now Questions

STAGE 3 – LEARNING PLAN

Activity 1- Moon Exploration

Objective:

- Investigate the moon, its phases, and craters through various hands on stations.
- Analyze, compare, and discuss findings about the moon and space.
- Discuss and record information of the moon and space on a class chart.

Activities:

- Introduce topic with read aloud/images/video, discussion of books, and questions to gather what students know about topic. Questions: Why does the moon look different in the night sky? Why does the moon have craters? How can we explore the different parts of the moon and space?
- Introduce investigation stations for students to work in. Students will work with partner/group to investigate the moon, the different phases of the moon, and craters of the moon.
- Stations:
  - Station A: Investigate craters on the moon through hands on activity.
  - Station B: Investigate phases of the moon using various materials and images.
  - Teacher will facilitate materials, stations, and question students as they work and investigate.

Activity 2- Space Lander Build

Objective:

- Investigate the EDP, exploring the steps (ask, imagine, plan, create, improve, communicate) to design and build a space lander. Students will make connections to prior lessons concerning the moon and the various components about the moon and set up for design and building of prototype.

Activities:

- Students work with group following the EDP to complete the design challenge of designing and building a space lander prototype.
- Brainstorm and illustrate a space lander design, including parts of the lander.

- Work with partner to gather materials needed and build prototype.
- Share ideas with group and class: how did we build our lander, did we incorporate all the parts of the space lander, why we chose certain materials, what happened to our structure when tested, how can it be improved.
- Analyze and discuss groups' designs and execution of the task (productive talk).
- Participate and work with partner/group to complete the challenge.
- Teacher will introduce, explain, and facilitate activity as students work in groups. Teacher will question groups as they work with the EDP to solve the problem. Teacher will guide students through questions.

Differentiation:

- EDP allows multiple entry points and multiple ways to demonstrate understandings.

UNIT RESOURCES
Supplies Cups, paper, tape, marshmallows, index cards, cardstock, paper, straws, chenille sticks, construction paper, markers **Books:** Jack and Annie Series National Geographic Big Book of Space The Moon Book by Gail Gibbons Next Time You See the Moon by Emily Morgan Buzz Aldrin Reaching for the Moon by Buzz Aldrin **Enrichment:** ● Rockets: build a telescope, space station dramatic play

Grade 1 STEM		**1st Grade Pacing Guide**
Note: STEM is a weekly course taught by the Elementary STEM teacher. Each unit takes place over 1 trimester.		
Unit		**Number of Days**
1.	**Scientific Process and Observation**	**13 days**
2.	**Sun, Moon, and Star Patterns**	**13 days**
3.	**Light and Sound Communication**	**13 days**

	Enrichment (during PLC time)	During Enrichment, activities can be extended correlating to the appropriate unit. The time devoted to Enrichment per grade level may vary by school building. Specific Enrichment extensions are included in each unit. In addition, block coding can be implemented during any open sessions using coding websites, Lego Robotics, Alex Toys coding tools, and other coding manipulatives.

Grade 1 STEM	Theme: Solar System: Space, Earth, Moon and Stars

Thematic Overview
Students explore the scientific process through observation and detailed illustrations. Students are introduced to patterns of the world/space around them through investigation of living and non-living things and their features. Students' drawings will include detailed illustrated visuals to represent their knowledge. As students move through the unit students will continue to focus on space through investigating constellations and rovers. While working on lunar rovers students will incorporate space knowledge gained to create codes for the rover mission. The culminating project of the unit will apply the engineering design process to create a lunar landing module that communicates through light and sound. Throughout the thematic unit, students will practice student-students, student-teacher discourse that encourages classroom conversations. Students will also cover a variety of science and engineering standards that will prepare them for the next stage of STEM exploration.

Unit Title: Scientific Process and Observation	Duration: 13 days

Stage 1-Desired Results	
Essential Questions	**Enduring Understandings**
How do scientists use observations to help them understand plants and animals or the living and nonliving world?	Scientists use their five senses to describe the world around them.
	Scientists include specific details to describe the characteristics of the world around them.

New Jersey Student Learning Standards for Science
1-LS1-1. Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.
1-LS1-2. Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.
1-LS3-1. Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.
Interdisciplinary Standards:
New Jersey Student Learning Standards for English Language Arts
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.
SL.1.5. Add drawings or other visual displays to descriptions when appropriate to clarify ideas, thoughts, and feelings.
SL.1.1. Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups. A. Follow agreed-upon norms for discussions (e.g., listening to others with care, speaking one at a time about the topics and texts under discussion). B. Build on others' talk in conversations by responding to the comments of others through multiple exchanges.
SL.1.4. Describe people, places, things, and events with relevant details, expressing ideas and feelings clearly.
NJSLSA.L1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

L.1.6. Use words and phrases acquired through conversations, reading and being read to, and responding to texts, including using frequently occurring conjunctions to signal simple relationships (e.g., because).

1.G.A.1. Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes (e.g., color, orientation, overall size); build and draw shapes to possess defining attributes.

Interdisciplinary Standards:
New Jersey Student Learning Standards for Math
Mathematical Practices 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. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning. 1.G.A.1. Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non defining attributes (e.g., color, orientation, overall size); build and draw shapes to possess defining attributes.

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Check ALL that apply – **21st Century Themes**			**Indicate whether these skills are:** ● **E – Encouraged** ● **T – Taught** ● **A – Assessed**	
			Career Ready Practices	
9.1	**Personal Financial Literacy**		E	CRP1. Act as a responsible and contributing citizen and employee.
	Income and Careers		ETA	CRP2. Apply appropriate academic and technical skills.
	Money Management			CRP3. Attend to personal health and financial well-being.
	Credit and Debt Management		ET,A	CRP4. Communicate clearly and effectively and with reason.
	Planning, Saving, and Investing		E	CRP5. Consider the environmental, social and economic impacts of decisions.
	Becoming a Critical Consumer		ETA	CRP6. Demonstrate creativity and innovation.
	Civic Financial Responsibility			CRP7. Employ valid and reliable research strategies.
	Insuring and Protecting		ET	CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
9.2	**Career Awareness, Exploration, and Preparation**			CRP9. Model integrity, ethical leadership and effective management.
X	Career Awareness			CRP10. Plan education and career paths aligned to personal goals.
X	Career Exploration		ETA	CRP11. Use technology to enhance productivity.
	Career Preparation		ET	CRP12. Work productively in teams while using cultural global competence.

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__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

_____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

_____Recognize and identify the thoughts, feelings, and perspectives of others
_____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
_____Demonstrate an awareness of the expectations for social interactions in a variety of settings

Responsible Decision Making

__x__Develop, implement and model effective problem solving and critical thinking skills
__x__Identify the consequences associated with one's action in order to make constructive choices
_____Evaluate personal, ethical, safety and civic impact of decisions

Relationship Skills

_____Establish and maintain healthy relationships
__x__Utilize positive communication and social skills to interact effectively with others
_____Identify ways to resist inappropriate social pressure
__x__Demonstrate the ability to present and resolve interpersonal conflicts in constructive ways
_____Identify who, when, where, or how to seek help for oneself or others when needed

Student Learning Targets / Objectives	
Students will know… ● That scientists describe the natural world by making observations. ● That offspring have similar characteristics to their parents. ● That offspring sometimes look slightly different from their parents. ● That creative and scientific drawings serve different purposes and look different. ● That scientists focus their drawings on the most important details.	**Students will be able to…** ● Name similarities and differences between parents and offspring. ● Describe the characteristics of an organism. ● Infer the name of an organism based on descriptive clues. ● Use their knowledge of scientific observation to critique another scientists' drawings. ● Construct a drawing of a plant or animal using scientific observation. ● Identify areas of improvement for their own scientific observations. ● Evaluate a classmate's drawing by providing kind, specific, and helpful suggestions. ● Incorporate self- and peer- feedback to re-create a scientific drawing. ● Identify specific changes that improved their ability to create a scientific representation. ● Use knowledge from Austin's butterfly lessons and apply to scientific drawing of Earth in space.

STAGE 2 – ASSESSMENT EVIDENCE	
Common Summative Assessments	Performance Task- Scientific Drawing of an Organism: Students draw at least 3 drafts of an organism by adding scientific details after observing a photograph. Students evaluate and improve this drawing over the course of 3-4 sessions, recreating more scientifically detailed each time. ● The teacher will observe students using the "Self and Peer Critique Rubric." ● <u>Differentiation:</u> ▪ High-Achieving: Students must produce at least 4 drafts and should exceed expectations on all areas of the rubric. ▪ ELL and Learners with Other Needs: The assessment is very visual, however students in need of more support will be provided with a more visual rubric. Performance Task- Scientific Drawing of the Earth: Students draw at least 2-3 drafts of the Blue Marble by adding scientific details after observing a photograph. Students evaluate and improve this drawing over the course of 2-3 sessions, recreating more scientifically detailed each time. ● The teacher will observe students using the "Self and Peer Critique Rubric." ● <u>Differentiation:</u> ▪ High-Achieving: Students will use less time to complete final draft and should exceed expectations on all areas of the rubric. ▪ ELL and Learners with Other Needs: The assessment is very visual, however students in need of more support will be provided with a more visual rubric.
Formative Assessments	ctivities-Austin's Butterfly o Students critique Austin's Butterfly (photographs) and teacher provides feedback o TCI plant and animal "Parent Offspring Card Game" o Drafts of Scientific Drawing of an Organism iscussions w Questions ctivities-Earth Image o Students critique Earth photographs from space and teacher provides feedback o Review of peer to peer critiques of student works o Drafts of Scientific Drawing of Earth in space iscussions Do Now Questions

STAGE 3 – LEARNING PLAN

Activity 1- (approximately 4 weeks) Austins's Butterfly Drawing

Objective:

- Make scientific observations of organisms and use those observations to create a scientific drawing of a plant or animal species.
- Use perseverance and revision to improve quality of work.
- Provide positive and specific critique to peers.

Activities

- Ask students, "What does a scientist do?" Explain that scientists make scientific observations to better understand the world around them. Explain to students that a boy in first grade was asked to draw a picture of a butterfly. Show students the first draft of Austin's Butterfly. Ask students to describe what they see. How can Austin make his drawing look more like the picture of the butterfly?
- Class introduction and review of productive conversations (peer to peer) (discourse cards)
- Facilitated by teacher students will be encouraged to "think like scientists" and critique drafts with observations that are specific and kind.
- Create multiple drafts of a chosen plant or animal species while using peer critiques to improve upon drawings.

Differentiation

- Higher level learners- create 3-4 drafts

Notes

- Teacher can explore these lesson in several ways, using graph paper to assist when drawing specific parts. Using the tracing paper may allow students to see the differences between each illustration when placed on each other.

Activity 2- (approximately 3 weeks) Earth Drawing

Objective:

- Use prior knowledge of observation to create a scientific drawing of the Earth.
  - Use perseverance and revision to improve quality of work.
  - Provide positive and specific critique to peers.

Activities

- Observe, discuss, and analyze images of Earth from space.
- Discuss details observed of image and create scientific drawings to represent image.
- Create multiple drafts of a scientific drawing of the Earth.

Differentiation

- Higher level learners should be able to complete their drawings in less drafts.

UNIT RESOURCES

- Supplies
  - Austin's Butterfly images (drafts) and video
    - https://modelsofexcellence.eleducation.org/resources/austins-butterfly
  - Drawing paper
    - graph paper, tracing paper, final paper
  - Images of Earth for Space (drafts)
  - Discourse Cards
  - Scavenger Hunt and Nature Walk Observation Sheet (Enrichment)
  - Nature Walk Scavenger Hunt Art Activity Record Sheet (Enrichment)
  - Think Like a Scientist Task Cards (Enrichment)

Unit Title: Sun, Moon, and Star Patterns	Duration: 13 days

Stage 1-Desired Results	
Essential Questions	**Enduring Understandings**
What is the Engineering Design Process?	Scientists and engineers use many ways to solve and find solutions to a problem. The engineering design process allows engineers to communicate and collaborate with others. Different tools and materials allow us to have new experiences and share ideas. The sun, moon, and stars have specific patterns and phases in our sky.
How can we use the engineering design process to improve our thinking, designing, creativity, and collaboration?	
How can the sun, moon, and stars help us make predictions?	

New Jersey Student Learning Standards for Science
1-ESS1-1. Use observations of the sun, moon, and stars to describe patterns that can be predicted.
K-2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
K-2-ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.
K-2-ETS1-3. Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

Interdisciplinary Standards:

New Jersey Student Learning Standards for English Language Arts

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.

SL.1.1. Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups. A. Follow agreed-upon norms for discussions (e.g., listening to others with care, speaking one at a time about the topics and texts under discussion). B. Build on others' talk in conversations by responding to the comments of others through multiple exchanges.

SL.1.2. Ask and answer questions about key details in a text read aloud or information presented orally or through other media.

SL.1.3. Ask and answer questions about what a speaker says in order to gather additional information or clarify something that is not understood.

SL.1.5. Add drawings or other visual displays to descriptions when appropriate to clarify ideas, thoughts, and feelings.

L.1.6. Use words and phrases acquired through conversations, reading and being read to, and responding to texts, including using frequently occurring conjunctions to signal simple relationships (e.g., because).

W.1.8. With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.

New Jersey Student Learning Standards for Math

Mathematical Practices

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.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

1.G.A.1. Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes (e.g., color, orientation, overall size); build and draw shapes to possess defining attributes.

1.MD A. Measure lengths indirectly and by iterating length units.

New Jersey Student Learning Standards for Technology

8.2.2.A.1 Define products produced as a result of technology or of nature.

8.2.2.A.3 Identify a system and the components that work together to accomplish its purpose.

8.2.2.A.4 Choose a product to make and plan the tools and materials needed.

8.2.2.A.5 Collaborate to design a solution to a problem affecting the community.

8.2.2.B.1 Identify how technology impacts or improves life.

8.2.2.C.1 Brainstorm ideas on how to solve a problem or build a product.

8.2.2.C.2 Create a drawing of a product or device that communicates its function to peers and discuss.

8.2.2.C.3 Explain why we need to make new products.

8.2.2.C.5 Describe how the parts of a common toy or tool interact and work as part of a system.

8.2.2.C.6 Investigate a product that has stopped working and brainstorm ideas to correct the problem.

8.2.2.D.1 Collaborate and apply a design process to solve a simple problem from everyday experiences.

8.2.2.D.3 Identify the strengths and weaknesses in a product or system.

In these unit plans, the following 21st Century Life and Careers skills are addressed:				
Check ALL that apply – **21st Century Themes**			**Indicate whether these skills are:** ● **E – Encouraged** ● **T – Taught** ● **A – Assessed**	
			Career Ready Practices	
9.1	**Personal Financial Literacy**		E	CRP1. Act as a responsible and contributing citizen and employee.
	Income and Careers		ETA	CRP2. Apply appropriate academic and technical skills.
	Money Management			CRP3. Attend to personal health and financial well-being.
	Credit and Debt Management		ET,A	CRP4. Communicate clearly and effectively and with reason.
	Planning, Saving, and Investing		E	CRP5. Consider the environmental, social and economic impacts of decisions.
	Becoming a Critical Consumer		ETA	CRP6. Demonstrate creativity and innovation.
	Civic Financial Responsibility			CRP7. Employ valid and reliable research strategies.
	Insuring and Protecting		ET	CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
9.2	**Career Awareness, Exploration, and Preparation**			CRP9. Model integrity, ethical leadership and effective management.
X	Career Awareness			CRP10. Plan education and career paths aligned to personal goals.
X	Career Exploration		ETA	CRP11. Use technology to enhance productivity.
	Career Preparation		ET	CRP12. Work productively in teams while using cultural global competence.

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

_____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

_____Recognize and identify the thoughts, feelings, and perspectives of others
_____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
_____Demonstrate an awareness of the expectations for social interactions in a variety of settings

Responsible Decision Making

__x__Develop, implement and model effective problem solving and critical thinking skills
__x__Identify the consequences associated with one's action in order to make constructive choices
_____Evaluate personal, ethical, safety and civic impact of decisions

Relationship Skills

_____Establish and maintain healthy relationships
__x__Utilize positive communication and social skills to interact effectively with others
_____Identify ways to resist inappropriate social pressure
__x__Demonstrate the ability to present and resolve interpersonal conflicts in constructive ways
_____Identify who, when, where, or how to seek help for oneself or others when needed

Student Learning Targets / Objectives	
Students will know… ● Patterns are observed in the day/night sky. ● Star patterns are visible in the night sky. ● Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted. ● Constellations are a group of stars that forms an imaginary pattern or object. ● Rovers are used to collect and record data of places unknown. ● Rovers are a piece of technology created to help people investigate and solve questions. ● Engineering Design Process are steps that scientists/engineers use to design a solution and solve problems.	**Students will be able to…** ● Make observations of the night sky. ● Build constellation structures that can be seen in the night sky. ● Create constellation patterns and explain a story. ● Ask questions, make observations, and gather information to solve and think about problems. ● Use the engineering design process to complete and create moveable rover. ● Communicate and collaborate with partner to complete EDP build. ● Develop a simple design to demonstrate and build. ● Analyze, compare, and discuss the various outcomes of the challenge.

STAGE 2 – ASSESSMENT EVIDENCE	
Common Summative Assessments	Performance Task- Constellations: Students create a constellation from diagrams with various materials. Students then design, create, and build their own constellation. ● Teacher will facilitate and question students as they work. ● <u>Differentiation</u>: ▪ High-Achieving: Students will produce a written story to explain their constellation they created. ▪ ELL/Extra Support: The assessment is very visual, however students will use images and peer/teacher assistance to help guide in their constellation design and build. Performance Task- Rover Build: Students will work in teams and use the EDP to imagine, design, create, and improve their rover model build. Students will evaluate and improve, using design and self/peer reflection and critique to guide their build. ● Teacher will facilitate and question students as they work, encouraging our failures as a learning tool.

	● Differentiation: ▪ High-Achieving: Students will use data to help make adjustments and produce a working rover. ▪ ELL and Learners with Other Needs: The assessment is very hands on, however students will use images and peer/teacher assistance to help guide in their design and build.
Formative Assessments	Class Activities-Constellations o Students build a constellation model. o Students design and create a constellation pattern. o Students share their constellation and story. Class Discussions Do Now Questions Class Activities-Rover Build o Students work with partner using the EDP to develop a design o Students use their design to build a working rover. o Students communicate and collaborate with partner to complete challenge. o Students improve their rover based on data collected from test trails. Class Discussions Do Now Questions

STAGE 3 – LEARNING PLAN

Activity 1- (approximately 2 weeks) Sky Patterns

Objective:

- Make and use a model to investigate and explain why the stars are visible at night but disappear when the sun comes out during the day.

Activities

- Ask students, why can we see stars at night but not during the day? Do they disappear? Where do they go? Show students the video on Mystery Science, "Why do the stars come out at night?" Ask students, why do you think you can see more stars in the country than you can in the city? Continue video and ask students if they can identify the Big Dipper in the cluster of stars.
- Mystery Science Star Projector Activity- make a paper cup star projector using the "Big Dipper" constellation.
- Use star projector to project constellation on a dimly lit sky picture-and see what happens when they light up that sky.

Differentiation

- ELL and Learners with Other Needs: The assessment is very hands-on, however students will use images and peer/teacher assistance to help guide in their constellation projector.

Activity 2- (approximately 3 weeks) Constellations

Objective:

- Explain a constellation pattern and how it is observed in the night sky.
- Arrange various materials to construct a constellation from images (diagrams).
- Design and create a fictional constellation.

Activities

- Story of how the Big Bear "Big Dipper" and the Little Bear "Little Dipper" became constellations.
- Constellation Activity Cards- Students construct a constellation using spaghetti and marshmallows. Students use prior knowledge (Austin's Butterfly) to self and peer critique their constellation build.
- Create and draw a fictional constellation and tell a story of the creation of their constellation.

Differentiation

- High-Achieving: Students will produce a written story to explain their constellation they created.
- ELL and Learners with Other Needs: The assessment is very visual and hands-on, however students will use images and peer/teacher assistance to help guide in their constellation design and build.

Activity 3- (approximately 4-5 weeks) Lunar Rovers

Objective:

- Use the EDP to design a diagram of a space rover.
- Work with partner/team to complete the EDP challenge.
- Use space rover design plan and given materials to build and create a working space rover based on rubric.
- Analyze data to evaluate and redesign build to improve moveable rover.
- Reflect on EDP and build.

Activities:

- Show students video of the Mars rover and rover yard at https://pbskids.org/video/. Discuss the importance of sending humans to other planets. Have we ever sent humans to another planet or anywhere else in space? Why or why not? What can we send in place of humans?
- Discussion on the rover and parts of a rover needed.
- Back to the Moon Activity: How can we help Snoopy get back to the Moon? Students use various materials to design and build a working space rover that will go down a ramp. Students work with partner/team throughout EDP. Groups will think like engineers to build, test, redesign, and explain builds.

Differentiation

- High-Achieving: Students will use data to help make adjustments and produce a working rover.
- ELL/Extra Support: The assessment is very hands on, however students will use images and peer/teacher assistance to help guide in their design and build.

UNIT RESOURCES

- Supplies
  - Constellation cards/diagrams
  - Marshmallow, sticks, spaghetti
  - Construction paper
  - Pasta (wheels), various materials
  - Cups
  - Straws/dowels
  - Tape
  - Index card
  - Lab sheet
  - Story of the Big Bear and Little Bear
  - Peanuts Back to the Moon Design Sheet (Activity 1)
  - Peanuts On to Orion Design Sheet (Activity 2 Enrichment)
- Read Aloud Books:
  - Star Stuff by: Stephanie Ross Sisson
  - Zoo In the Sky by: Jacqueline Mitton
  - The first Big Book of Space National Geographic by: Catherine D. Hughes

- Websites:

- https://www.nasa.gov/kidsclub/flash/clubhouse/index.html
- http://ymiclassroom.com/lesson-plans/peanuts-nasa/
- https://pbskids.org/video/
- https://www.youtube.com/watch?v=Ki_Af_o9Q9s

Enrichment:

- Dramatic play: Space Station
- Design a landing space by exploring parachutes and creating a vessel that can float within 12 inches of a specific target.

Unit Title: Light and Sound Communication	Duration: 13 days

Stage 1-Desired Results	
Essential Questions	**Enduring Understandings**
How can coding tools be used to create solutions?	Tools provide opportunities to have new experiences, acknowledge problems and share ideas.
	There are many ways to solve and find solutions to a problem.
How can we communicate with light or sound?	Light and sound objects help people communicate and help one another.

New Jersey Student Learning Standards for Science
1-PS4-3. Plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light. 1-PS4-4. Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance. K-2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool. K-2-ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. K-2-ETS1-3. Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

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New Jersey Student Learning Standards for Math
Mathematical Practices 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.

6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

1.G.A.1. Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes (e.g., color, orientation, overall size); build and draw shapes to possess defining attributes.
1.MD.C. 4. Represent and interpret data.

New Jersey Student Learning Standards for Technology

8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
A. Technology Operations and Concepts
B. Creativity and Innovation
C. Communication and Collaboration
E: Research and Information Fluency
F: Critical thinking, problem solving, and decision making
8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.
8.2.2.A.1 Define products produced as a result of technology or of nature.
8.2.2.A.3 Identify a system and the components that work together to accomplish its purpose.
8.2.2.A.4 Choose a product to make and plan the tools and materials needed.
8.2.2.A.5 Collaborate to design a solution to a problem affecting the community.
8.2.2.B.1 Identify how technology impacts or improves life.
8.2.2.C.1 Brainstorm ideas on how to solve a problem or build a product.
8.2.2.C.2 Create a drawing of a product or device that communicates its function to peers and discuss.
8.2.2.C.3 Explain why we need to make new products.
8.2.2.C.5 Describe how the parts of a common toy or tool interact and work as part of a system.
8.2.2.C.6 Investigate a product that has stopped working and brainstorm ideas to correct the problem.
8.2.2.D.1 Collaborate and apply a design process to solve a simple problem from everyday experiences.
8.2.2.D.3 Identify the strengths and weaknesses in a product or system.
8.2.2.E.2 Demonstrate an understanding of how a computer takes input through a series of written commands and then interprets and displays information as output.

8.2.2.E.3 Create algorithms (a sets of instructions) using a pre-defined set of commands (e.g., to move a student or a character through a maze).

8.2.2.E.4 Debug an algorithm (i.e., correct an error).

8.2.2.E.5 Use appropriate terms in conversation (e.g., basic vocabulary words: input, output, the operating system, debug, and algorithm).

In these unit plans, the following 21st Century Life and Careers skills are addressed:				
Check ALL that apply – **21st Century Themes**			**Indicate whether these skills are:** ● **E – Encouraged** ● **T – Taught** ● **A – Assessed**	
			Career Ready Practices	
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	Income and Careers		ETA	CRP2. Apply appropriate academic and technical skills.
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	Credit and Debt Management		ET,A	CRP4. Communicate clearly and effectively and with reason.
	Planning, Saving, and Investing		E	CRP5. Consider the environmental, social and economic impacts of decisions.
	Becoming a Critical Consumer		ETA	CRP6. Demonstrate creativity and innovation.
	Civic Financial Responsibility			CRP7. Employ valid and reliable research strategies.
	Insuring and Protecting		ET	CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
9.2	**Career Awareness, Exploration, and Preparation**			CRP9. Model integrity, ethical leadership and effective management.
X	Career Awareness			CRP10. Plan education and career paths aligned to personal goals.
X	Career Exploration		ETA	CRP11. Use technology to enhance productivity.
	Career Preparation		ET	CRP12. Work productively in teams while using cultural global competence.

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
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__x__Recognize one's personal traits, strengths and limitations
__x__Recognize the importance of self-confidence in handling daily tasks and challenges

Self-Management

_____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

_____Recognize and identify the thoughts, feelings, and perspectives of others
_____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
_____Demonstrate an awareness of the expectations for social interactions in a variety of settings

Responsible Decision Making

__x__Develop, implement and model effective problem solving and critical thinking skills
__x__Identify the consequences associated with one's action in order to make constructive choices
_____Evaluate personal, ethical, safety and civic impact of decisions

Relationship Skills

_____Establish and maintain healthy relationships
__x__Utilize positive communication and social skills to interact effectively with others
_____Identify ways to resist inappropriate social pressure
__x__Demonstrate the ability to present and resolve interpersonal conflicts in constructive ways
_____Identify who, when, where, or how to seek help for oneself or others when needed

Student Learning Targets / Objectives	
Students will know… ● Algorithm is a series of steps to complete a task or solve a problem. (coding) ● Vocabulary when working with coding and code programs. ● Coding programs can complete many different obstacles based on the sequencing and looping of the programmed blocks. ● The steps that scientists/engineers use to design a solution and solve problems are known as the Engineering Design Process (EDP).	**Students will be able to…** ● Communicate and collaborate in their stations to complete task that are associated to coding. ● Build and program code-a-pillar robot to complete design challenge. ● Use code blocks to program robot to move. ● Use coding vocabulary (sequencing, looping, and data). ● Predict and explore what happens when code-a-pillar blocks are repositioned. ● Design an obstacle and program code-a-pillar to complete obstacle through different coding blocks. ● Problem solve by rearranging segments to reach a goal. ● Collect data by recording the segments and the variety of movements they can perform. ● Use the engineering design process to complete and solve communication problem. ● Develop a simple design to demonstrate and build. ● Analyze, compare, and discuss the various outcomes of the challenge.

STAGE 2 – ASSESSMENT EVIDENCE	
Common Summative Assessments	Performance Tasks Code-a-pillars: Student will be introduced to and work with code using the code-a-pillar tool. Students will develop coding vocabulary as they predict and explore the code-a-pillar. Students will use knowledge through investigation to design, build, and code the code-a-pillar to complete a specific challenge. Coding Sites: Students will work with block coding through various sites to practice and explore coding. Students will develop vocabulary and investigate how block coding works. Students will use knowledge through the investigation coding through various interactive sites. Obstacle Course: Students will collaborate in teams to create a maze to be used for the end of unit code-a-pillar challenge. Teams will use guidelines to create the obstacle course. Students will use knowledge through investigation to plan, design, and build their obstacle course. ● Teacher will facilitate and question students as they work, explaining and modeling coding segments throughout investigation. ● Differentiation: ▪ Students work at own pace to investigate and complete the organization of coding segments to complete challenges.
Formative Assessments	Class Station Activities-Code and Obstacle Design o Students build and code the code-a-pillar to maneuver through groups designed obstacle. o Students improve their coding sequence based on data collected from test trails. Class Discussions Do Now Questions

STAGE 3 – LEARNING PLAN

Lesson 6 (approximately 10 weeks) Coding/Code-a-pillar

Objective:

- Introduced to the meaning of the word "code".
- Be encouraged to work together to make the Code-a-pillar "go".
- Be introduced to the words "sequencing and looping".
- Become familiar with the individual Code-a-pillar segments and how the order of the segments affects how Code-a-pillar moves.
- Become familiar with how to organize Code-a-pillar segments so that it repeats an action or group of actions.
- Make connections between arrow symbols and movement.
- Practice problem solving skills in small groups.
- Predict and explore what happens if a Code-a-pillar moves on different types of surfaces.
- Help a Code-a-pillar avoid obstacles through sequencing.
- Design an obstacle course for their Code-a-pillar to move through.
- Use measurement tools to record data on the movements a Code-a-pillar makes.
- See trial and error as a process.

Activities/Stations:

- Ask students to think about the videos that they watched and the rovers that they built earlier. How was the rover on Mars able to explore the planet? How do scientists and engineers control the rover? Explain to students that engineers have to program or "code" the rover to do different tasks such as move forward, pick up a rock, take pictures, etc.
- Explain to students that they will work with a Code-a-pillar to make it do different tasks just like engineers do with a rover.

- **Meet a Code-a-pillar**- Students will be given the opportunity to interact with Code-a-pillar in small groups and explore how the toy works through open-ended, child-directed play. Groups will explore sequencing, data collection, and problem solving. Utilize the lessons on the Code-a-pillar Teacher Guide at https://www.fisher-price.com/en_US/CodeapillarTeacherGuide.pdf
- **Lunar Obstacle Course-** Groups will design a lunar obstacle course and story that narrates Code-a-pillar activities. After completing this activity students should successfully run the Code-a-pillar through the obstacle course and explain how they solved each obstacle.

Lesson 7 (approximately 5 weeks) Light and Sound

Objective:

- Identify the importance of light.
- Explain the way light travels in a pinhole box.
- Follow a given plan investigating the path of light.
- Discover objects that can be seen through a pinhole box because of the way that the light is hitting the object.
- Record data based on their observations.

Activities:

- Pinhole Boxes STEM Challenge- Hold a class discussion as to why we need light. Place a toy inside a box. You may have 5-6 different groups and each group can have a different toy. Use a pen to poke a hole in the side of the box. Explain to students that they need to figure out what is inside the box without opening it. Ask students to look through hole and describe what they see. Students problem solve to figure out a way to see what is inside of the box. (ex. Poking more holes, shining a flashlight through the holes, etc.) Students draw pictures of what they see and label it. Students can rotate through stations to identify what is in each box.

UNIT RESOURCES

- Supplies
    - Code-a-pillar
    - Unplugged coding activities
    - Various materials for obstacle course: consumables, recycled materials
    - Sound Vibrations materials from TCI Kits

- Websites
    - https://www.kodable.com/
    - https://code.org/
    - https://www.abcya.com/games/lightbot
- https://www.fisher-price.com/en_US/CodeapillarTeacherGuide.pdf
- https://mysteryscience.com/waves/mystery-1/sound-vibrations/50
- www.teachtci.com

Book Resources:

- Sky Color by: Peter H Reynolds
- How to Code a Sandcastle by: Joshua Funk
- Rosie Revere Engineer by: Andrea Beaty
- Ada Twist Scientist by: Andrea Beaty
- Iggy Peck Architect by: Andrea Beaty

Suggested Enrichment Activities

- Scavenger Hunt and Nature Walk Observation
- Nature Walk Scavenger Hunt Art Activity
- Think Like a Scientist Task Cards
- Peanuts Activity 2- On To Orion
- Mystery Science Activity- How far can a whisper travel?
- TCI Unit 2 Lesson 6- How do people use light and sound to send messages?

Grade 2 STEM		2nd Grade Pacing Guide
Note: STEM is a weekly course taught by the Elementary STEM teacher. Each unit takes place over 1 trimester.		
Unit		**Number of Days**
1.	Changing Earth	**13 days**
2.	Properties of Matter	**13 days**
3.	Nature: Pollination Devices	**13 days**
	Enrichment (during PLC time)	During Enrichment, activities can be extended correlating to the appropriate unit. The time devoted to Enrichment per grade level may vary by school building. Specific Enrichment extensions are included in each unit. In addition, block coding can be implemented during any open sessions using coding websites, Lego Robotics, Alex Toys coding tools, and other coding manipulatives.

Grade 2 STEM	Theme: Human Usage of Materials

Thematic Overview
Throughout this thematic unit, students investigate material properties and how materials can be used in ways to solve problems. Students first explore the Earth and its ever-changing landscape. Students apply the engineering design process to create solutions that limit or stop the impact of erosion on an area. As students move through the unit, they will continue their investigation of materials and their observable properties by determining best material to use in a design challenge. As the year comes to an end students continue their thematic overview incorporating life science and their knowledge of materials by researching animal dispersal of seeds and pollination to develop a device that mimics seed dispersal to pollinate plants. Throughout the year students will practice student-student and student-teacher discourse that encourages classroom conversations. Students will also cover a variety of science and engineering standards that will prepare them for the next stage of STEM exploration.

Unit Title: Changing Earth	Duration: 13 days

Stage 1-Desired Results

Essential Questions	Enduring Understandings
How are different landforms created?	The Earth and landforms are ever changing. Land can change through a slow process, such as, erosion and weather or quickly through landslides, eruptions, or earthquakes.
How might you design a structure to prevent and limit erosion?	Humans need to adapt to the changing land since many humans live in affected areas.
	Humans can use natural and man-made materials to prevent/limit erosion.

New Jersey Student Learning Standards for Science
2-ESS2-1. Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.
2-ESS1-1. Use information from several sources to provide evidence that Earth events can occur quickly or slowly.
K-2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
K-2-ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.
K-2-ETS1-3. Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs

Interdisciplinary Standards:

New Jersey Student Learning Standards for English Language Arts

RI.2.1. Ask and answer such questions as *who, what, where, when, why*, and *how* to demonstrate understanding of key details in a text.

RI.2.7. Explain how specific illustrations and images (e.g., a diagram showing how a machine works) contribute to and clarify a text.

NJSLSA.W1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

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.W7. Conduct short as well as more sustained research projects, utilizing an inquiry-based research process, based on focused questions, demonstrating understanding of the subject under investigation.

NJSLSA.W8. Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.

NJSLSA.W9. Draw evidence from literary or informational texts to support analysis, reflection, and research.

W.2.2. Write informative/explanatory texts in which they introduce a topic, use evidence-based facts and definitions to develop points, and provide a conclusion.

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.

NJSLSA.SL4. Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.

SL.2.1. Participate in collaborative conversations with diverse partners about *grade 2 topics and texts* with peers and adults in small and larger groups.

A. Follow agreed-upon norms for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the topics and texts under discussion).
B. Build on others' talk in conversations by linking their explicit comments to the remarks of others.

C. Ask for clarification and further explanation as needed about the topics and texts under discussion.

SL.2.2. Recount or describe key ideas or details from a text read aloud or information presented orally or through other media.

SL.2.3. Ask and answer questions about what a speaker says in order to clarify comprehension, gather additional information, or deepen understanding of a topic or issue.

SL.2.5. Use multimedia; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings.

Interdisciplinary Standards:

New Jersey Student Learning Standards for Math

Mathematical Practices

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.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Operations and Algebraic Thinking 2.OA

Measurement and Data 2.MD

Interdisciplinary Standards:
New Jersey Student Learning Standards for Technology

8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.

A. Technology Operations and Concepts

B. Creativity and Innovation

C. Communication and Collaboration

E: Research and Information Fluency

F: Critical thinking, problem solving, and decision making

8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

A. The Nature of Technology: Creativity and Innovation *Technology systems impact every aspect of the world in which we live.*

B. Technology and Society: *Knowledge and understanding of human, cultural and societal values are fundamental when designing technological systems and products in the global society.*

C. Design: *The design process is a systematic approach to solving problems.*

D. Abilities for a Technological World: *The designed world is the product of a design process that provides the means to convert resources into products and systems.*

E. Computational Thinking: Programming: *Computational thinking builds and enhances problem solving, allowing students to move beyond using knowledge to creating knowledge.*

In these unit plans, the following 21st Century Life and Careers skills are addressed:				
Check ALL that apply – **21st Century Themes**			**Indicate whether these skills are:** ● **E – Encouraged** ● **T – Taught** ● **A – Assessed**	
			Career Ready Practices	
9.1	**Personal Financial Literacy**		E	CRP1. Act as a responsible and contributing citizen and employee.
	Income and Careers		ETA	CRP2. Apply appropriate academic and technical skills.
	Money Management			CRP3. Attend to personal health and financial well-being.
	Credit and Debt Management		ETA	CRP4. Communicate clearly and effectively and with reason.
	Planning, Saving, and Investing		ET	CRP5. Consider the environmental, social and economic impacts of decisions.
	Becoming a Critical Consumer		ETA	CRP6. Demonstrate creativity and innovation.
	Civic Financial Responsibility		E	CRP7. Employ valid and reliable research strategies.
	Insuring and Protecting		ETA	CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
9.2	**Career Awareness, Exploration, and Preparation**			CRP9. Model integrity, ethical leadership and effective management.
X	Career Awareness			CRP10. Plan education and career paths aligned to personal goals.
X	Career Exploration		ETA	CRP11. Use technology to enhance productivity.
	Career Preparation		ET	CRP12. Work productively in teams while using cultural global competence.

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

_____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

_____Recognize and identify the thoughts, feelings, and perspectives of others
_____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
_____Demonstrate an awareness of the expectations for social interactions in a variety of settings

Responsible Decision Making

__x__Develop, implement and model effective problem solving and critical thinking skills
__x__Identify the consequences associated with one's action in order to make constructive choices
_____Evaluate personal, ethical, safety and civic impact of decisions

Relationship Skills

_____Establish and maintain healthy relationships
__x__Utilize positive communication and social skills to interact effectively with others
_____Identify ways to resist inappropriate social pressure
__x__Demonstrate the ability to present and resolve interpersonal conflicts in constructive ways
_____Identify who, when, where, or how to seek help for oneself or others when needed

Student Learning Targets / Objectives	
nts will know…	**nts will be able to…**
● Landforms are creating over long and short periods of time (quickly/shortly). ● Man-made and natural materials can be used to limit and prevent erosion. ● Earth forms change slowly or rapidly. ● Wind, water, and ice can change the shape of the land. ● Engineers compare multiple solutions to solve a problem. ● That there is more than one possible solution to a problem. ● Developing and using technology has an impact on the natural world.	● Demonstrate a quick/slow process of land erosion. ● Rotate and record information gathered through stations on landforms. ● Label and draw different types of erosion (wind, ice, water). ● Label and draw different landforms. ● Compare and discuss multiple solutions to solve the problem. ● Reflect on the solution and adjust/improve plan. ● Share possible solutions to a problem. ● Critique how technology has impacted the natural world.

STAGE 2 – ASSESSMENT EVIDENCE	
Common Summative Assessments	Performance Task- Students rotate through various stations that involve visual and hands-on investigations for students to identify, illustrate, and discuss different landforms and how they are formed. ● Teacher will facilitate and question students as they work, explaining and modeling stations throughout investigation. <u>Differentiation:</u> ▪ ELL and Learners with Other Needs: Students will be provided with visual directions and rubric to complete each station. Performance Task- Students design and build a solution using natural and man-made materials to limit the impact of erosion in a certain area. ● Teacher will facilitate and question students as they work, explaining and modeling different strategies throughout investigation. <u>Differentiation:</u> ▪ High-Achieving: Students will focus on creating an area that can withstand more than 1 impact of erosion (water, wind, ice).

	▪ ELL and Learners with Other Needs: The assessment is very hands-on, however students in need of more support will be provided with limited material, individual assistance, and separate rubric checklist to guide build of 1 impact.
Formative Assessments	Class Activities- Landform Stations ● Various media (videos, images) showing landforms and landform formations ● Interactive investigation to explore landform development and length of time to create ● Hands-on investigation of wind, water, ice erosion ● Record findings throughout station rotations Class Activities- Erosion Structure ● Students work with partner using the EDP to develop a design to prevent erosion. ● Students use design and materials to create an area that may withstand land, water, or ice erosion. ● Students communicate and collaborate with partner to complete challenge. ● Students improve their design and build based on data collected from test trails. Class Discussions Do Now Questions

STAGE 3 – LEARNING PLAN

Activity 1- Landform Stations

Objective:

- Investigate weathering and erosion through various hands-on and interactive stations.
- Analyze, compare, and discuss how landforms are made.
- Research landforms and their formation using interactive games.
- Collect and record information gathered throughout station rotations.

Activities

- Introduce topic with anchoring phenomena video/images (mudslide, water erosion, Grand Canyon formation). Question students "How can we prevent/stop erosion?" Discuss landforms and different types and how they can be formed.
- Introduce investigation stations for students to work in. Students will work with partner/group to investigate different types of landforms. Students will record their findings on their lab sheet/notebook.
- Stations:
  - Landform Activity Cards: identify wind, water, or ice erosion.
  - Wind Erosion: using a straw students will blow through to represent wind and how it can change the land
  - Water Erosion: using water students will pour to represent how it can change the land
  - Ice Erosion: using an ice cube students will place on land to see how it can change the land
  - Website: Students will use site to investigate the time line of erosion (fast/slow)
  - Teacher will facilitate landforms station and questions students as they work and investigate.

Differentiation

- Stations incorporate various learning strategies to reach all levels and types of learners: visual, auditory, reading/writing, and kinesthetic.

Activity 2- Landform Barrier Build

Objective:

- Investigate the EDP through prevention designs using the steps (ask, imagine, plan, create, improve, communicate) to solve the problem.
- Brainstorm various ideas choosing one to develop a diagram to represent, build, and prepare materials.
- Build a model from diagram to represent design to prevent/slow down erosion.
- Question and make observations about erosion solution designs and how it worked/did not work.
- Analyze, compare, and discuss the various team outcomes of the challenge. (Productive Talk)
- Participate and work with partner/group to complete the challenge.

Activities:

1. Students work with team following the EDP to complete the challenge of finding a solution to prevent/slow down erosion in a certain area.
2. Create a list of thoughts ideas and materials that can be used to complete the challenge.
3. Choose team's best idea to prepare and construct the erosion barrier.
4. Predict, analyze, and compare the outcomes of team and class solutions. Here students reflect and discuss in teams, as well as whole group, on positives and negatives of build (productive talk).
5. Evaluate discussion and build and redesign/reconstruct to improve design.

- Teacher will introduce, explain, and facilitate activity as students work in groups. Teacher will questions groups as they work with the EDP to solve the problem. Teacher will guide students through questions: What do you need to take into account when making your model? What materials will help slow down the movement of the sand? Is erosion able to be completely stopped?

Differentiation:

EDP allows multiple entry points and multiple ways to demonstrate understandings.

UNIT RESOURCES

- Supplies
    - Various natural and Recycled materials: plastic, plastic bags, cardboard, paper, sand, rocks, soil, wood pieces, grass, trees
    - Mini-Legos (building structures)

- Enrichment:
    - Coding Activities: Code.org, Tynker.com

Unit Title: Properties of Matter	Duration: 13 days

Stage 1-Desired Results	
Essential Questions	**Enduring Understandings**
How can I describe and classify objects?	All matter can be described and classified by its observable properties (color, texture, hardness, and flexibility). Different materials are suited for different purposes depending on their physical properties. Simple test can be designed to gather evidence to show how a materials property work in different situations.
How do the properties of materials relate to their use?	
Why might some material be better suited for certain building challenges than others?	

New Jersey Student Learning Standards for Science
2-PS1-1. Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties. [Clarification Statement: Observations could include color, texture, hardness, and flexibility. Patterns could include the similar properties that different materials share.] 2-PS1-2. Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.* [Clarification Statement: Examples of properties could include, strength, flexibility, hardness, texture, and absorbency.] [Assessment Boundary: Assessment of quantitative measurements is limited to length.] 2-PS1-3. Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object. K-2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool. K-2-ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. K-2-ETS1-3. Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.
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C. Ask for clarification and further explanation as needed about the topics and texts under discussion.

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New Jersey Student Learning Standards for Math

Mathematical Practices
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	Money Management			CRP3. Attend to personal health and financial well-being.
	Credit and Debt Management		ETA	CRP4. Communicate clearly and effectively and with reason.
	Planning, Saving, and Investing		ET	CRP5. Consider the environmental, social and economic impacts of decisions.
	Becoming a Critical Consumer		ETA	CRP6. Demonstrate creativity and innovation.
	Civic Financial Responsibility		E	CRP7. Employ valid and reliable research strategies.
	Insuring and Protecting		ETA	CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
9.2	**r Awareness, Exploration, and ration**			CRP9. Model integrity, ethical leadership and effective management.
X	Career Awareness			CRP10. Plan education and career paths aligned to personal goals.
X	Career Exploration		ETA	CRP11. Use technology to enhance

				productivity.
	Career Preparation		ET	CRP12. Work productively in teams while using cultural global competence.

INTEGRATED SOCIAL AND EMOTIONAL LEARNING COMPETENCIES

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__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

_____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
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Social Awareness

_____Recognize and identify the thoughts, feelings, and perspectives of others
_____Demonstrate an awareness of the differences among individuals, groups, and others' cultural backgrounds
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_____Demonstrate an awareness of the expectations for social interactions in a variety of settings

Responsible Decision Making

__x__Develop, implement and model effective problem solving and critical thinking skills
__x__Identify the consequences associated with one's action in order to make constructive choices
_____Evaluate personal, ethical, safety and civic impact of decisions

Relationship Skills

_____Establish and maintain healthy relationships
__x__Utilize positive communication and social skills to interact effectively with others
_____Identify ways to resist inappropriate social pressure
__x__Demonstrate the ability to present and resolve interpersonal conflicts in constructive ways
_____Identify who, when, where, or how to seek help for oneself or others when needed

Student Learning Targets / Objectives	
nts will know… ● Different kinds of matter exist (solid, liquid, gas). ● Matter can be described and classified by its observable properties. ● Different properties are suited to different purposes. ● Many objects can be built up from a smaller set of objects. ● Simple tests can be designed to gather evidence to support or refute ideas. ● Engineers compare multiple solutions to solve a problem. ● That there is more than one possible solution to a problem. ● Developing and using technology has an impact on the natural world.	**ıts will be able to…** ● Identify properties of matter. ● Describe and classify material based on observable properties. ● Describe and classify material based on potential uses. ● Compare strengths and weaknesses of structure materials and structure builds. ● Test and compare materials in relation to how each performs in a structure. ● Ask questions, make observations, and gather information that are helpful in solving problems. ● Reflect on the solution and adjust/improve the plan.

STAGE 2 – ASSESSMENT EVIDENCE	
Common Summative Assessments	Performance Task- Students rotate through various hands-on investigations for students to manipulate and classify different kinds of materials by their observable properties: color, texture, flexibility, absorption, hardness. ● Teacher will facilitate and question students as they work, explaining and modeling stations throughout investigation. <u>Differentiation:</u> ▪ ELL and Learners with Other Needs: Students will be provided with modeling, visual directions, and a rubric to complete each station.

	Performance Task- Students apply their knowledge and skills to determine the best material to solve a design problem and then evaluate how their designs might be improved. ● Teacher will facilitate and question students as they work, explaining and modeling different strategies and materials throughout investigation. <u>Differentiation:</u> ▪ Engineering Design Process allows multiple entry points and multiple ways to demonstrate understandings to meet all needs or learners. ▪ ELL and Learners with Other Needs: The assessment is hands-on, however students in need of more support will be provided with a specific task card for build. Including checklist, images, and written directions for guide.
Formative Assessments	Class Activities- Observable Properties Stations ● Various media (videos, images) showing of materials and their observable materials ● Hands-on investigation to explore and test various materials/objects: compare/contrast, absorbency, strength, flexibility, construct/deconstruct, reversible/irreversible changes. ● Record findings throughout station rotations Class Discussions Do Now Questions ss Activities- Material Build Challenge ● Students work with partner using the EDP to develop a design to solve a design problem. ● Students use design and specific materials to create to complete challenge. ● Students communicate and collaborate with partner/team. ● Students evaluate and improve their design and build based on data collected from test trails. Class Discussions Do Now Questions

STAGE 3 – LEARNING PLAN

Activity 1- Materials Stations

Objective:

- Investigate and classify different kinds of materials by their observable properties through various hands-on and interactive stations.
- Analyze, compare, and discuss how materials are different and how they can be used.
- Collect and record information gathered throughout station rotations

Activities:

- Introduce topic with video/images, demonstration of materials. Question students: "What properties do these materials share?", "How can we manipulate these materials into something else?", and "How are these materials useful?"
- Introduce investigation stations for students to work in. Students will work with partner/group to investigate different types of materials and their properties. Students will record their findings on their lab-sheet/notebook.
- Stations:
  - Matter Activity Cards: identify solid, liquid, and gas.
  - Properties Activity: using various materials students explore, observe, describe, compare, and classify properties of matter.
  - Station A: Investigate which material is most absorbent and compare the differences/similarities.
  - Station B: Test different materials for strength and record the findings.
  - Station C: Identify whether material is flexible or not and record findings.
  - Teacher will facilitate material stations and question students as they work and investigate.

Activity 2- Material Build Challenge

Objective:

- Investigate the EDP, completing the steps (ask, imagine, plan, create, improve, communicate) to solve a design problem. Students will make connections to prior lessons concerning observable materials and will now link to an intended purpose.
- Brainstorm various ideas using prior knowledge, choosing one to illustrate a diagram that represents build and prepare materials.
- Build a model from diagram to represent, design, and solve a problem.
- Question and make observations about materials and their use to solve the design problem and how their designs might be improved.
- Analyze, compare, and discuss the various team outcomes of the challenge. (Productive Talk)
- Participate and work with partner/group to complete the challenge.

Activities:

- Students work with team following the EDP to complete the design challenge of determining the best material and best use of the material to solve the design problem.
- Create a list of thoughts, ideas, and materials that can be used to complete the challenge.
- Choose the team's best idea to prepare and construct the structure.
- Predict, analyze, and compare the outcomes of the individual team and class solutions. Here students reflect and discuss in teams, as well as, whole group on positives and negatives of the design build. (productive talk)
- Evaluate discussion and build and redesign/reconstruct to improve design.
- Teacher will introduce, explain, and facilitate activity as students work in groups. Teacher will questions groups as they work with the EDP to solve the problem. Teacher will guide students through questions: What do you need to take into account when making your model? What about the material is useful? What properties does the material have to help with the build?

Differentiation:

- EDP allows multiple entry points and multiple ways to demonstrate understandings.

Notes: Various builds can be used to complete this design challenge. Some examples include: 3 Little Pigs build, Bridge build, Boat build, Shelter build.

UNIT RESOURCES

- Supplies:
  Wood pieces, sticks, paper, sponge, paper towels, cardboard, foil, recycled materials, plastic, etc…

- Read Aloud Books:
  Dreaming Up by Christy Hale
  Bridges by Susan Canizares
  Iggy Peck Architect by Andrea Beaty

- Websites:
  TCI
  Mystery Science

- Enrichment:
  - Coding Activities: Code.org, Tynker.com
  - Extension Activities: Additional Structure builds using Andrea Beaty engineering books.

Unit Title: Nature: Pollination Device	Duration: 13 days

Stage 1-Desired Results	
Essential Questions	**Enduring Understandings**
How might animals help humans and our environment?	Insects and animals are important for our many ecosystems around the world because they produce seeds to continue the life cycle of plants and flowers.
	Pollinators pollinate 75% of our flowering plants and crops around the world.
Why might the form or structure of a plant affect its pollination ability?	There are specific pollinators for the many different size and shaped plants in our ecosystem.

New Jersey Student Learning Standards for Science
2-LS2-2. Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.
K-2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
K-2-ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.
K-2-ETS1-3. Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

Interdisciplinary Standards:
New Jersey Student Learning Standards for English Language Arts
1. Ask and answer such questions as *who, what, where, when, why*, and *how* to demonstrate understanding of key details in a text.
7. Explain how specific illustrations and images (e.g., a diagram showing how a machine works) contribute to and clarify a text.
LSA.W1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
LSA.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.
LSA.W7. Conduct short as well as more sustained research projects, utilizing an inquiry-based research process, based on focused questions, demonstrating understanding of the subject under investigation.
LSA.W8. Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.
LSA.W9. Draw evidence from literary or informational texts to support analysis, reflection, and research.
W.2.2. Write informative/explanatory texts in which they introduce a topic, use evidence-based facts and definitions to develop points, and provide a conclusion.
LSA.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.
LSA.SL2. Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.
LSA.SL3. Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.
LSA.SL4. Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.
.1. Participate in collaborative conversations with diverse partners about *grade 2 topics and texts* with peers and adults in small and larger groups. D. Follow agreed-upon norms for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the topics and texts under discussion). E. Build on others' talk in conversations by linking their explicit comments to the remarks of others. F. Ask for clarification and further explanation as needed about the topics and texts under discussion.
.2. Recount or describe key ideas or details from a text read aloud or information presented orally or through other media.

.3. Ask and answer questions about what a speaker says in order to clarify comprehension, gather additional information, or deepen understanding of a topic or issue.

.5. Use multimedia; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings.

New Jersey Student Learning Standards for Math

Mathematical Practices

. Make sense of problems and persevere in solving them.

. Reason abstractly and quantitatively.

. Construct viable arguments and critique the reasoning of others.

. Model with mathematics.

. Use appropriate tools strategically.

. Attend to precision.

. Look for and make use of structure.

. Look for and express regularity in repeated reasoning.

Operations and Algebraic Thinking 2.OA

Measurement and Data 2.MD

New Jersey Student Learning Standards for Technology

8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.

A. Technology Operations and Concepts: *Students demonstrate a sound understanding of technology concepts, systems and operations.*

B. Creativity and Innovation: *Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.*

C. Communication and Collaboration: *Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.*

D. Digital Citizenship: *Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.*

E: Research and Information Fluency: *Students apply digital tools to gather, evaluate, and use information.*

F: Critical thinking, problem solving, and decision making: *Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.*

8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

A. The Nature of Technology: Creativity and Innovation *Technology systems impact every aspect of the world in which we live.*

B. Technology and Society: *Knowledge and understanding of human, cultural and societal values are fundamental when designing technological systems and products in the global society.*

C. Design: *The design process is a systematic approach to solving problems.*

D. Abilities for a Technological World: *The designed world is the product of a design process that provides the means to convert resources into products and systems.*

E. Computational Thinking: Programming: *Computational thinking builds and enhances problem solving, allowing students to move beyond using knowledge to creating knowledge.*

In these unit plans, the following 21st Century Life and Careers skills are addressed:		
Check ALL that apply – **21st Century Themes**		**Indicate whether these skills are:** ● **E – Encouraged** ● **T – Taught** ● **A – Assessed**

			Career Ready Practices	
9.1	**Personal Financial Literacy**		E	CRP1. Act as a responsible and contributing citizen and employee.
	e and Careers		ETA	CRP2. Apply appropriate academic and technical skills.
	Management			CRP3. Attend to personal health and financial well-being.
	and Debt Management		ETA	CRP4. Communicate clearly and effectively and with reason.
	ng, Saving, and Investing		ET	CRP5. Consider the environmental, social and economic impacts of decisions.
	ing a Critical Consumer		ETA	CRP6. Demonstrate creativity and innovation.
	Financial Responsibility		E	CRP7. Employ valid and reliable research strategies.
	g and Protecting		ETA	CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
9.2	**r Awareness, Exploration, reparation**			CRP9. Model integrity, ethical leadership and effective management.
X	Awareness			CRP10. Plan education and career paths aligned to personal goals.
X	Exploration		ETA	CRP11. Use technology to enhance productivity.
	Career Preparation		ET	CRP12. Work productively in teams while using cultural global competence.

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

_____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

_____Recognize and identify the thoughts, feelings, and perspectives of others

_____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

_____Demonstrate an awareness of the expectations for social interactions in a variety of settings

Responsible Decision Making

__x__Develop, implement and model effective problem solving and critical thinking skills

__x__Identify the consequences associated with one's action in order to make constructive choices

_____Evaluate personal, ethical, safety and civic impact of decisions

Relationship Skills

_____Establish and maintain healthy relationships

__x__Utilize positive communication and social skills to interact effectively with others

_____Identify ways to resist inappropriate social pressure

__x__Demonstrate the ability to present and resolve interpersonal conflicts in constructive ways

_____Identify who, when, where, or how to seek help for oneself or others when needed

Student Learning Targets / Objectives	
nts will know… ● Plants and animals depend on each other. ● Animals help with seed dispersal and pollinate plants. ● There are many different kinds of living things in any area. ● That specific pollinators visit certain flowers/plants. ● That some pollinators are in danger. ● Pollinators are important for our ecosystem. ● What can be done to help pollinators? ● Engineers compare multiple solutions to solve a problem. ● That there is more than one possible solution to a problem. ● Developing and using technology has an impact on the natural world.	**nts will be able to…** ● Explain how both plants and pollinators benefit from pollination. ● Explain how humans benefit from pollination and how pollinator loss affects us. ● Make observations and collect data to make comparisons. ● Identify how the shape of pollinators affects their function as a pollinator. ● Design and create a device through sketch, drawings, or model that mimics a pollinator. ● Test and compare materials and how each can be used to create pollinator structure. ● Ask questions, make observations, and gather information that are helpful in solving the problem. ● Reflect on the solution and adjust/improve plan and build. ● Incorporate knowledge from prior builds to share and critique how some materials are better suited for the pollinator build challenge. ● Connect classroom challenge to real world pollinator crisis. ● Create a school yard pollinator habitat.

STAGE 2 – ASSESSMENT EVIDENCE	
Common Summative Assessments	Performance Task- Students rotate through various hands-on investigations for students to explore and analyze different kinds of pollinators and plants. Students will record their observations to use for future design build. ● Teacher will facilitate and question students as they work, explaining and modeling stations throughout investigation. <u>Differentiation:</u> ▪ ELL and Learners with Other Needs: Students will be provided with modeling, visual directions, and rubric to complete each station. Performance Task- Students apply their knowledge and skills to determine the best material and shape for their pollinator design build and then evaluate how their designs might be improved. ● Teacher will facilitate and question students as they work, explaining and modeling different strategies, materials, and functions throughout investigation. <u>Differentiation:</u> ▪ Engineering Design Process allows multiple entry points and multiple ways to demonstrate understandings to meet all needs or learners. • ELL and Learners with Other Needs: The assessment is hands-on, however students in need of more support will be provided with model pollinate and images to use in build and checklist to guide.
Formative Assessments	Class Activities- Pollinators and Pollination Stations ● Various media (videos, images) pollinators and pollination, showing how form and function of each affects the process. ● Hands-on investigation to explore various flowers, pollinators (shape and function), habitat, seed dispersal. ● Record findings throughout station rotations Class Discussions Do Now Questions Class Activities- Pollinator Build Challenge ● Students work with partner using the EDP to develop a design to solve the pollinator design challenge. ● Students use design and specific materials to create to complete challenge.

	● Students communicate and collaborate with partner/team. ● Students evaluate and improve their design and build based on data collected from test trails. Class Discussions Do Now Questions

STAGE 3 – LEARNING PLAN

Lesson 1- Pollinator Pollination Stations

Objective:

- Investigate and classify different kinds of pollinators, pollination, flowers, seed dispersal through various hands-on and interactive stations.
- Analyze, compare, and discuss how pollinators are different/same and how they affect pollination.
- Collect and record information gathered throughout station rotations.

Activities/Stations:

- Introduce topic with anchoring phenomena video/images, discussion of topic and real world problem. Question students: “How do plants rely on animals?”, “What are some plants that animals pollinate and why do you think they pollinate those plants?”, and “How might the decrease in bee population affect humans?”
- Introduce investigation stations for students to work in. Students will work with partner/group to investigate different types of pollinators, pollen, plants, seeds, etc. Students will record their findings on their lab-sheet/notebook.
- Stations:
    - Station A: Investigate pollinators and their plants through informational cards, images, and card game.
    - Station B: Investigate parts of the flower through a flower dissection.
    - Station C: Observation of local ecosystem and the pollinators in the area.
    - Station D: Videos and simulations of the different pollinators and how they collect and pollinate plants and flowers.
    - Station E: Observation of different seeds and how they may be dispersed.
    - Teacher will facilitate stations and question students as they work and investigate.

Lesson 2-Pollinator Build challenge

Objective:

- Investigate the EDP completing the steps (ask, imagine, plan, create, improve, communicate) to solve a design problem. Students will make connections to prior lessons concerning materials and the form and function of pollination to solve the design problem.
- Brainstorm various ideas using prior knowledge, choosing one to illustrate a diagram that represents build and design problem.
- Build a model from diagram to represent, design, and solve a problem.
- Question and make observations about the materials used, why, their use to solve the design problem, and how their designs might be improved.
- Analyze, compare, and discuss the various team outcomes of the challenge. (Productive Talk)
- Participate and work with partner/group to complete the challenge.

Activities:

1. Students work with team following the EDP to complete the design challenge of determining the best device that mimics how an animals disperses seeds or pollinate plants.
2. Create a list of thoughts ideas and materials that can be used to complete the challenge.
3. Choose the team's best idea to prepare and construct the device.
4. Predict, analyze, and compare the outcomes of the individual team and class solutions. Here students reflect and discuss in teams, as well as, whole group on positives and negatives of the design build. (productive talk)
5. Evaluate discussion and pollination device, redesign/rebuild to improve device.
6. Teacher will introduce, explain, and facilitate activity as students work in groups. Teacher will questions groups as they work with the EDP to solve the problem. Teacher will guide students through questions: What do you need to take into account when making your model? What about the form and function is useful? How does your device resemble a pollinator in nature?

Differentiation:

- EDP allows multiple entry points and multiple ways to demonstrate understandings.

Notes:

Various builds can be used to complete this design challenge. Some examples include: mimic animal's dispersal of seeds, mimic animal pollination of a plant.

Lesson 3-Wildflower Garden

Objective:

- Apply knowledge of previous classes and design build to create a wildflower pollinator habitat.
- Brainstorm design ideas for garden plot.
- Investigate various plants/flowers for flower garden plot.
- Present information board to class.
- Analyze, compare, and discuss the various team outcomes of the challenge. (Productive Talk)
- Participate and work with group to complete the challenge.

Activities:

- Students work with team following the EDP to complete the wildflower design challenge of determining the best flowers/plants and location of garden.
- Choose the team's best idea to prepare and share out their ideas; class decides which design plot is best. Here students reflect and discuss in teams, as well as whole group, on positives and negatives of each design. (productive talk)
- If possible, using design information from groups, class builds wildflower plot garden to attract pollinators. In schools where this is not possible, children will engage in other gardening activities at the school plots and watch more videos about pollination.
- Teacher will introduce, explain, and facilitate activity as students work in groups. Teacher will question groups as they work. Teacher will guide students through questions: What do you need to take into account when creating this garden? How will our flower garden help the real world pollinator problem?

Differentiation:

- EDP allows multiple entry points and multiple ways to demonstrate understandings.

Notes:

- All schools may not have flower beds. This part of lesson can be tailored to schools specific needs and materials available, ie. orchard, indoor hydroponics tower, classroom teacher setup.

UNIT RESOURCES

- Supplies:
  - Various Seeds: flowers, plants
  - Garden Materials: gloves, shovels, rake, etc.
  - Various Materials for build: plastic, sticks, wood, strainers, utensils, pipette, etc.
  - Pollinator cards and images
  - Nature Walk checklist

- Books:
  - Flowers are calling by Rita Gray
  - What if there were no bees? By Slade, S
  - Mrs. Carter's butterfly garden by Rich, S
  - What is Pollination? By Bobbie Kalman

- Websites:
  - Youtube.com/watch?v=MQiszdk0wuU pollination video (animals)
  - National Geographic-Pollination https://www.nationalgeographic.com/magazine/2011/03/pollinators/
  - pbslearningmedia.org
  - Robobees to the Rescue https://www.pbs.org/wgbh/nova/video/robobees-to-the-rescue/

- Enrichment:
  - Coding Activities: Code.org, Tynker.com
  - Extension Activities:
  - Additional outdoor gardening
  - Greenhouse- Design and build greenhouse using research and recycled materials.

Grade 3 STEM		Third Grade Pacing Guide
Note: STEM is a weekly course taught by the Elementary STEM teacher. Each unit takes place over 1 trimester.		
	Unit	**Number of Days**
1.	**Flood Structures**	**13 days**
2.	**Powerful Forces**	**13 days**
3.	**Earth and Human Impact**	**13 days**
	Enrichment (during PLC time)	During Enrichment, activities can be extended correlating to the appropriate unit. The time devoted to Enrichment per grade level may vary by school building. Specific Enrichment extensions are included in each unit. In addition, block coding can be implemented during any open sessions using coding websites, Lego Robotics, Alex Toys coding tools, and other coding manipulatives.

Grade 3 STEM	Theme: Environmental Impacts on Humans

Thematic Overview

Students will investigate the environment around them, how living and nonliving things interact with each other, with a focus on the needs of living things and the effects of changes in the environment on those organisms. Students build understanding of how humans interact with their environments, both in ways that positively impact human communities and in ways that negatively impact humans, their environments, and other living and non-living things in their environments. Students are also introduced to conceptual awareness of changes in their environment such as the localized effects of climate change, erratic weather conditions, and the effects of local climate and weather on their habitats.

Students will begin by understanding why some hurricanes cause severe flooding and why these storms are considered some of the worst natural disasters. As students move through the unit, students will continue to focus on environmental impacts through investigating structures that can withstand hurricane and tornado force winds, to levees, which are built to protect towns from flood waters. Students will then be challenged to design, build, and test a model of a levee. Finally, students will learn about what is causing sea level rise by observing ice

melting on a solid surface near a body of water and ice melting in a body of water. The culminating project of the unit will apply the engineering design process to design a new city located on an island that is sinking due to sea level rise. Throughout the thematic unit, students will practice student-student, student-teacher discourse that encourages classroom conversations. Students will also cover a variety of science and engineering standards that will prepare them for the next stage of STEM exploration.

Unit Title: Flood Structures	Duration: 13 days

Stage 1-Desired Results	
Essential Questions	**Enduring Understandings**
do levees help control the process of flooding?	Levees help prevent rising flood waters from reaching other parts of a town.
How do engineers design and build structures that withstand the forces of wind and gravity?	Engineers have to build structures to resist flooding and hurricane and tornado force winds. They must think about the forces on the building and how to build those structures to resist them.

New Jersey Student Learning Standards for Science
-ESS3-1. Make a claim about the merit of a design solution that reduces the impacts of a weather-related azard -5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria r success and constraints on materials, time, or cost. -5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is kely to meet the criteria and constraints of the problem. -5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are onsidered to identify aspects of a model or prototype that can be improved

Interdisciplinary Standards:
New Jersey Student Learning Standards for English Language Arts
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.R7. Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.
RL.3.1. Ask and answer questions, and make relevant connections to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.
RI.3.1. Ask and answer questions, and make relevant connections to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.
RI.3.3. Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.
RI.3.7. Use information gained from text features (e.g., illustrations, maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur).
NJSLSA.W1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
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.W6. Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.
NJSLSA.W7. Conduct short as well as more sustained research projects, utilizing an inquiry-based research process, based on focused questions, demonstrating understanding of the subject under investigation.
NJSLSA.W8. Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.
NJSLSA.W9. Draw evidence from literary or informational texts to support analysis, reflection, and research.
W.3.2. Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
A. Introduce a topic and group related information together; include text features (e.g.: illustrations, diagrams, captions) when useful to support comprehension.
B. Develop the topic with facts, definitions, and details.
C. Use linking words and phrases (e.g., also, another, and, more, but) to connect ideas within categories of information.
D. Provide a conclusion.

W.3.7. Conduct short research projects that build knowledge about a topic.

W.3.8. Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories

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.

NJSLSA.SL4. Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.

SL.3.1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher led) with diverse partners on *grade 3 topics and texts*, building on others' ideas and expressing their own clearly.

A. Explicitly draw on previously read text or material and other information known about the topic to explore ideas under discussion.
B. Follow agreed-upon norms for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the topics and texts under discussion).
C. Ask questions to check understanding of information presented, stay on topic, and link their comments to the remarks of others.
D. Explain their own ideas and understanding in light of the discussion.

SL.3.3. Ask and answer questions about information from a speaker, offering appropriate elaboration and detail

Interdisciplinary Standards:	
New Jersey Student Learning Standards for Math	
Mathematical Practices 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. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning	
Operations and Algebraic Thinking	3.OA
Measurement and Data	3.MD
B. Represent and interpret data	
Geometry	3.G

In these unit plans, the following 21st Century Life and Careers skills are addressed:				
Check ALL that apply – 21st Century Themes			**Indicate whether these skills are: ● E – Encouraged ● T – Taught ● A – Assessed Career Ready Practices**	
9.1	**Personal Financial Literacy**		E	CRP1. Act as a responsible and contributing citizen and employee.
	Income and Careers		ETA	CRP2. Apply appropriate academic and technical skills.
X	Money Management			CRP3. Attend to personal health and financial well-being.
	Credit and Debt Management		ETA	CRP4. Communicate clearly and effectively and with reason.
X	Planning, Saving, and Investing		ET	CRP5. Consider the environmental, social and economic impacts of decisions.
X	Becoming a Critical Consumer		ETA	CRP6. Demonstrate creativity and innovation.
	Civic Financial Responsibility		E	CRP7. Employ valid and reliable research strategies.
	Insuring and Protecting		ETA	CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
9.2	**Career Awareness, Exploration, and Preparation**			CRP9. Model integrity, ethical leadership and effective management.
X	Career Awareness			CRP10. Plan education and career paths aligned to personal goals.
X	Career Exploration		ETA	CRP11. Use technology to enhance productivity.
	Career Preparation		ET	CRP12. Work productively in teams while using cultural global competence.

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

_____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

_____Recognize and identify the thoughts, feelings, and perspectives of others
_____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
_____Demonstrate an awareness of the expectations for social interactions in a variety of settings

Responsible Decision Making

__x__Develop, implement and model effective problem solving and critical thinking skills
__x__Identify the consequences associated with one's action in order to make constructive choices
_____Evaluate personal, ethical, safety and civic impact of decisions

Relationship Skills

_____Establish and maintain healthy relationships
__x__Utilize positive communication and social skills to interact effectively with others
_____Identify ways to resist inappropriate social pressure
__x__Demonstrate the ability to present and resolve interpersonal conflicts in constructive ways
_____Identify who, when, where, or how to seek help for oneself or others when needed

Student Learning Targets / Objectives	
Students will know… • Humans cannot eliminate natural hazards but can reduce their impacts. • Engineers design solutions that reduce the impacts of weather-related hazards. • Civil engineers design projects to support the needs of people living together. • Engineers design and build levees and flood walls to prevent flooding from hurricanes. • If a levee fails, engineers are called to evaluate what happened and why as well as to make improvements and redesign.	**Students will be able to…** ● Put clues together to find out why New Orleans was destroyed during a hurricane. ● Answer, conduct research, and ask questions, recording information in their Hurricane Katrina Investigation Journals (Google Notebook). ● Identify the characteristics of a hurricane and how it is measured and monitored. ● Describe a levee and its parts. ● Manage a budget to "purchase" supplies for structure build. ● List the steps of the engineering design process. ● Build a levee to prevent water from one side of a plastic container from reaching the other side.

STAGE 2 – ASSESSMENT EVIDENCE	
Common Summative Assessments	Performance Task- Students create a budget and use various materials to design, build, and test a model of a levee. Structures should prevent rising waters from flooding area when a flood is simulated. • Teacher will facilitate and question students as they work, explaining and modeling stations throughout the investigation. <u>Differentiation:</u> ▪ ELL and Learners with Other Needs: Students will be given materials ahead of time to view to help them create their budget and design.

Formative Assessments -	Class Activities- Design a Levee • Develop a list of materials to build levee using a budget of $100. • Students work with a partner using the EDP to design and build a levee that will prevent a hurricane from flooding the town. • Students communicate and collaborate with partner to complete challenge. • Students improve their design and build based on data collected from test trials. Class Discussions/Teacher questioning

STAGE 3 – LEARNING PLAN

Activity 1- (approximately 6 weeks) Hurricane Investigation Stations

Objectives:

- Put clues together to explain why certain areas are flooded by hurricanes.
- Conduct research and answer questions about hurricanes.
- Understand why levees fail and why they cause so much destruction.

Activities:

- Read story *Two Bobbies: A True Story of Hurricane Katrina, Friendship and Survival.*
- Hurricane Katrina Investigation Stations: Students rotate through stations and conduct research and record data in Hurricane Katrina Investigation Journal.
  - Station 1- Locate New Orleans on a map and the bodies of water that surround it.
  - Station 2- What is a hurricane? Research wind speeds of a hurricane and how hurricanes are measured.
  - Stations 3- Visit **www.nhc.noaa.gov** to research how hurricanes are monitored and differences between hurricanes and tornadoes.
  - Station 4- Research levees and record what happened to the levees around New Orleans.
  - Station 5- Watch a video of a weather scientist. How do they predict and monitor hurricanes. How are satellites useful for studying weather?
  - Summarize with students the events that made Hurricane Katrina one of the worst natural disasters in American history.

tivity 2- (approximately 6 weeks) Model Levee Design Challenge

Objective:

- Describe a levee and its parts.
- Manage a budget to purchase supplies.
- List the steps of the engineering design process.
- Build a levee to prevent water from one side of a plastic container from reaching the other side.

ctivities

- Give each student the Model Levee Design Challenge Budget sheet. Explain to students that they will choose from a list of materials to build their levees but can only spend $10 on supplies.
- After students have created their budgets and have chosen their materials students will design their levees.
- Students will use small building blocks such as Legos to build small buildings to sit on top of sand. Tell students that these will represent the city. Tell students that the opposite end of a plastic container will represent a body of water next to the city.
- Students will be challenged to build a levee that will keep the water from flooding the city.

UNIT RESOURCES

- Supplies:
  - Craft sticks, cotton balls, sand, gravel, plastic bins, Legos, tape, plastic bags
  - Hurricane Katrina Investigation Journal (online Google tool)
  - Chromebooks for research
  - *Two Bobbies: A True Story of Hurricane Katrina, Friendship and Survival* by: Kerbie Larson and Mary Netherly

- Enrichment:
  - Code.org, Tynker.com, Lego WeDo 1.0.

Unit Title: Powerful Forces	Duration: 13 days

Stage 1-Desired Results	
Essential Questions	**Enduring Understandings**
How do engineers design and build structures that withstand the forces of wind and gravity?	Engineers have to build structures to resist flooding and hurricane and tornado force winds. They must think about the forces on the building and how to build those structures to resist them.

New Jersey Student Learning Standards for Science
3-ESS3-1. Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard 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
Interdisciplinary Standards:
New Jersey Student Learning Standards for English Language Arts
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.R7. Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words. RL.3.1. Ask and answer questions, and make relevant connections to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. RI.3.1. Ask and answer questions, and make relevant connections to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. RI.3.3. Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. RI.3.7. Use information gained from text features (e.g., illustrations, maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur).

NJSLSA.W1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
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.W6. Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.
NJSLSA.W7. Conduct short as well as more sustained research projects, utilizing an inquiry-based research process, based on focused questions, demonstrating understanding of the subject under investigation.
NJSLSA.W8. Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.
NJSLSA.W9. Draw evidence from literary or informational texts to support analysis, reflection, and research.
W.3.2. Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
A. Introduce a topic and group related information together; include text features (e.g.: illustrations, diagrams, captions) when useful to support comprehension.
B. Develop the topic with facts, definitions, and details.
C. Use linking words and phrases (e.g., also, another, and, more, but) to connect ideas within categories of information.
D. Provide a conclusion.
W.3.7. Conduct short research projects that build knowledge about a topic.
W.3.8. Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories
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.
NJSLSA.SL4. Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.
SL.3.1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher led) with diverse partners on *grade 3 topics and texts*, building on others' ideas and expressing their own clearly.

E. Explicitly draw on previously read text or material and other information known about the topic to explore ideas under discussion.
F. Follow agreed-upon norms for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the topics and texts under discussion).

G. Ask questions to check understanding of information presented, stay on topic, and link their comments to the remarks of others.

H. Explain their own ideas and understanding in light of the discussion.

SL.3.3. Ask and answer questions about information from a speaker, offering appropriate elaboration and detail

New Jersey Student Learning Standards for Math

Mathematical Practices

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.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Operations and Algebraic Thinking	3.OA
Measurement and Data	3.MD
B. Represent and interpret data	
Geometry	3.G

New Jersey Student Learning Standards for Technology
8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment. A. The Nature of Technology: Creativity and Innovation *Technology systems impact every aspect of the world in which we live.* B. Technology and Society: *Knowledge and understanding of human, cultural and societal values are fundamental when designing technological systems and products in the global society.* C. Design: *The design process is a systematic approach to solving problems.* D. Abilities for a Technological World: *The designed world is the product of a design process that provides the means to convert resources into products and systems.*

In these unit plans, the following 21st Century Life and Careers skills are addressed:				
Check ALL that apply – **21st Century Themes**			**Indicate whether these skills are:** ● **E – Encouraged** ● **T – Taught** ● **A – Assessed** **Career Ready Practices**	
9.1	**Personal Financial Literacy**		E	CRP1. Act as a responsible and contributing citizen and employee.
	Income and Careers		ETA	CRP2. Apply appropriate academic and technical skills.
	Money Management			CRP3. Attend to personal health and financial well-being.
	Credit and Debt Management		ETA	CRP4. Communicate clearly and effectively and with reason.
	Planning, Saving, and Investing		ET	CRP5. Consider the environmental, social and economic impacts of decisions.
	Becoming a Critical Consumer		ETA	CRP6. Demonstrate creativity and innovation.
	Civic Financial Responsibility		E	CRP7. Employ valid and reliable research strategies.
	Insuring and Protecting		ETA	CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
9.2	**Career Awareness, Exploration, and Preparation**			CRP9. Model integrity, ethical leadership and effective management.
X	Career Awareness			CRP10. Plan education and career paths aligned to personal goals.
X	Career Exploration		ETA	CRP11. Use technology to enhance productivity.
	Career Preparation		ET	CRP12. Work productively in teams while using cultural global competence.

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

_____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

_____Recognize and identify the thoughts, feelings, and perspectives of others
_____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
_____Demonstrate an awareness of the expectations for social interactions in a variety of settings

Responsible Decision Making

__x__Develop, implement and model effective problem solving and critical thinking skills
__x__Identify the consequences associated with one's action in order to make constructive choices
_____Evaluate personal, ethical, safety and civic impact of decisions

Relationship Skills

_____Establish and maintain healthy relationships
__x__Utilize positive communication and social skills to interact effectively with others
_____Identify ways to resist inappropriate social pressure
__x__Demonstrate the ability to present and resolve interpersonal conflicts in constructive ways
_____Identify who, when, where, or how to seek help for oneself or others when needed

Student Learning Targets / Objectives	
Students will know… ● Damage to buildings can come because of wind, storm surge, or heavy rainfall leading to flooding. ● Engineers design buildings for hurricane prone areas. ● Building a tall structure that will remain standing might be challenging with the two forces of wind and gravity at work. ● Engineers constantly create new and better structures.	**Students will be able to…** ● Define wind and gravity. ● Design and construct prototypes of a structure that will remain standing while being pushed by wind and pulled by gravity. ● Use given design criteria to build a tower out of simple materials, test it, and potentially redesign and rebuild it to improve performance.

STAGE 2 – ASSESSMENT EVIDENCE	
Common Summative Assessments	Performance Task- ● Build a freestanding tower that can support a tennis ball as high as possible off the ground (measured from the bottom of the tennis ball) while withstanding the wind from a fan. <u>Differentiation:</u> ELL and Learners with Other Needs: Students will be given materials ahead of time to view to help them create their design. High Achieving Learners: Incorporate different money amounts to calculate materials. (Optional extra challenge: add a spray bottle to represent rain.)
Formative Assessments	Class Activities- ● Building for Hurricanes Engineering Design Challenge Capture Sheet Class Discussions Teacher Questioning Tower Design Plan Analysis of Results

STAGE 3 – LEARNING PLAN

Activity 1- Hurricane Background (approximately 3 weeks)

Objective: Students will identify towers and structural components and learn how data from satellites improve our ability to forecast the track of storms and has led to insights that allow us to know when a storm will intensify.

Activities

- Show students the Hurricane Towers Powerpoint Presentation and discuss how storms can cause various types of destruction.
- Explain that meteorologists and data scientists use special tools to help them track and measure hurricanes.
- Explain to students that builders who live in hurricane prone areas need to design and build structures that can withstand forces such as wind and gravity.
- Show students photographs of various towers and buildings around the world and have them think about what shapes and structures they might use for their towers.
- Before you begin designing, think about answers to the following questions. Use the capture sheet given for brainstorming to record your ideas:
    - Which combination of materials will make the tower as tall as possible (measured to the bottom of the tennis ball)?
    - What tower shapes could you use? Should your base be round? Square? Triangular?
    - Can you be creative about using the materials in an unexpected way?
    - How can you get the tower to be freestanding, not taped to the table, and yet not fall over?
    - Think about the forces on the tower, wind from the side and gravity pulling down. How you will build your tower to resist them?
- Using the guiding questions on the Hurricane Design Challenge Capture Sheet and the images of various types of towers and structural elements provided, look at the materials you have available and make a plan for your tower.

Activity 2- Hurricane Tower (approximately 9 weeks)

Objective: Build a freestanding tower that can support a tennis ball as high as possible off the ground (measured from the bottom of the tennis ball) while withstanding the wind from a fan.

Activities:

- Once students have decided on their design, work as a team to build the tower.
- The materials students will have available will be from the following list: index cards, straws, craft sticks, chenille stems, tape or other adhesive, and string. Additional materials may also be provided.
- Once groups are finished, students may begin testing their design. They will record the height of their tower and for how long the tower stood. Other observations may include failure or points of strength, whether the tower tips over or collapses, etc.
- Students will then analyze their results on the Hurricane Tower Capture Sheet.

Differentiation

- High-Achieving: Use a spray bottle when testing to simulate rain
- ELL and Learners with Other Needs: Instead of tape, consider giving each group part of a sheet of sticky mailing labels. They are easier to have ready to hand out to multiple groups (such as in pre-made supply bins), and ensure that each group gets the exact same quantity if you are framing it as a competition. Alternatively, to make the challenge a bit easier, you could give each group a roll of tape and allow them to use as much as they would like.

UNIT RESOURCES
• Supplies: tennis ball, straws, index cards, craft sticks, string, pipe cleaners, tape, spray bottle, fan or blow dryer. Hurricane design challenge capture sheet, Hurricane Tower Power Point • Websites: https://pmm.nasa.gov/education/interactive/building-hurricanes-engineering-design-challenge • Enrichment: code.org, tynker.com, WeDo Lego 1.0

Unit Title: Earth and Human Impact	Duration: 13 days

Stage 1-Desired Results	
Essential Questions	**Enduring Understandings**
What is causing sea levels to rise?	Both thermal expansion and ice melt are the results of the rise in global average temperatures on land and sea known as climate change.
How do humans play a role in climate change?	Greenhouse gases caused by cars, power plants, and other man-made sources act like a blanket, trapping the sun's warmth near the earth's surface, and affecting the planet's climate system.

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3-ESS3-1. Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard 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

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Operations and Algebraic Thinking	3.OA
Measurement and Data	3.MD
B. Represent and interpret data	
Geometry	3.G

New Jersey Student Learning Standards for Technology

8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.

A. Technology Operations and Concepts: *Students demonstrate a sound understanding of technology concepts, systems and operations.*

B. Creativity and Innovation: *Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.*

E: Research and Information Fluency: *Students apply digital tools to gather, evaluate, and use information.*

F: Critical thinking, problem solving, and decision making: *Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.*

8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

A. The Nature of Technology: Creativity and Innovation *Technology systems impact every aspect of the world in which we live.*

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C. Design: *The design process is a systematic approach to solving problems.*

D. Abilities for a Technological World: *The designed world is the product of a design process that provides the means to convert resources into products and systems.*

E. Computational Thinking: Programming: *Computational thinking builds and enhances problem solving, allowing students to move beyond using knowledge to creating knowledge*

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	Planning, Saving, and Investing		ET	CRP5. Consider the environmental, social and economic impacts of decisions.
	Becoming a Critical Consumer		ETA	CRP6. Demonstrate creativity and innovation.
	Civic Financial Responsibility		E	CRP7. Employ valid and reliable research strategies.
	Insuring and Protecting		ETA	CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
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_____Identify ways to resist inappropriate social pressure
__x__Demonstrate the ability to present and resolve interpersonal conflicts in constructive ways
_____Identify who, when, where, or how to seek help for oneself or others when needed

Student Learning Targets / Objectives

Students will know…	Students will be able to…
● How sea ice and land ice effect the Earth's oceans. ● Sea level is rising, in part, because melting glaciers on land are adding more water to Earth's oceans. ● As temperatures rise, glaciers melt faster than they accumulate new snow. As these ice sheets and glaciers melt, the water eventually runs into the ocean, causing sea level to rise. ● Icebergs and frozen seawater also melt in warm temperatures but do not cause sea level to rise. ● Thermal expansion and ice melt are the results of the rise in global average temperatures on land and sea known as climate change. ● Small islands are already being affected and sinking due to climate change and rising sea levels. ● Engineers are now designing cities and buildings to stop flooding and rising waters.	● Observe ice melting on a solid surface near a body of water and ice melting in a body of water. ● Predict what each situation will do to the level of water and then compare. predictions to what they observations. ● Measure water levels in millimeters and record data. ● Design an island to prevent rising waters and keep the island from sinking. ● Define climate change and sustainability ● Use the engineering design process to solve a real world problem.

STAGE 2 – ASSESSMENT EVIDENCE	
Common Summative Assessments	Performance Task- Land Ice vs. Sea Ice Activity- ● Groups should take measurements and record data at regular intervals. ● Groups should compare their results to their predictions and provide a reasonable explanation for what they observed. ● Land Ice vs. Sea Ice Student Worksheet Design an Island City- ● Island Design Sheet ● Island City Planning Budget ● Rate your Island Rubric Differentiation: High Achieving - Use the data from the student data sheet to create a line graph using spreadsheet software.
Formative Assessments	Class Station Activities- Land Ice vs. Sea Ice Activity- ● Students should make a prediction and provide reasoning for their prediction. The accuracy of their prediction is not as important as the fact that they made one and can communicate their reasoning. ● Groups should build the land-ice and sea-ice containers according to the directions. ● Class Discussion/Teacher Questioning Design an Island City- ● Island City Planning Worksheets ● Scenario Cards ● Class Discussion/Teacher Questioning

STAGE 3 – LEARNING PLAN

Activity 1: Land Ice vs. Sea Ice (approximately 2-3 weeks)

Objective: Observe ice melting on a solid surface near a body of water and ice melting in a body of water to determine if sea ice or land ice contributes to sea level rise.

Activities:

- As a class, discuss sea-level rise and climate change. Tell students they're going to conduct an experiment to learn how melting ice contributes to sea-level rise.
- Ask students where there is a lot of ice on Earth. Ask them to specify if the ice is on land or at sea. (The Greenland and Antarctic ice sheets, along with smaller mountain glaciers, are considered land ice. The ice in the Arctic is frozen seawater and therefore considered sea ice.)
- Ask students which type of ice, if any, contributes more to sea-level rise. Ask students to explain their thinking.
- On the student data sheet, have students record their prediction about which type of ice will contribute more to sea-level rise.
- Provide each group with the required materials and directions to conduct the experiment.
- Press equal amounts of clay into one side of each plastic tub, making a smooth, flat surface representing land rising out of the ocean.
- In one tub, place as many ice cubes as possible on the flat clay surface. This represents land ice.
- In the other tub, place the same number of ice cubes on the bottom of the tub, next to the clay. This represents sea ice.
- Pour water into the sea-ice container until the ice floats. Be sure no ice is resting on the bottom of the tub. The water shouldn't be higher than the land level.
- Without disturbing the ice cubes, pour water into the land-ice container until the water level is about equal to the water level in the sea-ice container.
- Using the ruler, measure the water level (in millimeters) in each tub and record the data on the student data sheet.

- You can mark the water level with a marker on the outside of the tub, but if the containers are reused, they will have the marks from the previous group. Another way to mark the water level is to mark a line in the clay using a pencil or other object.

- At regular intervals, measure the water level and record it on the data sheet. Compare the water level with the marked line in the clay. Allow the ice in both tubs to melt completely.

- Use the measurements recorded on the data sheet to create a line graph representing the water level in each tub

- Discuss with students
  In which container did the water level rise more?
  How does this compare to your prediction?
  Why do you think this occurred?
  In what way is this related to global sea-level rise?
  Does the melting of Earth's glaciers contribute to sea-level rise? How about the melting of icebergs?

Activity 2: Island City (approximately 10 weeks)

Objective: Design an island city to prevent rising waters and keep the island from sinking

Activities:

- Read paragraph "Shrinking City" and have class discussion about how to prevent flooding and rising waters. Explain to students that some islands are already experiencing effects of climate change.
- Show video "Island Nation of Kiribati" https://www.youtube.com/watch?v=D0MYO9peLRY&scrlybrkr=5837adf8
- Discuss the possibility of creating a new island. Show video "Floating City of the Future." https://www.youtube.com/watch?v=D0MYO9peLRY&scrlybrkr=5837adf8
- Have a discussion of human needs and sustainability.
- Assign groups and have each group complete sheets about the people of "Chillville"
- Before designing their islands, give students their budget sheets. Students can spend $10 million on each department in their city.
- Have each group design their islands as if they were the characters from their assigned sheets.
- Students will then rate their island based on the criteria from the Rate Your Island Sheet
- Students will be given scenario cards and will rate their islands again.
- Based on their design, students will build their island out of various materials. The island must be sustainable and not flood when water is filled in their container.

UNIT RESOURCES
Supplies ● Various recycled materials ● Design an Island City Downloaded Activity and Worksheets (Teachers Pay Teachers) ● Clay, Ice, Water, Ruler, Marker, Plastic Containers ● Sea Ice vs. Land Ice Student Worksheet Websites ● file:///C:/Users/kmarlatt/Downloads/DesignanIslandCityRisingWatersASocialStudiesClimateChangeActivity.pdf ● https://www.jpl.nasa.gov/edu/teach/activity/whats-causing-sea-level-rise-land-ice-vs-sea-ice/ ● https://www.youtube.com/watch?v=D0MYO9peLRY ● https://www.youtube.com/watch?v=SuQTBkLqHxc Enrichment: ● code.org, tynker.com, WeDo Lego 1.0

Grade 4 STEM		Grade 4 Pacing Guide
Note: STEM is a weekly course taught by the Elementary STEM teacher. Each unit takes place over 1 trimester.		
Unit Human Impacts		**Number of Days**
1.	Water and Pollution	**13 days**
2.	Prosthetics and Ocean Animals	**13 days**
3.	Waves and Water	**13 days**
	Enrichment (during PLC time)	During Enrichment, activities can be extended correlating to the appropriate unit. The time devoted to Enrichment per grade level may vary by school building. Specific Enrichment extensions are included in each unit. In addition, block coding can be implemented during any open sessions using coding websites, Lego Robotics, Alex Toys coding tools, and other coding manipulatives.

Grade 4 STEM	Theme: Human Impact on the Environment

Thematic Overview
Students are challenged to think about how their individual and local decisions have an impact on the environment and the world around us and to extend these ideas to the potential future impacts to our world. Students debate the cause and effect relationship of human activity and its consequences on natural resources and ecosystems. As students work through the year they will develop experiments to answer questions and build prototypes to solve problems related to these real world phenomena, from the water pollution crisis, to aquatic veterinarians, to underwater research and seismology. Throughout the thematic unit, students will develop ideas and build on concepts from previous years as well as practice student-student and student-teacher discourse that encourages classroom conversations. Students will also cover a variety of science and engineering standards that will prepare them for the next stage of STEM exploration.

Unit Title: Water Pollution	Duration: 13 days

Stage 1-Desired Results	
Essential Questions	**Enduring Understandings**
How might human development impact local and worldwide water ecosystems?	Humans affect oceans in a variety of ways through pollution, ocean chemistry, physical modifications, etc.
How can humans minimize their impact on certain ecosystems? (How can we protect our water resource?)	The ocean ecosystem is changed by natural and un-natural causes, such as, weather, erosion, and human activity.
What are some creative solutions to removing marine debris from Earth's waterways?	We need to think of ways to minimize the effects of human impact (such as using recycling, upcycling, reusing, reducing, etc.)

New Jersey Student Learning Standards for Science
4-ESS3-1. Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment. 4-ESS3-2. Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans. 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.
Interdisciplinary Standards:
New Jersey Student Learning Standards for English Language Arts
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.R2. Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.
NJSLSA.R7. Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.
NJSLSA.R8. Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.
NJSLSA.R10. Read and comprehend complex literary and informational texts independently and proficiently with scaffolding as needed.
RL.4.1. Refer to details and examples in a text and make relevant connections when explaining what the text says explicitly and when drawing inferences from the text.
RI.4.7. Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.
NJSLSA.W6. Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.
NJSLSA.W7. Conduct short as well as more sustained research projects, utilizing an inquiry-based research process, based on focused questions, demonstrating understanding of the subject under investigation.
NJSLSA.W8. Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.
NJSLSA.W9. Draw evidence from literary or informational texts to support analysis, reflection, and research.
W.4.2. Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
A. Introduce a topic clearly and group related information in paragraphs and sections; include formatting (e.g., headings), illustrations, and multimedia when useful to aiding comprehension.
B. Develop the topic with facts, definitions, concrete details, text evidence , or other information and examples related to the topic.
C. Link ideas within paragraphs and sections of information using words and phrases (e.g., *another*, *for example*, *also*, *because*).
D. Use precise language and domain-specific vocabulary to inform about or explain the topic.
E. Provide a conclusion related to the information or explanation presented.
W.4.9. Draw evidence from literary or informational texts to support analysis, reflection, and research.
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.SL4. Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.

SL.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.

A. Explicitly draw on previously read text or material and other information known about the topic to explore ideas under discussion.

B. Follow agreed-upon rules for discussions and carry out assigned roles.

C. Pose and respond to specific questions to clarify or follow up on information, and make comments that contribute to the discussion and link to the remarks of others.

D. Review the key ideas expressed and explain their own ideas and understanding in light of the discussion.

Interdisciplinary Standards:		
New Jersey Student Learning Standards for Math		
ıthematical Practices		
Make sense of problems and persevere in solving them.		
Reason abstractly and quantitatively.		
Construct viable arguments and critique the reasoning of others.		
Model with mathematics.		
Use appropriate tools strategically.		
Attend to precision.		
Look for and make use of structure.		
Look for and express regularity in repeated reasoning		
erations and Algebraic Thinking	4.OA	
Generate and analyze patterns.		
easurement and Data	4.MD	
Represent and interpret data		
ometry		4.G
New Jersey Student Learning Standards for Technology		

8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.

Technology Operations and Concepts: *Students demonstrate a sound understanding of technology concepts, systems and operations.*

B. Creativity and Innovation: *Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.*

C. Communication and Collaboration: *Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.*

D. Digital Citizenship: *Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.*

E: Research and Information Fluency: *Students apply digital tools to gather, evaluate, and use information.*

F: Critical thinking, problem solving, and decision making: *Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.*

8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

A. The Nature of Technology: Creativity and Innovation *Technology systems impact every aspect of the world in which we live.*

B. Technology and Society: *Knowledge and understanding of human, cultural and societal values are fundamental when designing technological systems and products in the global society.*

Design: *The design process is a systematic approach to solving problems.*

D. Abilities for a Technological World: *The designed world is the product of a design process that provides the means to convert resources into products and systems.*

E. Computational Thinking: Programming: *Computational thinking builds and enhances problem solving, allowing students to move beyond using knowledge to creating knowledge.*

In these unit plans, the following 21st Century Life and Careers skills are addressed:				
Check ALL that apply – **21st Century Themes**			**Indicate whether these skills are:** ● **E – Encouraged** ● **T – Taught** ● **A – Assessed** **Career Ready Practices**	
9.1	**Personal Financial Literacy**		ETA	CRP1. Act as a responsible and contributing citizen and employee.
	Income and Careers		ETA	CRP2. Apply appropriate academic and technical skills.
	Money Management			CRP3. Attend to personal health and financial well-being.
	Credit and Debt Management		ETA	CRP4. Communicate clearly and effectively and with reason.
	Planning, Saving, and Investing		ETA	CRP5. Consider the environmental, social and economic impacts of decisions.
	Becoming a Critical Consumer		ETA	CRP6. Demonstrate creativity and innovation.
	Civic Financial Responsibility		ET	CRP7. Employ valid and reliable research strategies.
	Insuring and Protecting		ET	CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
9.2	**Career Awareness, Exploration, and Preparation**		E	CRP9. Model integrity, ethical leadership and effective management.
X	Career Awareness			CRP10. Plan education and career paths aligned to personal goals.
X	Career Exploration		ETA	CRP11. Use technology to enhance productivity.
	Career Preparation		ET	CRP12. Work productively in teams while using cultural global competence.

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

_____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

_____Recognize and identify the thoughts, feelings, and perspectives of others
_____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
_____Demonstrate an awareness of the expectations for social interactions in a variety of settings

Responsible Decision Making

__x__Develop, implement and model effective problem solving and critical thinking skills
__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

_____Establish and maintain healthy relationships
__x__Utilize positive communication and social skills to interact effectively with others
_____Identify ways to resist inappropriate social pressure
__x__Demonstrate the ability to present and resolve interpersonal conflicts in constructive ways
_____Identify who, when, where, or how to seek help for oneself or others when needed

Student Learning Targets / Objectives	
Students will know… ● Humans affect ecosystems (ocean waters) in a variety of ways. ● Water is essential for all life on Earth. ● The impact of humans on water pollution can possibly affect all life on Earth (food web). ● Local pollution contributes to worldwide pollution. ● There are many ways to combat the water pollution crisis. ● Engineers compare multiple solutions to solve a problem. ● That there is more than one possible solution to a problem. ● Developing and using technology has an impact on the natural world.	**Students will be able to…** ● Explain and describe how water is essential for all life on Earth. ● Generate and compare multiple solutions to reduce the impact of humans on Earth. ● Identify ways humans impact not only local environments but also worldwide ecosystems. ● Analyze different options/pathways organizations are taking to combat water pollution. ● A single person can make a change. ● Test and compare materials and how each can be used to create a device to solve the problem. ● Ask questions, make observations, and gather information that will be helpful to solving the problem. ● Reflect on the solution and adjust/improve plan and build. ● Incorporate knowledge from research and prior builds to share and critique how some devices are better suited for the pollution crisis. ● Connect classroom challenge to real world pollution crisis.

STAGE 2 – ASSESSMENT EVIDENCE	
Common Summative Assessments	Performance Task- Students rotate through various mini hands-on investigations for students to explore and analyze different kinds of pollution, its source, and ways to stop or reduce the amount. Students will record their observations to use for future design build. ● Teacher will facilitate and question students as they work, explaining and modeling stations throughout investigation. <u>Differentiation:</u> High-Achieving: Students must produce a list of 3 items for each category (kinds of pollution, source of pollution, ways to stop/reduce pollution) and should exceed expectations on all areas of the rubric. ELL/Extra Support: Students will be provided with modeling, visual/auditory directions, and specific rubric and checklist to complete each station. Performance Task- Using their research journals students apply their knowledge and skills from investigations to determine the best idea of a device that will clean pollution from waterways, using best material. They will design, build, and then evaluate how their devices might be improved. ● Teacher will facilitate and question students as they work, explaining and modeling different strategies, materials, and functions throughout the investigation. <u>Differentiation:</u> ▪ Engineering Design Process allows multiple entry points and multiple ways to demonstrate understandings to meet all needs or learners. The assessment is hands-on, however students in need of more support will be provided with visuals of similar devices, limited materials, and checklist.
Formative Assessments	Class Activities- Water Pollution Investigation ● Various media (videos, images, slides) on pollution, its sources, affects, and solutions. ● Hands-on investigation to explore various sources of water pollution by creating a model of a polluted water area. ● Record findings throughout station rotations

	Class Activities- Pollution Solution Challenge ● Students work with partner using the EDP to develop a design to solve the water pollution device challenge. ● Students use research, design, and specific materials to create and complete challenge. ● Students communicate and collaborate with partner/team. ● Students evaluate and improve their device design and build based on data collected from test trails. Class Discussions Do Now Questions

STAGE 3 – LEARNING PLAN

Activity 1- Water Pollution Investigation

Objective:

- Investigate and identify the cause and effect of ways humans impact not only local environments, but also world ecosystems.
- Research, analyze, compare, and discuss some possible solutions/devices that could help reduce water pollution.
- Develop questions and ideas about humans and our part in creating and reducing water pollution.
- Collect and record information gathered throughout activity stations.

Activities:

- Introduce topic with anchoring phenomena video/images, discussion of topic and the real world pollution crisis. Question students: "What are some major causes of pollution and overuse of our waters and how can we better protect this natural resource?" "How does this pollution affect different areas in our environment?" "Where does all this pollution go?" "Why does it matter?"
- Introduce investigation stations for students to work in. Students will work with partner/group to investigate and research different types of pollution and ways to combat it. Students will record their findings on their lab-sheet/notebook.
- Stations:
- Station A: Investigate pollution and their sources through informational cards, images, and card game.
- Station B: Create an oil spill model to observe how water is affected by pollution.
- Station C: Work with interactive activities to investigate different kinds of pollution and ways to reduce them.
- Station D: Videos and simulations of pollution, its affects, and ways people/organizations are dealing with the issue.
- Station E: What happens to our trash? Follow a path of where our trash ends up and how it affects our environments.

Teacher will facilitate stations and question students as they work and investigate

Notes
Activities can be done as stations through a couple weeks or as mini-lessons throughout the unit.

Activity 2-Pollution Solution Challenge

Objective:

- Investigate the EDP completing the steps (ask, imagine, plan, create, improve, communicate) to solve the real world design problem. Students will make connections to prior lessons concerning pollution and create a device to solve the problem.
- Brainstorm various ideas using prior knowledge, choosing one to illustrate a diagram that represents build and design problem.
- Build a model from diagram to represent, design, and solve the problem.
- Question and make observations about the device created, why they chose the specific design/materials, how it's used, if they could solve the problem, and how their designs might be improved.
- Analyze, compare, and discuss the various team outcomes of the challenge (Productive Talk).
- Participate and work with partner/group to complete the challenge.

Activities:

- Students work with team following the EDP to complete the design challenge of determining the best device that cleans/reduces water pollution.
- Create a list of ideas and materials that can be used to complete the challenge.
- Choose the team's best idea to prepare and construct the device.
- Predict, analyze, and compare the outcomes of the individual team and class solutions. Here students reflect and discuss in teams, as well as, whole group on positives and negatives of the design build (productive talk).
- Evaluate discussion and pollution device, redesign/rebuild to improve device.
- Teacher will introduce, explain, and facilitate activity as students work in groups. Teacher will questions groups as they work with the EDP to solve the problem. Teacher will guide students through questions: What do you need to take into account when making your model? What about its build is useful? How does your device work and would it be feasible to use on a larger scale?

Differentiation:

- EDP allows multiple entry points and multiple ways to demonstrate understandings.

Notes:

Various scenarios can be used to complete this design challenge. Some examples include: eliminate marine debris, plastic crisis, oil spill challenge.

UNIT RESOURCES

• Supplies:
  • Legos, straws, wood sticks, screens, sponges, string, tubes,
• Books
  • Oil Spill by Melvin Berger
  • Pesky Plastic: An Environmental Story by Leticia Colon DeMejias
  • Did your can of soda kill a whale? By Baby Professor
  • Make a Splash: A Kids Guide to Protecting Our Waters by Cathryn Berger Kage
  • Plastic Ahoy! Investigating the Great Pacific Garbage Patch by Patricia Newman
  • All the Way to the Ocean by Joel Harper
  • Pollution: Problems Made by Man by Baby Professor
 	
• Websites:
  • Nearpod: https://nearpod.com/
  • Legends of Learning: https://www.legendsoflearning.com/
  • Google
  • worldoceanobservatory.org
• Enrichment:
Coding Activities: Code.org, Tynker.com
Extension Activities: Further research on ocean pollution and ways to combat this epidemic.

Unit Title: Prosthetics and Ocean Animals	Duration: 13 days

Stage 1-Desired Results	
Essential Questions	**Enduring Understandings**
How has technology helped shape lives of humans and animal body systems?	Animals have external structures that serve various functions in growth, survival, behavior, and reproduction. Biomedical engineers design everything from life- saving medical devices to life changing prosthetic limbs.
How can a man-made device look and function like a real life body part?	

New Jersey Student Learning Standards for Science

4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
4-LS1-2. Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.
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.
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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.
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E. Explicitly draw on previously read text or material and other information known about the topic to explore ideas under discussion.
F. Follow agreed-upon rules for discussions and carry out assigned roles.
G. Pose and respond to specific questions to clarify or follow up on information, and make comments that contribute to the discussion and link to the remarks of others.
H. Review the key ideas expressed and explain their own ideas and understanding in light of the discussion.

New Jersey Student Learning Standards for Math

Mathematical Practices
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.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning

Operations and Algebraic Thinking 4.OA
C. Generate and analyze patterns.
Measurement and Data 4.MD
B. Represent and interpret data
Geometry 4.G

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	Income and Careers		ETA	CRP2. Apply appropriate academic and technical skills.
	Money Management			CRP3. Attend to personal health and financial well-being.
	Credit and Debt Management		ETA	CRP4. Communicate clearly and effectively and with reason.
	Planning, Saving, and Investing		ETA	CRP5. Consider the environmental, social and economic impacts of decisions.
	Becoming a Critical Consumer		ETA	CRP6. Demonstrate creativity and innovation.
	Civic Financial Responsibility		ET	CRP7. Employ valid and reliable research strategies.
	Insuring and Protecting		ET	CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
9.2	**Career Awareness, Exploration, and Preparation**		E	CRP9. Model integrity, ethical leadership and effective management.
X	Career Awareness			CRP10. Plan education and career paths aligned to personal goals.
X	Career Exploration		ETA	CRP11. Use technology to enhance productivity.
	Career Preparation		ET	CRP12. Work productively in teams while using cultural global competence.

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

_____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

_____Recognize and identify the thoughts, feelings, and perspectives of others
_____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
_____Demonstrate an awareness of the expectations for social interactions in a variety of settings

Responsible Decision Making

__x__Develop, implement and model effective problem solving and critical thinking skills
__x__Identify the consequences associated with one's action in order to make constructive choices
_____Evaluate personal, ethical, safety and civic impact of decisions

Relationship Skills

_____Establish and maintain healthy relationships
__x__Utilize positive communication and social skills to interact effectively with others
_____Identify ways to resist inappropriate social pressure
__x__Demonstrate the ability to present and resolve interpersonal conflicts in constructive ways
_____Identify who, when, where, or how to seek help for oneself or others when needed

Student Learning Targets / Objectives	
Students will know… ● An animal or plant's structures and functions are connected through a system that help it to survive. ● Biomedical engineers work together to design devices that save lives. ● Prosthetics need to fit a variety of considerations to work effectively including comfort and aesthetically appealing, function. ● 3-D technology has helped the medical teams develop more affordable and convenient designs for individuals. ● Engineers compare multiple solutions to solve a problem. ● That there is more than one possible solution to a problem. ● Developing and using technology has an impact on our living world.	**Students will be able to…** ● Analyze how structure and function are connected and needed for animal/plant survival. ● Construct a prosthetic device that becomes part of a system. ● Critique design and structure and modify prosthetic device. ● Apply information learned and gathered from animal prosthetic design to connect to design of a human prosthetic scenario. ● Test and compare materials and how each can be used to create a prosthetic device to solve the problem. ● Ask questions, make observations, and gather information that will be helpful in designing the device. ● Reflect on the prototype and adjust/improve plan and build. ● Incorporate knowledge from research and prior builds to share and critique how some prosthetics are better suited for an animal's survival. ● Connect classroom challenge to real world situations.

STAGE 2 – ASSESSMENT EVIDENCE	
Common Summative Assessments	Performance Task- Students will explore and analyze biomedical engineers and their relationship to prosthetics and ocean animals. Students will discuss and compare their findings to use for future design build. ● Teacher will facilitate and question students as they work, explaining and modeling throughout investigation. <u>Differentiation:</u> High-Achieving: Students must produce and contribute at least 3 valid points or connections they made for each category and should exceed expectations on all areas of the rubric. ELL/Extra Support: Students will contribute to at least 1 point or connection they made about biomedical engineers and prosthetics. Students will use specific rubric and checklist to help complete their research. Performance Task- Using their journals and findings, students apply their knowledge and skills from research investigation to determine the best idea for their prosthetic animal challenge. They will design, build, and then evaluate how their prosthetic works and might be improved. ● Teacher will facilitate and question students as they work, explaining and modeling different strategies, materials, and functions throughout investigation. <u>Differentiation:</u> ▪ Engineering Design Process allows multiple entry points and multiple ways to demonstrate understandings to meet all needs or learners. The assessment is hands-on, however students in need of more support will be provided with visuals of similar prosthetics, specific materials, and step by step checklist.
Formative Assessments	Class Activities- Animals and Prosthetics ● Various media (videos, images, slides, books, read aloud) on prosthetics and biomedical engineering. Showing the different types of prosthetics and how they are designed and used to support animals survival, and the job of a biomedical engineering. ● Record findings throughout station rotations Class Activities- Animal Prosthetic Challenge

	● Students work with partner using the EDP to develop a design to solve the marine animal prosthetic device challenge. ● Students use research, design, and specific materials to create and complete challenge. ● Students communicate and collaborate with partner/team. ● Students evaluate and improve their device design and build based on data collected from test trails. ● Students create an informative pamphlet; using google suite, that will include their research on marine animals and prosthetics, effects of plastics in the ocean, ideas they have to combat this epidemic, images and illustrations. Class Discussions Do Now Questions

STAGE 3 – LEARNING PLAN

Activity 1- Animals and Prosthetics

Objective:

- Research biomedical engineers and their contribution to health care, as well as, marine biology.
- Observe various animals to analyze how external structures serve various functions in growth, survival, behavior, and reproduction.
- Research, analyze, compare, and discuss some possible prosthetic devices that could help humans/animals movements.
- Develop questions and ideas about prosthetics and how they have helped marine animals survive.
- Collect and record information gathered throughout activity stations.

Activities:

- Introduce topic with "Winter's Tail" read aloud/video, discussion of topic and how it relates to previous unit's topic. Question students: "Why are these animals becoming affected?", "How do you think this may impact marine life?", "Is this something that may happen more in the future?", "How can we help these animals and these situations?"
- Introduce investigation of various video/research. Students will work with partner/group to investigate and research different types of animal prosthetics and what biomedical engineering is. Students will record their findings on their lab-sheet/notebook.
- Students will use various websites, images, videos provided to collect data needed for prosthetic build.
- Teacher will facilitate activities and question students as they work and investigate

Notes

Activities can be done as stations through a couple weeks or as mini-lessons as classroom teacher sees fit.

Activity 2-Prosthetic Animal Challenge

Objective:

- Investigate the EDP completing the steps (ask, imagine, plan, create, improve, communicate) to solve the real world design problem. Students will make connections to prior lessons exploring prosthetics and engineers and create a prosthetic for a marine animal.
- Brainstorm various ideas using prior knowledge, choosing best one to illustrate a diagram that represents build and design challenge.
- Build a prototype from diagram to represent design and solve the challenge.
- Question and make observations about the prosthetic device created, why they chose the specific design/materials, how it's used, if they could solve the challenge, and how their designs might be improved.
- Analyze, compare, and discuss the various team outcomes of the challenge (Productive Talk).
- Participate and work with partner/group to complete the challenge.

Activities:

1. Students work with team following the EDP to complete the design challenge of determining the best prosthetic device that allows the animal to function correctly.
2. Create a list of thoughts, ideas, and materials that can be used to complete the challenge.
3. Choose the team's best idea to prepare and construct the device.
4. Predict, analyze, and compare the outcomes of the individual team and class solutions. Here students reflect and discuss in teams, as well as, whole group on positives and negatives of the design build. (productive talk)
5. Evaluate discussion and prosthetic device, redesign/rebuild to improve device.
6. Teacher will introduce, explain, and facilitate activity as students work in groups. Teacher will question groups as they work with the EDP to solve the problem. Teacher will guide students through questions: What do you need to take into account when making your model/prototype? What about its build is useful? Will your device allow your animal to move and function to survive?

Differentiation:

- EDP allows multiple entry points and multiple ways to demonstrate understandings.

UNIT RESOURCES

- Supplies:
  Wind-up water toys, tools, various recycled plastic items, wood pieces, glue, 3D printer (if available), straws, sticks, etc.

- Read Aloud Books:
  Winter's Tail: How one little Dolphin learned to swim again by Juliana Hatkoff
  Biomedical Engineering and Human Body Systems by Recca Sjonger

- Websites:
  Arkive.org (videos)
  Clearwater Marina Aquarium: https://www.seewinter.com/winter-and-hope/winter/

- Enrichment:
  Coding Activities: Code.org, Tynker.com
  Extension Activities: Creating other kinds of prosthetics, 3D printing of prosthetics (based on availability).

Notes:
Various builds can be used to complete this design challenge, depending on materials at each school.

Unit Title: Waves and Water	Duration: 13 days

Stage 1-Desired Results	
Essential Questions	**Enduring Understandings**
How do we describe the motion of waves and their energy?	Waves are patterns of motion that can be detected through different mediums (solid, liquid, or gas)
How can we use waves to collect and send information that is beneficial to humans?	Energy moves through waves.
	We can create/use different tools to record waves and provide humans with informative and useful information. (seismograph, buoy)

New Jersey Student Learning Standards for Science
4-PS4-1. Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move. 4-PS4-3. Generate and compare multiple solutions that use patterns to transfer information. 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.

Interdisciplinary Standards:
New Jersey Student Learning Standards for English Language Arts
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.R2. Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas. NJSLSA.R7. Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words. NJSLSA.R8. Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence. NJSLSA.R10. Read and comprehend complex literary and informational texts independently and proficiently with scaffolding as needed. RL.4.1. Refer to details and examples in a text and make relevant connections when explaining what the text says explicitly and when drawing inferences from the text. RI.4.7. Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears. NJSLSA.W6. Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others. NJSLSA.W7. Conduct short as well as more sustained research projects, utilizing an inquiry-based research process, based on focused questions, demonstrating understanding of the subject under investigation. NJSLSA.W8. Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism. NJSLSA.W9. Draw evidence from literary or informational texts to support analysis, reflection, and research. W.4.2. Write informative/explanatory texts to examine a topic and convey ideas and information clearly. K. Introduce a topic clearly and group related information in paragraphs and sections; include formatting (e.g., headings), illustrations, and multimedia when useful to aiding comprehension. L. Develop the topic with facts, definitions, concrete details, text evidence , or other information and examples related to the topic. M. Link ideas within paragraphs and sections of information using words and phrases (e.g., *another*, *for example*, *also*, *because*). N. Use precise language and domain-specific vocabulary to inform about or explain the topic. O. Provide a conclusion related to the information or explanation presented.

W.4.9. Draw evidence from literary or informational texts to support analysis, reflection, and research.
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.SL4. Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.
SL.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.

I. Explicitly draw on previously read text or material and other information known about the topic to explore ideas under discussion.

J. Follow agreed-upon rules for discussions and carry out assigned roles.

K. Pose and respond to specific questions to clarify or follow up on information, and make comments that contribute to the discussion and link to the remarks of others.

L. Review the key ideas expressed and explain their own ideas and understanding in light of the discussion.

New Jersey Student Learning Standards for Math

Mathematical Practices
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.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning

Operations and Algebraic Thinking	4.OA
C. Generate and analyze patterns.	
Measurement and Data	4.MD
B. Represent and interpret data	
Geometry	4.G

New Jersey Student Learning Standards for Technology

8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.

B. Creativity and Innovation: *Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.*
C. Communication and Collaboration: *Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.*
E: Research and Information Fluency: *Students apply digital tools to gather, evaluate, and use information.*
F: Critical thinking, problem solving, and decision making: *Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.*

8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.
A. The Nature of Technology: Creativity and Innovation *Technology systems impact every aspect of the world in which we live.*
B. Technology and Society: *Knowledge and understanding of human, cultural and societal values are fundamental when designing technological systems and products in the global society.*
C. Design: *The design process is a systematic approach to solving problems.*
D. Abilities for a Technological World: *The designed world is the product of a design process that provides the means to convert resources into products and systems.*
E. Computational Thinking: Programming: *Computational thinking builds and enhances problem solving, allowing students to move beyond using knowledge to creating knowledge*

In these unit plans, the following 21st Century Life and Careers skills are addressed:		
Check ALL that apply – **21st Century Themes**		**Indicate whether these skills are:** ● **E – Encouraged** ● **T – Taught** ● **A – Assessed**

			Career Ready Practices	
9.1	**Personal Financial Literacy**		ETA	CRP1. Act as a responsible and contributing citizen and employee.
	Income and Careers		ETA	CRP2. Apply appropriate academic and technical skills.
	Money Management			CRP3. Attend to personal health and financial well-being.
	Credit and Debt Management		ETA	CRP4. Communicate clearly and effectively and with reason.
	Planning, Saving, and Investing		ETA	CRP5. Consider the environmental, social and economic impacts of decisions.
	Becoming a Critical Consumer		ETA	CRP6. Demonstrate creativity and innovation.
	Civic Financial Responsibility		ET	CRP7. Employ valid and reliable research strategies.
	Insuring and Protecting		ET	CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
9.2	**Career Awareness, Exploration, and Preparation**		E	CRP9. Model integrity, ethical leadership and effective management.
X	Career Awareness			CRP10. Plan education and career paths aligned to personal goals.
X	Career Exploration		ETA	CRP11. Use technology to enhance productivity.
	Career Preparation		ET	CRP12. Work productively in teams while using cultural global competence.

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

_____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

_____Recognize and identify the thoughts, feelings, and perspectives of others
_____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
_____Demonstrate an awareness of the expectations for social interactions in a variety of settings

Responsible Decision Making

__x__Develop, implement and model effective problem solving and critical thinking skills
__x__Identify the consequences associated with one's action in order to make constructive choices
_____Evaluate personal, ethical, safety and civic impact of decisions

Relationship Skills

_____Establish and maintain healthy relationships
__x__Utilize positive communication and social skills to interact effectively with others
_____Identify ways to resist inappropriate social pressure
__x__Demonstrate the ability to present and resolve interpersonal conflicts in constructive ways
_____Identify who, when, where, or how to seek help for oneself or others when needed

Student Learning Targets / Objectives	

Students will know…
 	
● Waves travel through different media (solid, liquid, gas).
● That waves are a regular pattern of motion.
● That waves carry energy from place to place.
● The differences between transverse and longitudinal waves.
● That geologist study the Earth and Earth systems.
● That engineers compare multiple solutions to solve a problem.
● That there is more than one possible solution to a problem.
● That developing and using technology can have a helpful impact on our world.
	Students will be able to…
	
	● Use a model to simulate different types of waves.
	● Illustrate parts of the wave (wavelength, amplitude, frequency).
	● Compare and Contrast transverse and longitudinal waves.
	● Demonstrate longitudinal and transverse waves using various materials.
	● Explain the relationship between a wave's amplitude, frequency, and wavelength.
	● Analyze and explain how buoys/seismographs are used to measure data and collect information.
	  ● Test and compare materials and how each can be used to create a device to solve the problem and record data.
	  ● Ask questions, make observations, and gather information that will be helpful to solving the problem.
	● Reflect on the solution and adjust/improve plan and build.
	● Incorporate knowledge from research and prior builds to share and critique how some devices are better suited for a specific need.
	● Connect classroom challenge to real world earthquake and tsunami systems.

STAGE 2 – ASSESSMENT EVIDENCE	
Common Summative Assessments	Performance Task- Students rotate through various mini hands-on investigations for students to explore and analyze different types of waves, parts of waves and how geologists study and record waves on earth. Students will record their observations to use for future design build. ● Teacher will facilitate and question students as they work, explaining and modeling stations throughout the investigation. <u>Differentiation:</u> High-Achieving: Students must produce a list of 3 items for each category (types of waves, relationship of wave properties, how waves travel) and should exceed expectations on all areas of the rubric. ELL/Extra Support: Many activities are hands-on simulations of waves; students will be provided with modeling, visual/auditory directions, and specific rubric and checklist to complete each station. Performance Task- Using their journals and findings students apply their knowledge and skills from research investigation to determine the best idea for their instrument to measure and record waves. They will design, build, and then evaluate how their device works and might be improved. ● Teacher will facilitate and question students as they work, explaining and modeling different strategies, materials, and functions throughout investigation. <u>Differentiation:</u> ▪ Engineering Design Process allows multiple entry points and multiple ways to demonstrate understandings to meet all needs or learners. ELL and Learners with Other Needs: The assessment is hands-on, however students in need of more support will be provided with visuals of similar devices (seismograph/buoy, specific materials, and a step-by-step checklist guide).
Formative Assessments	Class Activities- Wave Investigation ● Various media (videos, images, slides) on types of waves (solid, liquid, gas), earthquakes/tsunamis showing the different types of waves, energy associated with waves and how to measure a wave. ● Hands-on investigation to explore various types of water waves by creating a model/demonstration of its movement.

	● Record findings throughout station rotations Class Activities- Wave Device Challenge ● Students work with partner using the EDP to develop a design to measure waves through either a solid or liquid medium. ● Students use research, design, and specific materials to create and complete challenge. ● Students communicate and collaborate with partner/team. ● Students evaluate and improve their device design and build based on data collected from test trails. Class Discussions Do Now Questions

STAGE 3 – LEARNING PLAN

Activity 1: Wave Stations

Objective:

- Investigate and identify the relationship between wave properties; amplitude, wavelength, and frequency
- Use hands-on models to simulate different waves (transverse, longitudinal).
- Research, analyze, compare, and discuss devices that help collect data recorded from waves through different media (solid, liquid, gas).
- Develop questions and ideas on why it is important to collect this data and its possible effects on humans.
- Collect and record information gathered throughout activity stations.

Activities:

- Introduce topic with anchoring phenomena video/images, discussion of waves and the real life application of waves. Question students: "How are waves similar/different as they travel through various media?", "What is the relationship between a wave's amplitude, wavelength, and frequency?", "Who studies and why do you think it is important to study waves?", "How can you explain the movement of waves in patterns?"
- Introduce investigation stations. Students will work with partner/group to investigate and research different types of waves and wave properties. Students will record their findings on their lab-sheet/notebook.
- Stations:
    - Station A: Interactive sites that explore waves and wave properties.
    - Station B: Model transverse wave, using string.
    - Station C: Model longitudinal wave, using slinky.
    - Station D: Observation of waves in water.
    - Station E: Videos/images/simulations of different types of waves.
- Teacher will facilitate stations and question students as they work and investigate

Notes

Activities can be done as stations through a couple weeks or as mini-lessons throughout unit.

Activity 2-Wave Device Challenge

Objective:

- Investigate the EDP completing the steps (ask, imagine, plan, create, improve, communicate) to solve the real world design problem. Students will make connections to prior lessons exploring waves and geologists to design and create the build challenge.
- Brainstorm various ideas using prior knowledge, choosing best one to illustrate a diagram that represents build and design challenge.
- Build a prototype from diagram to represent design, and build the challenge.
- Question and make observations about the wave device created, why they chose the specific design/materials, how it's used, if they could solve the challenge, and how their designs might be improved.
- Analyze, compare, and discuss the various team outcomes of the challenge (Productive Talk).
- Participate and work with partner/group to complete the challenge.

Activities:

- Students work with team following the EDP to complete the design challenge of determining the best wave device that collects and measures data.
- Create a list of thoughts, ideas, and materials that can be used to complete the challenge.
- Choose the team's best idea to prepare and construct the device.
- Predict, analyze, and compare the outcomes of the individual team and class solutions. Here students reflect and discuss in teams, as well as, whole group on positives and negatives of the design build (productive talk).
- Evaluate discussion and wave device; redesign/rebuild to improve device.
- Teacher will introduce, explain, and facilitate activity as students work in groups. Teacher will questions groups as they work with the EDP to solve the problem. Teacher will guide students through questions: What do you need to take into account when making your model/prototype? What about the build is useful? Will your device meet all criteria?

Differentiation:

- EDP allows multiple entry points and multiple ways to demonstrate understandings.

Notes:

Various builds can be used to complete this design challenge, depending on materials at each school. Some examples include: seismograph, buoy design.

UNIT RESOURCES
• Supplies: Tubes, string, slinky, PVC pipes (varying sizes), straws, weights Videos/Images of waves • Websites: Legends of Learning: https://www.legendsoflearning.com/ NOAA: https://www.noaa.gov/ Brainpop.com/wave Bozeman science: http://www.bozemanscience.com/ • Enrichment: Coding Activities: Code.org, Tynker.com Extension Activities: Activities including light and sounds waves.

Grade 5 STEM		Fifth Grade Pacing Guide
Note: STEM is a weekly course taught by the Elementary STEM teacher. Each unit takes place over 1 trimester.		
Unit		**Number of Days**
1.	**Physics of Flight**	**13 days**
2.	**Exploring Life Beyond Earth**	**13 days**
3.	**LEGO Robotics**	**13 days**
	Enrichment (during PLC time)	During Enrichment, activities can be extended correlating to the appropriate unit. The time devoted to Enrichment per grade level may vary by school building. Specific Enrichment extensions are included in each unit. In addition, block coding can be implemented during any open sessions using coding websites, Lego Robotics, Alex Toys coding tools, and other coding manipulatives.

Grade 5 STEM	Theme: Exploring the Expanding Universe

Thematic Overview
An introduction to our solar system – the planets, our sun and the moon. Students learn about the history and engineering of space travel while making contraptions that will enable them to understand the basic concepts of Newton's Laws of Motion. They see how engineers design tools, equipment and spacecraft to go where it is too far or too dangerous for humans. They will incorporate the steps of the engineering design process as they create models of planetary rovers while balancing a budget. They will use that knowledge and translate it with a more realistic approach by building Lego robots and coding them to navigate through unknown worlds. Students will learn about STEM based careers and that more than aerospace engineers work in the space industry. Biomedical, chemical, mechanical, electrical and computer (and other) engineers work together to make spacesuits, design life support systems, create new materials for spacecraft, and design control systems, cameras, communications, etc. The space industry provides endless opportunities—requiring a wide range and depth of study and expertise. Throughout the thematic unit students will practice student-students, student-teacher discourse that encourages classroom conversations. Students will also cover a variety of science and engineering standards that will prepare them for the next stage of STEM exploration.

Unit Title: Physics of Flight	Duration: 13 days

Stage 1-Desired Results	
Essential Questions	**Enduring Understandings**

How might the forces resulting from a collision Be reduced or redirected?	Through careful design and many experimental trials, NASA engineers have developed a way to safely land Mars rovers at speeds exceeding 12,000 mph. To slow down the spacecraft that is transporting the rover, engineers have designed a craft that includes an *aeroshell*, which is comprised of a *heat shield* *parachute*, *airbags*, *rockets* and *lander* among other important components.
What design would allow you to create the smallest container capable of protecting an egg from a falling or being dropped?	Aerospace and mechanical engineers use materials that slow down spacecraft and cushion the object to reduce the greatest impact when landing on the moon or another planet.

New Jersey Student Learning Standards for Science
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 5-PS2-1 Support an argument that the gravitational force exerted by Earth on objects is directed down.

Interdisciplinary Standards:
New Jersey Student Learning Standards for English Language Arts

Key Ideas and Details

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.R2. Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

NJSLSA.R3. Analyze how and why individuals, events, and ideas develop and interact over the course of a text.

Craft and Structure

NJSLSA.R4. Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

NJSLSA.R5. Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

NJSLSA.R6. Assess how point of view or purpose shapes the content and style of a text.

Integration of Knowledge and Ideas

NJSLSA.R7. Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.

NJSLSA.R8. Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.

NJSLSA.R9 Analyze and reflect on how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

NJSLSA.R10. Read and comprehend complex literary and informational texts independently and proficiently with scaffolding as needed.

Interdisciplinary Standards:

New Jersey Student Learning Standards for Math

Mathematical Practices

. Make sense of problems and persevere in solving them.

. Reason abstractly and quantitatively.

. Construct viable arguments and critique the reasoning of others.

. Model with mathematics.

. Use appropriate tools strategically.

. Attend to precision.

. Look for and make use of structure.

. Look for and express regularity in repeated reasoning

Operations and Algebraic Thinking	3.OA
Measurement and Data	3.MD
B. Represent and interpret data	
Geometry	3.G

In these unit plans, the following 21st Century Life and Careers skills are addressed:

Check ALL that apply – 21st Century Themes			Indicate whether these skills are: ● E – encouraged ● T – taught ● A – assessed Career Ready Practices	
9.1	**Personal Financial Literacy**		E	CRP1. Act as a responsible and contributing citizen and employee.
	Income and Careers		E, T, A	CRP2. Apply appropriate academic and technical skills.
	Money Management			CRP3. Attend to personal health and financial well-being.
	Credit and Debt Management		E, T, A	CRP4. Communicate clearly and effectively and with reason.
	Planning, Saving, and Investing		E, T,	CRP5. Consider the environmental, social and economic impacts of decisions.
	Becoming a Critical Consumer		E, T, A	CRP6. Demonstrate creativity and innovation.
	Civic Financial Responsibility		E,T	CRP7. Employ valid and reliable research strategies.
	Insuring and Protecting		E, T, A	CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
9.2	**Career Awareness, Exploration, and Preparation**		E,T,	CRP9. Model integrity, ethical leadership and effective management.
X	Career Awareness		E, T	CRP10. Plan education and career paths aligned to personal goals.
X	Career Exploration		E, T, A	CRP11. Use technology to enhance productivity.
	Career Preparation		E,T	CRP12. Work productively in teams while using cultural global competence.

Student Learning Targets / Objectives

Students will know…	**Students will be able to…**
• Velocity and acceleration from falling objects relate to a force on landing. • Objects accelerate as they fall. • Falling objects experience drag, which is friction caused by the atmosphere. As an object falls faster, drag increases. • The terms acceleration, force, gravity, speed, and gravity. • The moon has no atmosphere making a parachute ineffective. • Mars has a very thin atmosphere and 1/3 of Earth's gravity making objects fall more slowly on Mars. • Engineers work with scientists to develop robots that can safely explore places where humans cannot go.	● Drop an egg from various heights without breaking it. ● Create a package to contain and successfully land a raw egg, unbroken from a fall to the ground. ● Identify several components of a Mars lander designed by engineers. ● Define the term velocity. ● Recognize similarities and differences between their model lander design and the Mars Landing Spacecraft design. ● Implement critical thinking and creativity by designing methods to combat the force of gravity. ● Demonstrate an understanding of the challenges of soft landing a spacecraft on Mars. ● Design, build, and test their own interplanetary lander.

STAGE 2 – ASSESSMENT EVIDENCE

Common Summative Assessments	• Performance Task- Students design, build, and test a device that will contain and successfully land a raw egg, unbroken from a fall to the ground. • Teacher will facilitate and question students as they work, explaining and modeling throughout investigation. Success will be determined by whether or not the egg breaks upon contact. • Have students explain the best part of their design and what could go wrong with it (and what could be fixed in future models). Remind students that engineers go through the deign/build/redesign process many times before they arrive at a finished product. • We performed the egg-lander experiment on Earth rather than on Mars where the atmosphere is much thinner. What problem could this present if we tested our designs on Mars? <u>Differentiation:</u> ▪ ELL: Students will be given materials ahead of time to view to help them create their budget and design.
Formative Assessments	Class Activities- Egg Drop Martian Lander • Ask the students to come up with some ideas on how to safely land a delicate falling object like an egg. (Possible answers may include: padding or foam, airbags or balloons, springs, parachutes, etc.). • Using the EDP develop a list of materials to a build a device that will land an egg safely on the ground without breaking • Students communicate and collaborate with partner to complete challenge. • Students improve their design and build based on data collected from test trials. Class Discussions/Teacher questioning

STAGE 3 – LEARNING PLAN

Activity 1- (approx 13 weeks) Mars Pathfinder Egg Drop Challenge

Objectives:

- Design, build and drop your "pathfinder" from a high place and see if your "payload" (egg) survives.
- Demonstrate an understanding of the of challenges of soft landing a spacecraft on Mars
- Design, build, and test their own interplanetary lander

Activities:

- Begin by asking students "Have humans ever been anywhere other than Earth?" "Have we sent humans to another planet? What has NASA sent in the place of humans?" Explain to students that it is important to study other planets so we have a better understanding of our solar system and the planet that we live on. Scientists and engineers work together to build rovers that can explore areas where humans cannot yet go. Landing these pathfinders on other planets are very difficult and require precise programming and timing.
- Show students video, "7 Minutes of Terror: The Challenges of Getting to Mars". Ask students what types of things did they see in the video that engineers used to slow the spacecraft down.
- Now show the students video, "Mars Exploration Rover Animation" https://www.youtube.com/watch?v=RIE0tYQ_9U0. Ask students what are some techniques that engineers used in this video to land safely on Mars?
- Challenge students to build a device that will hold a raw egg that will not break when dropped from various heights.
- Give students time to familiarize themselves with the materials and have them choose materials they will use to build their contraptions.
- Students will use the EDP to design, build, and test their "egg-landers." A group will successfully completed the mission if their egg remains unbroken after the fall.

UNIT RESOURCES

• Supplies
  • Cotton balls, egg carton, bubble wrap, string, plastic bags, coffee filters, eggs, paper
  • Egg Drop Design Sheet
  • Mars Exploration Rover Animation video: https://www.youtube.com/watch?v=RIE0tYQ_9U0
  • 7 Minutes of Terror: Challenges of Getting to Mars video: https://www.youtube.com/watch?v=Ki_Af_o9Q9s

Unit Title: Exploring Life Beyond Earth	**Duration: 13 days**

Stage 1-Desired Results	
Essential Questions	**Enduring Understandings**

Why do engineers design rovers to successfully drive and collect information on Mars?	Organizations like NASA need engineers that study geology, manufacturing, biology, electricity, and many different sciences to solve the problems they face in traveling through our solar system and beyond.

New Jersey Student Learning Standards for Science
TS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. -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. -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 S2-1 Support an argument that the gravitational force exerted by Earth on objects is directed down.

Interdisciplinary Standards:
New Jersey Student Learning Standards for English Language Arts
Key Ideas and Details 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.R2. Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas. NJSLSA.R3. Analyze how and why individuals, events, and ideas develop and interact over the course of a text. **Craft and Structure** NJSLSA.R4. Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone. NJSLSA.R5. Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole. NJSLSA.R6. Assess how point of view or purpose shapes the content and style of a text. **Integration of Knowledge and Ideas** NJSLSA.R7. Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words. NJSLSA.R8. Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence. NJSLSA.R9 Analyze and reflect on how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take. NJSLSA.R10. Read and comprehend complex literary and informational texts independently and proficiently with scaffolding as needed.

New Jersey Student Learning Standards for Math

Mathematical Practices

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.

6. Attend to precision.

7. Look for and make use of structure.

8. Look for and express regularity in repeated reasoning

Operations and Algebraic Thinking	3.OA
Measurement and Data	3.MD
B. Represent and interpret data	
Geometry	3.G

New Jersey Student Learning Standards for Technology

8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
B. Creativity and Innovation: *Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.*
C. Communication and Collaboration: *Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.*

E: Research and Information Fluency: *Students apply digital tools to gather, evaluate, and use information.*
F: Critical thinking, problem solving, and decision making: *Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.*

8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.
A. The Nature of Technology: Creativity and Innovation *Technology systems impact every aspect of the world in which we live.*
B. Technology and Society: *Knowledge and understanding of human, cultural and societal values are fundamental when designing technological systems and products in the global society.*
C. Design: *The design process is a systematic approach to solving problems.*
D. Abilities for a Technological World: *The designed world is the product of a design process that provides the means to convert resources into products and systems.*
E. Computational Thinking: Programming: *Computational thinking builds and enhances problem solving, allowing students to move beyond using knowledge to creating knowledge*

In these unit plans, the following 21st Century Life and Careers skills are addressed:				
Check ALL that apply – **21st Century Themes**			**Indicate whether these skills are:** ● **E – encouraged** ● **T – taught** ● **A – assessed** **Career Ready Practices**	
9.1	**Personal Financial Literacy**		E	CRP1. Act as a responsible and contributing citizen and employee.
	Income and Careers		E, T, A	CRP2. Apply appropriate academic and technical skills.

	Money Management			CRP3. Attend to personal health and financial well-being.
	Credit and Debt Management		E, T, A	CRP4. Communicate clearly and effectively and with reason.
	Planning, Saving, and Investing		E	CRP5. Consider the environmental, social and economic impacts of decisions.
	Becoming a Critical Consumer		ETA	CRP6. Demonstrate creativity and innovation.
	Civic Financial Responsibility			CRP7. Employ valid and reliable research strategies.
	Insuring and Protecting		ET	CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
9.2	**Career Awareness, Exploration, and Preparation**			CRP9. Model integrity, ethical leadership and effective management.
X	Career Awareness			CRP10. Plan education and career paths aligned to personal goals.
X	Career Exploration		ETA	CRP11. Use technology to enhance productivity.
	Career Preparation		ET	CRP12. Work productively in teams while using cultural global competence.

Student Learning Targets / Objectives

Students will know…	Students will be able to…
• Engineers take into consideration the constraints that may limit the rover's ability to complete a drive. (ie. What obstacles are in the way? Is there a slope to drive down? Is it too steep for the rover to safely drive? Does the terrain change part way through the drive?) • The Mars rovers Spirit, Curiosity and Opportunity have collectively driven over 35 miles on Mars, some days less than one meter other days more than 100 meters. • Rovers are machines that drive either by human or robotic control on planetary surfaces	• Design a rover that will travel down a one-meter ramp and then travel an additional one meter on a smooth, flat surface. • Define what a successful drive will look like and identify the limiting factors they will face on their drive. • Identify the main parts of a rover including wheels, body, science instruments, axles, suspension, and cameras. • Build a rover that will travel down a one-meter ramp (to gain speed) and continue to travel on a smooth surface at least one additional meter. • Stay within a budget of $50,000,000 for supplies.

STAGE 2 – ASSESSMENT EVIDENCE

Common Summative Assessments	Performance Task- Rovers that travel the full meter on a flat surface have achieved the full goal of the assignment. Consider involving students in developing assessment guidelines, or rubric, for the best performing rovers <u>Differentiation:</u> ELL: Students will be given materials ahead of time to view to help them create their design. Consider giving each team a pasta budget: Either limit their access to the pasta by predetermining their pasta supply or give each team a financial budget and charge them for each piece of pasta they use for their rover gh Achieving Learners: (Optional extra tough challenge: Using stop watches, have students measure the time (t) a rover is in transit and measure the distance (d) the rover travels.
Formative Assessments	Class Activities- • Planetary Pasta Rover Budget Sheet • Planetary Pasta Rovers How Fast Does Your Rover Travel? Sheet (for extension) Class Discussions Teacher Questioning Rover Design Plan Analysis of Results

STAGE 3 – LEARNING PLAN

Activity 1- **Planetary Pasta Rovers (approx. 13 weeks)**

Objective: Build a rover that will travel down a one-meter ramp (to gain speed) and continue to travel on a smooth surface at least one additional meter.

Activities

- Introduce the activity by showing images of NASA rovers.
- Ask students to examine rover images and identify the main parts of a rover (e.g., wheels, body, science instruments, axles, suspension, cameras, etc.).
- Tell students that rovers are expensive to build and require careful engineering, often incorporating new technologies.
- Challenge students, in groups of two to four, to build a rover that will travel down a one-meter ramp (to gain speed) and continue to travel on a smooth surface at least one additional meter.
- Inform students that they may only use pasta and glue, and they will have to stay within a budget of $50,000,000 for supplies. Fortunately, glue is considered an incidental expense and will not be billed
- After displaying the types of pasta available, challenge students to brainstorm ideas and sketch concepts for their pasta rovers on paper.
- After students have workable concepts, allow building to ensue. Note: Some pasta will break or not work out as students expect. Rover cost could be based on total pasta (used or wasted) or on pasta used in the final product as an option.
- Encourage each team to name their rover.
- As each team prepares to run their rover, encourage them to explain the design of their rover and the intent of the design.
- Run one rover at a time by having the team place their rover at the top of the ramp and letting it go without pushing it.
- Mark distance traveled by each rover on the flat surface with masking tape and the team's rover name.
- As time allows, encourage students to engage in the iterative design process by building a second rover, improving on the design and performance of their first rover. Consider increasing the overall budget to encourage creativity.

UNIT RESOURCES
● Supplies: Various types of pasta, glue guns, paper and pencils, ramp, meter stick or other linear measuring device, pasta budget sheet, data sheet, tape, stopwatch. ● Websites: https://www.jpl.nasa.gov/edu/teach/activity/planetary-pasta-rover/

Unit Title: LEGO Robotics	**Duration: 13 days**

Stage 1-Desired Results

Essential Questions	Enduring Understandings
What do scientists and engineers do when they cannot go where they want to explore?	Scientist and engineers take these situations as challenges they want to solve. With proper resources and commitment, they will develop prototypes as possible solutions and ultimately choose the best option.

New Jersey Student Learning Standards for Science
3-ESS3-1. Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard 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.
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	Career Preparation		E,T	CRP12. Work productively in teams while using cultural global competence.

Student Learning Targets / Objectives

Students will know…	Students will be able to…
• Scientists and engineers have always challenged themselves to explore remote places and make new discoveries. • To succeed in this journey, they have designed spacecraft, rovers, satellites, and robots to help them see and collect data about these new places. • When a rover is in a remote place, it needs to have sensors in order to help it make decisions about where to go and where to stop. The rover needs to have sensors so they can achieve a task without constant human control. • When rovers locate what they are looking for, they send a message back to the base.	• Explore different ways scientists and engineers reach remote places. • Create and program Milo the Science Rover. • Document how Milo can help you discover a special plant specimen. • Build an arm using the Motion Sensor that will allow Milo to detect the plant sample. They will also build a plant sample on a LEGO® round plate. • Record a video of their mission. They will practice manipulating the camera and recording themselves, which will be useful in future projects. • Build a device using the Tilt Sensor that can send a message back to the base. • Take a screen capture of their final program. Have them practice documenting the program strings they used in their project. • Collaborate with another rover to move the sample forward together • Build the transportation device, physically connecting the two rovers together. • Create their own program strings so they can move the specimen from point A to B.

STAGE 2 – ASSESSMENT EVIDENCE

Common Summative Assessments	Performance Task- Lego We Do 2.0- Milo the Science Rover Parts A-D • Completion of Create and Share Phases Differentiation: High Achieving – Students who showed successful completion of all 4 parts may choose activities from the We Do lessons. Students may also work with Lego Mindstorms or EV3s
Formative Assessments	Class Activities- - ● Milo the Science Rover Parts A-D correctly put together ● Introductory Videos ● Milo Programming ● Successful Use of the documenting tool

STAGE 3 – LEARNING PLAN

Activity 1: Milo the Science Rover Part A (approx 3 weeks)

Objectives:

- Explore different ways scientists and engineers reach remote places.
- Create and program Milo the Science Rover.
- Document how Milo can help you discover a special plant specimen.

Activities:

- Explain to students that scientists and engineers have always challenged themselves to explore remote places and make new discoveries. To succeed in this journey, they have designed spacecraft, rovers, satellites, and robots to help them see and collect data about these new places. They have succeeded many times and failed many times, too. Show students the introductory video on the We Do app.

Remember that failure is a chance to learn more. Use the following ideas to start thinking like a scientist:

1. Scientists send rovers to Mars.
2. They use submarines in water.
3. They fly drones into volcanoes.

Ask students, "What do scientists and engineers do when they cannot go where they want to explore?"

Scientist and engineers take these situations as challenges they want to solve. With proper resources and commitment, they will develop prototypes as possible solutions and ultimately choose the best option.

- **Build and program Milo**
  Students should follow the building instructions to build Milo, the Science Rover.

- After building Milo, connect via Bluetooth and program Milo using the given code. This program will start the motor at power 8, go in one direction for 2 sec., and then stop.The motor can be started in both directions, stopped and turned at different speeds, and activated for a specific amount of time (specified in seconds).

- Give students time to change the parameters of this program string.
  Let them discover new features, such as adding sound.
  Use this opportunity to guide students to the Design Library so they can gain inspiration about other program strings they can explore.
- Before you move on to the next part of the Getting Started Project, allow the students to express themselves:
  • Have a short discussion with your students about scientific and engineering instruments.
  • Have your students describe how science rovers are helpful to humans.
  • Have students discover the use of the Documentation tool.
  • Have them take a team picture with their model.

Activity 2: Milo the Science Rover Part B (approx. 2 weeks)

Objective: Create and program Milo's object-detector arm using the Motion Sensor Input. Document how Milo has found the special plant specimen.

Activities:

- Ask students, "How is the use of science instruments important to the task scientists have to do?" Explain that when a rover is in a remote place, it needs to have sensors in order to help it make decisions about where to go and where to stop. The rover needs to have sensors so they can achieve a task without constant human control.
- With the provided building instructions, your students will build an arm using the Motion Sensor that will allow Milo to detect the plant sample. They will also build a plant sample on a LEGO® round plate. The program string provided will make the rover go forward until it detects the presence of this sample object. It will stop and make a sound.
- Use this opportunity to have students record their own sound for the discovery.
- In this part of the Getting Started Project, ask your students to record a video of their mission. They will practice manipulating the camera and recording themselves, which will be useful in future projects.

Activity 3: Milo the Science Rover Part C (approx. 2 weeks)

Objective: Create a program Milo's messaging arm using the Tilt Sensor.
Document Milo's communication with the base.

Activities:

- Explain to students when rovers locate what they are looking for, they send a message back to the base. Ask, "Why is communication between a rover and the base important?" Explain if a rover is successful in its mission but fails to send back the results, the whole mission will be worth nothing. Communication remains to link between the remote mission and the base. What are some ways you might communicate with rovers? Currently satellites are used to send radio signals between the base and the rover.

- With the provided building instructions, your students will build a device using the Tilt Sensor that can send a message back to the base. The program string will trigger two actions depending on the angle detected by the Tilt Sensor:
  • If tilted down, the red LED will light up.
  • If tilted up, a text message will appear on the device.

- In this section of the Getting Started Project, ask your students to take a screen capture of their final program. Have them practice documenting the program strings they used in their project.

Activity 4: Milo the Science Rover Part D (approx 2 weeks)

Objective: Create and program a device to move the plant sample.
Document and present how Milo's mission went overall.

Activities:

- Explain to students that now that your rover has found the plant sample, it is time to carry it back. But wait. It might be too heavy! Let's see if you can collaborate with another rover to move the sample forward together.

- Pair up the teams to complete this final part of the mission: Have them build the transportation device, physically connecting the two rovers together. Let students create their own program strings so they can move the specimen from point A to B. It doesn't matter where point A or B is. Students use the program strings to code Milo.

- Have students talk about their experiences:
  Why is it important to collaborate to solve a problem?
  Give an example of good communication among teams.

Activity 5: LEGO EV3 (approx. 4 weeks)

Objective: Understand that algorithms are capable of carrying out a series of instructions in order Explore the concept of Outputs by compare different ways in which a wheeled robot can move

Activities:

- Ignite a classroom discussion around the following questions: – How do autonomous cars work? – What would it take to ensure that autonomous cars are safe? – What types of movements do autonomous cars need to perform? Allow the students to select the tool(s) they find most appropriate for capturing and sharing their ideas. Encourage them document their thoughts using text, videos, images, sketchnotes, or another creative medium.
- Students will construct the Robot Educator base model, which is a basic wheeled robot.
- Have the students perform the following building check before they program their robots: – Are the wires correctly connected from the motors to ports B and C? – Are the wheels correctly installed? – Are the wheels rotating freely?
- Have the students begin a new project in the EV3 programming environment. Have them practice by creating a program that will make the robot turn three times. Encourage the students to explore different ways of making the wheeled robot move. Have them describe the effect(s) of altering the parameters of each of the blocks that they use.
    1. Start the Program
    2. Turn the driving base and stop after 1.5 seconds.
    3. Turn the driving base left and stop after 1 second.
    4. Move the driving base forward for 3 seconds. Program solutions for this lesson are available for download at: http://www.LEGOeducation.com
- Have the students choose one or all of these autonomous driving scenarios to program: – Parallel parking – Angle parking – Perpendicular parking They should use a different Programming Canvas for each solution. Allow the students to select the tool(s) they find most appropriate for capturing and sharing their pseudocode. Encourage them to use text, videos, images, sketchnotes, or another creative medium.

UNIT RESOURCES
Supplies: ● Lego WeDo 2.0 Kits ● Lego Mindstorms NXT or EV3 ● Student Chromebooks ● Lego WeDo App ● Mindstorms EV3 Manual: https://www.sos.wa.gov/_assets/library/libraries/projects/youthservices/legomindstormsev3programmingbasics.pdf

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
- Chunk the assignment - broken up into smaller units, work submitted in phases
- Encourage student to proofread assignments and tests
- Provide regular home/school communication
- Teacher checks student planner
- Provide student with clear expectations in writing and grading criteria for assignments (rubrics)

Testing Accommodations:
Students should receive all testing accommodations for Benchmark assessments that they receive for State testing.

- Setting: Alternate setting for assessments, small groups, screens to block distractions
- Presentation: large print, test readers, use of audio, fewer questions on each page
- Response: answer verbally, use large block answer sheet, speech-to-text dictation, accept short answers
- Allow for retakes
- Provide study guides
- Use of reference aids such as glossary, multiplication tables, calculator
- Choice of test format (multiple-choice, essay, true-false)
- Alternate ways to evaluate (projects or oral presentations instead of written tests)
- Open-book or open-note tests

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 (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
- Use of self-assessment rubrics
- Increase one-on-one conferencing; frequent check ins
- Use study guide to organize materials
- Make vocabulary words available in a student created vocabulary notebook, vocabulary bank, Word Wall, or vocabulary ring
- 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.

<u>Students at Risk of Failure</u>:

- 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 daily planner
- Encourage student to proofread work
- Assign a peer buddy
- Build on students' strengths based on Multiple Intelligences: Linguistic (verbal); Logical (reasoning); Musical/Rhythmic; Intrapersonal Intelligence (understanding of self); Visual Spatial Intelligence; Interpersonal Intelligence (the ability to interact with others effectively); Kinesthetic (bodily); Naturalist Intelligence; and Learning Styles: Visual; Auditory; Tactile; Kinesthetic; Verbal

<u>High Achieving</u>:

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 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)

Strategies to Differentiate to Meet the Needs of a Diverse Learning Population

- 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)
- Brainstorm Carousel-Large Post Its around the room, group moves in a carousel to music. Group discusses topic and responses on paper. Groups rotate twice to see comments of others. (Refer to Kagan Differentiated Strategies)
- 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.
- Think Pair Share Write
- Think Talk Write
- Think Pair Share
- 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/.

NEPTUNE CITY SCHOOL DISTRICT

Office of the Superintendent
210 West Sylvania Avenue
Neptune City, NJ 07753

An Affirmative Action Equal Opportunity Employer

2022