CAPE MAY CITY
ELEMENTARY SCHOOL

Grade 4 Science Curriculum

This curricula and accompanying instructional materials have been developed to align with the NJSLS and in accordance with the NJ Department of Education's guidelines to include: Curriculum designed to meet grade level expectations, integrated accommodations and modifications for students with IEPs, 504s, ELLs, and gifted and talented students, assessments including benchmarks, formative, summative, and alternative assessments, a list of core instructional and supplemental materials, pacing guide, interdisciplinary connections, integration of 21st century skills, integration of technology, and integration of 21st Century Life and Career standards.

About the Standards

In 1996, the New Jersey State Board of Education adopted the state's first set of academic standards called the Core Curriculum Content Standards. The standards described what students should know and be able to do upon completion of a thirteen-year public school education. Over the last twenty years, New Jersey's academic standards have laid the foundation for local district curricula that are used by teachers in their daily lesson plans.

Revised every five years, the standards provide local school districts with clear and specific benchmarks for student achievement in nine content areas. Developed and reviewed by panels of teachers, administrators, parents, students, and representatives from higher education, business, and the community, the standards are influenced by national standards, research-based practice, and student needs. The standards define a "Thorough and Efficient Education" as guaranteed in 1875 by the New Jersey Constitution. Currently the standards are designed to prepare our students for college and careers by emphasizing high-level skills needed for tomorrow's world.

The New Jersey Student Learning Standards include Preschool Teaching and Learning Standards, as well as nine K-12 standards for the following content areas: **21st Century Life and Careers, Comprehensive Health and Physical Education, English Language Arts, Mathematics, Science, Social Studies, Technology, Visual and Performing Arts, World Languages**

The 2020 NJSLS in Science were adopted by the State Board of Education on June 3, 2020. Districts are required to implement it by September 2022. The 2020 New Jersey Student Learning Standards webpage provides links to the 2020 NJSLS and information regarding curriculum implementation dates.

Cape May City Elementary School District Science Curriculum

Science Pacing Guide

Content Area: Science

Our elementary science program is founded upon the New Jersey Student Learning Standards for Science, which emphasizes three dimensions to promote scientific literacy for all student scientists. The core three dimensions of science learning, which are integrated into all science learning activities, are: **Science and Engineering Practices, Disciplinary Core Ideas, and Cross Cutting Concepts.** These three dimensions can also be thought of as, **"what scientists do," "what scientists need to know," and "common themes found throughout all science disciplines."**

To implement these standards and corresponding dimensions, our district utilizes highly interactive and engaging activities. These dynamic activities are categorized into three main units of study. and present hands-on, real-world science experiences matched to the developmental level of students.

Three Main Units of Study:

1. Physical Science,
2. Earth & Space Science, and
3. Life Science

Course Title: Grade 4 Science	**Grade level: 4**
Unit I: 4-PS3: Energy-Grade 4 **Instructional Days: 15** In this unit students develop an understanding that energy can be transferred from place to place by sound, light, heat, and electrical currents. Students also obtain and combine information to describe that energy and fuels are derived from natural resources and that their uses affect the environment. The crosscutting concepts of cause and effect, energy and matter, and the interdependence of science, engineering, and technology, and influence of science, engineering, and technology on society and the natural world are called out as organizing concepts for these disciplinary core ideas. Students are expected to demonstrate grade-appropriate proficiency in planning and carrying out investigations and obtaining, evaluating, and communicating information. Students are also expected to use these practices to demonstrate understanding of the core ideas. This unit is based on 4-PS3-2 and 4-ESS3-1.	**Dates for Unit: September to November** **<u>Pacing Guide: 15 days</u>** Week 1: Types of Energy Transfer Week 2: Transfer of Energy by Electricity Week 3: Transfer of Energy by Light Week 4: Design Energy Solutions Week 5: Thermal Energy Transfer/Bottle Crush Experiment
Unit II: 4- PS4: Waves and their Applications in Technologies for Information Transfer **Instructional Days: 10** In this unit of study, students expand their knowledge of energy, and use a model of waves to describe patterns of waves in terms of amplitude and wavelength and to show that waves	**Dates for Unit: November to February** **<u>Pacing Guide: 10 days</u>** Week 1: What is a wave? Week 2: Light & Sound/Transverse and Compression Waves Week 3: How Do We Hear Sound?

can cause objects to move. The crosscutting concepts of patterns; interdependence of science, engineering, and technology; and influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for these disciplinary core ideas. Students demonstrate grade-appropriate proficiency in developing and using models, planning and carrying out investigations, and constructing explanations, and designing solutions. Students are also expected to use these practices to demonstrate their understanding of the core ideas. This unit is based on 4-PS4-1, 4-PS4-3, 3-5-ETS1-2, and 3-5-ETS1-3	Week 4: Patterns in Frequency and Wavelength Week 5: Electromagnetism Week 6: Make Your Own Recycled Materials Instrument, and Explain the Sound.
Unit III: **4-LS1: From Molecules to Organisms: Structures and Processes** **Instructional Days: 15** In this unit students will identify internal and external structures of living things, and use a model to describe information transfer of an animal. All plants & animals have structures that help them survive. Each structure has a specific function. Animal structures may appear similar or different depending on where they live. The concept of humans mimicking nature to solve problems is introduced at the first grade level through the NGSS. Biomimicry is an important concept in engineering. Many examples, such as glow sticks inspired by fireflies, adhesive inspired by gecko's feet, and swimwear inspired by shark skin could be explored. This unit is based on 4-LS1-1, 4-LS1-2 and 4-PS4-2.	**Dates for Unit: February to March** **<u>Pacing Guide: 15 days</u>** Week 1: Structures and Functions of Plants Week 2: Structures and Functions of Animals Week 3: Information Processing in Animals Week 4: The Role of Animals and System Functions Week 5: Review/Paper Airplane Bird
Unit IV: **Our Earth: 4-ESS1: Earth's Place in the Universe, 4-ESS2: Earth's Systems, 4-ESS3: Earth and Human Activity** **Instructional Days: 25** In this unit of study, students apply their knowledge of natural Earth processes, rock formations, fossils in rock, changes to landscape,topographical maps, and then generate and compare multiple renewable and non-renewable energy solutions to reduce the impacts of natural Earth processes (earthquakes, tsunamis, volcanos, and floods), and climate change on humans. Students will generate and compare multiple solutions to Earth's problems. This unit is based on 4-ESS1-1, 4-ESS2-1, 4-ESS2-2, 4-ESS3-2, 3-5-ETS1-2, and 3-5-ETS1-3.	**Dates for Unit: March to May** **<u>Pacing Guide: 25 days</u>** Week 1: Earth's Landforms and Features Week 2: Effects of Erosion Week 3: History of the Earth's Surface Week 4: Performance Task and Assessments Week 5: Weather Changes Week 6: Different Climates Week 7: Changes Affect Living Things Week 8: Humans & Animals and Natural Hazards Week 9: Science Role Play Presentations
Unit V: **3-5-ETS1: Engineering Design** **Instructional Days: 10** In this unit of study, students will ask questions, make	**Dates for Unit: May to June** **<u>Pacing Guide: 10 days</u>** Week 1: What is an engineer? Week 2: Types of engineers

observations, and gather information about a situation people want to change. People's needs and wants change over time, as do their demands for new and improved technologies. Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. They will define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost. Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. This unit is based on 3-5-ETS1-1, 2, and 3.	Week 3: Sticky Engineering Challenge
Date Created: 04/10/2022	**Board Approved On: 8/18/22**

Note: The number of instructional days is an estimate based on the information available at this time. 1 day equals approximately 42 minutes of seat time. Teachers are strongly encouraged to review the entire unit of study carefully and collaboratively to determine whether adjustments to this estimate need to be made.

Cape May City Elementary School District Grade 4 Science Curriculum
Unit I Overview

Content Area: Science

Unit Title: Unit I
4-PS3: Energy-Grade 4

Target Course/Grade Level: Grade 4

Unit Summary: Learning Goal

- Students will provide evidence that energy can be transferred from place to place.
- Students will design a device that converts energy from one form to another.

Interdisciplinary Connections:

- Science, Technology, English / Language Arts, Health, Social Emotional Learning, Mathematics, Social Studies

Career Readiness: Life Literacies and Key Skills Standards:

- Career Readiness, Life Literacies and Key Skills
  - These include critical thinking, problem solving, creativity, innovation, collaboration, teamwork and leadership, cross-cultural understanding, and interpersonal communication and science.
  - Incorporation of relevant technologies as tools as part of instruction (i.e. Chromebooks, Touch screen devices, manipulatives, certified assistive technologies for students with special needs, etc.)
  - Developing effective communication
  - Developing Independent Learning Strategies
  - Incorporating Science, Technology, Engineering, and Mathematical themes into daily lessons

Learning Targets:

• 4-PS3-1 Use evidence to construct an explanation relating the speed of an object to the energy of that object. [Assessment Boundary: Assessment does not include quantitative measures of changes in the speed of an object or on any precise or quantitative definition of energy.]

4-PS3-2 Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents. [Assessment Boundary: Assessment does not include quantitative measurements of energy.]

4-PS3-3 Ask questions and predict outcomes about the changes in energy that occur when objects collide. [Clarification Statement: Emphasis is on the change in the energy due to the change in speed, not on the forces, as objects interact.] [Assessment Boundary: Assessment does not include quantitative measurements of energy.]

4-PS3-4 Apply scientific ideas to design, test, and refine a device that converts energy from one form to another. [Clarification Statement: Examples of devices could include electric circuits that convert electrical energy into motion energy of a vehicle, light, or sound; and, a passive solar heater that converts light into heat. Examples of constraints could include the materials, cost, or time to design the device.] [Assessment Boundary: Devices should be limited to those that convert motion energy to electric energy or use stored energy to cause motion or produce light or sound.]

Unit Activity	Suggested Learning Activities
I.	**Science and Engineering Practices:** Asking Questions and Defining Problems Asking questions and defining problems in grades 3–5 builds on K–2 experiences and progresses to specifying qualitative relationships. Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships. (4-PS3-3) Planning and Carrying Out Investigations Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions. Make observations to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. (4-PS3-2) Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. Use evidence (e.g., measurements, observations, patterns) to construct an explanation. (4-PS3-1) Apply scientific ideas to solve design problems. (4-PS3-4) **DCI:** PS3.A: Definitions of Energy The faster a given object is moving, the more energy it possesses. (4-PS3-1) Energy can be moved from place to place by moving objects or through sound, light, or electric currents. (4-PS3-2), (4-PS3-3) PS3.B: Conservation of Energy and Energy Transfer Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. (4-PS3-2), (4- PS3-3) Light also transfers energy from place to place. (4-PS3-2) Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy. (4- PS3-2), (4-PS3-4) PS3.C: Relationship Between Energy and Forces When objects collide, the contact forces transfer energy so as to change the objects' motions. (4- PS3-3) PS3.D: Energy in Chemical Processes and Everyday Life The expression "produce energy" typically refers to the conversion of stored energy into a desired form for practical use. (4-PS3-4) ETS1.A: Defining Engineering Problems Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. (secondary to 4-PS3- 4)

Crosscutting Concepts; Energy and Matter Energy can be transferred in various ways and between objects. (4-PS3-1), (4-PS3-2), (4-PS3-3), (4-PS3-4) Connections to Engineering, Technology, and Applications of Science Influence of Science, Engineering and Technology on Society and the Natural World Engineers improve existing technologies or develop new ones. (4-PS3-4) Connections to Nature of Science Science is a Human Endeavor Most scientists and engineers work in teams. (4-PS3-4) Science affects everyday life. (4- PS3-4)

Bottle Crush Lesson Activity:

Overview:

Heat transfer experiments can be exciting and engaging. Heat Energy is often called thermal energy. Thermal energy is present in the molecules of an object. When an object is hot the molecules have a lot of energy and move fast. When an object is cold, the molecules have little energy and move slowly. Thermal energy transfer involves the transfer of internal energy. The three types of thermal energy transfer are:

- Conduction
- Convection
- Radiation

Conduction involves direct contact of atoms, convection involves the movement of warm particles and radiation involves the movement of electromagnetic waves.

The Second Law of Thermodynamics states that heat will always move from a hot object to a cooler one. Heat transfer is the movement of thermal energy as it transfers from one object to another or between an object and its surroundings. Thermal energy will naturally work towards a state of balance or equilibrium. This is known as thermal equilibrium, where two objects or an object and its surroundings achieve the same level of heat energy (thermal energy). The Bottle Crush experiment below is a fantastic fun way to demonstrate this principle.

Objective:

This lesson demonstrates the relationships between temperature, volume, and pressure. Students use water with different temperatures to physically change a plastic bottle. The lesson can be extended to address energy and energy transfer.

Required Equipment

- Empty 2 liter plastic bottle with lid
- 6-8 cups of Ice
- 1/2 cup Boiling Water
- 8×11 pan
- Pitcher of Ice Water

Directions:

Step 1 – Fill the 8×11 pan with ice.
Step 2 – Run the empty pop bottle, with the cap off, under hot water for a minute.
Step 3 – Then put on the cap and place the bottle in a pan of iced water
Step 4 – Slowly pour the pitcher of ice water onto the bottle.
Step 5 – Stand the bottle up and observe what happens. The plastic bottle has been crushed in.

Have the students write and draw what they learned in a science journal or on paper.

How Does the Experiment Work?

Once the hot boiling water was placed in the bottle, it heated up the air inside the bottle. When we put the cap on the bottle, the hot air was trapped inside. When we then placed the bottle in the ice and poured the cold water on it, the air inside the bottle began to cool down. Cool air exerts less pressure than hot air, therefore the air pressure inside the bottle begins to decrease. The air pressure inside the bottle decreased

	to the point where it was less than the air pressure outside the bottle. Therefore the pushing in was greater than the pressure pushing out, causing the bottle to be crushed.

Gifted and Talented: Enrichment Links and Writing Prompts

Links:
Coupled Pendulum
Solar Cars
Algae Fuel and Food
Amazing Rube Goldberg Machines
The Drinking Bird
Heat Energy

Writing Prompts:
Draw or write sentences to finish the prompts.
"What is thermal equilibrium?"
"How can a car run without gas?"
"What makes roller coasters go fast?"
"Why is the first hill of a roller coaster the highest?"
"What if there was no electricity?"
"Tell how you could build a chain reaction machine."
"Summarize what you learned from The Three Ring Circuit Book."

At-Risk, Including ELL: Resources to Enhance Understanding

Books: Science of Roller Coasters, Understanding Energy,
Reading A to Z: Most Books are in English and Spanish
Energy Sources, Level Z
To Drill or Not to Drill
The Sun, Level V
Alternative Fuel Cars, Level V
Electric Cars, History and Future, Level W
The Power of Wind, Level Q
Battery Power, No Level

Video Links:
The Three Ring Circuit Book
PBS Pendulum Art
PBS Kinetic and Potential Energy
Energy Transfer in a Roller Coaster
Energy in a Roller Coaster
Solar Energy STEAM Camp

Cape May City Elementary School District Grade 4 Science Curriculum

Unit II Overview

Content Area: Science

Unit Title: Unit II

4- PS4: Waves and their Applications in Technologies for Information Transfer

Target Course/Grade Level: Grade 4

Unit Summary: Learning Goal

- Students will develop models to describe waves and light.

Interdisciplinary Connections:

- Science, Technology, English / Language Arts, Health, Social Emotional Learning, Mathematics, Social Studies

Career Readiness: Life Literacies and Key Skills Standards:

- Career Readiness, Life Literacies and Key Skills
  - These include critical thinking, problem solving, creativity, innovation, collaboration, teamwork and leadership, cross-cultural understanding, and interpersonal communication and science.
  - Incorporation of relevant technologies as tools as part of instruction (i.e. Chromebooks, Touch screen devices, manipulatives, certified assistive technologies for students with special needs, etc.)
  - Developing effective communication
  - Developing Independent Learning Strategies
  - Incorporating Science, Technology, Engineering, and Mathematical themes into daily lessons

Learning Targets:

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. [Clarification Statement: Examples of models could include diagrams, analogies, and physical models using wire to illustrate wavelength and amplitude of waves.] [Assessment Boundary: Assessment does not include interference effects, electromagnetic waves, non-periodic waves, or quantitative models of amplitude and wavelength.]

4-PS4-2 Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen. [Assessment Boundary: Assessment does not include knowledge of specific colors reflected and seen, the cellular mechanisms of vision, or how the retina works.]

4-PS4-3 Generate and compare multiple solutions that use patterns to transfer information. [Clarification Statement: Examples of solutions could include drums sending coded information through sound waves, using a grid of 1's and 0's representing black and white to send information about a picture, and using Morse code to send text.]

Unit Activity	Suggested Learning Activities
II.	**Science and Engineering Practices:** Developing and Using Models Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. Develop a model using an analogy, example, or abstract representation to describe a scientific principle. (4-PS4-1) Develop a model to describe phenomena. (4-PS4-2) Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution. (4-PS4-3) **DCI:** PS4.A: Wave Properties Waves, which are regular patterns of motion, can be made in water by disturbing the surface. When waves move across the surface of deep water, the water goes up and down in place; there is no net motion in the direction of the wave except when the water meets a beach. (Note: This grade band endpoint was moved from K–2.) (4-PS4-1) Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks). (4-PS4-1) PS4.B: Electromagnetic Radiation An object can be seen when light reflected from its surface enters the eyes. (4-PS4-2) PS4.C: Information Technologies and Instrumentation Digitized information can be transmitted over long distances without significant degradation. High-tech devices, such as computers or cell phones, can receive and decode information— convert it from digitized form to voice—and vice versa. (4-PS4-3) ETS1.C: Optimizing the Design Solution Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. (secondary to 4-PS4-3) **Crosscutting Concepts:** Patterns, Similarities, and differences in patterns can be used to sort and classify natural phenomena. (4- PS4-1) Similarities and differences in patterns can be used to sort and classify designed products. (4- PS4-3) Cause and Effect Cause and effect relationships are routinely identified. (4-PS4-2) Connections to Engineering, Technology, and Applications of Science Interdependence of Science, Engineering, and Technology Knowledge of relevant scientific concepts and research findings is important in engineering. (4-PS4- 3) Connections to Nature of Science Scientific Knowledge is Based on Empirical Evidence Science findings are based on recognizing patterns. (4-PS4-1)  **Musical Jars!-Lesson Activity:** A fun science experiment and music lesson all in one! This easy experiment allows kids to learn and make noise (music) in the process. Kids can explore and investigate sound waves, pitch, and more as they create their own simple musical instrument. Watch the demonstration video below. **Demonstration Video** **Materials:** ● Set of Glasses of equal shape and size ● Water ● Metal Spoon ● Food Coloring (optional) **Directions:** **Step1** – Begin with empty glass jars of the same shape and size. Use the metal spoon to tap on each one. What do you observe? Do they sound the same? Yes! At this point you'll notice that each sound is the same. Now let's find out if we can make the sounds different. **Step 2** – Pour water into each jar. Make sure that the water level is different in each jar.

Step 3 – Add food coloring to each jar to make it easier to see the different water levels. You can use the same color in each jar or use a rainbow of colors as we did. This is an optional step, but it adds to the fun!

Step 4 – Use the same metal spoon to tap on the jars again. Listen carefully so you can hear how the sounds have changed.

Do you know the reason why the jars make different sounds? Find out the answer below!

How Does This Science Experiment Work:
Sound is a disturbance that travels through a medium as a wave. In this experiment, tapping on the jars with the spoon disturbs the particles of the jar causing them to vibrate. The vibrations in the jar are transferred to the air surrounding the jar, creating a sound wave. When the jars are all empty, the vibrations and the sounds are all the same. Adding different amounts of water to the jars causes the vibrations (and sound) to change.

You can change the pitch of the sound produced by the amount of water you put in the glass. Pitch is how high or low sound seems to a person and it depends on the frequency of the sound wave. When you add more water to the glass, the pitch is low. This is because the high volume of water in the glass makes it more difficult for the glass particles to vibrate, so the vibrations of the glass are slower and they have a lower frequency. When you add less water to the glass, the pitch is high. This is because the low volume of water in the glass allows the glass particle to vibrate more easily, so the vibrations of the glass are faster and have a higher frequency.

Gifted and Talented: Enrichment Links and Writing Prompts

Links:
How Do Mother Dolphins Transfer Sound?
Frequency and Wavelengths
Amazing Slinky Tricks
Echolocation
There is No Sound in Space
Tuning Fork
Can You Hear in Space?
Bill Nye-Sound Waves
Physics of Traveling Waves
Light is a Wave
Electromagnetism
Electromagnetic Waves
Why Do We See Color?
What If the Sun Became Black in Color?
Wonders of Vision and Light

Writing Prompts:
Draw or write sentences to finish the prompts.
“What would happen if you scream in outer space?”
“Why are some sounds high, and some sounds low?”
“How far can a whisper travel?”
“What is Huygens' Principle?”
“Why do we see colors?”

At-Risk, Including ELL: Resources to Enhance Understanding

Books: The Remarkable Farkle McBride by John Lithgow, What are Light Waves, by Robin Johnson, Soundwaves and Communication, by Jenna Winterburg, Let's Ride a Wave, by Everyday Science Academy, Make Waves, by Nick Arnold, Waves of Light and Sound, by Shirely Duke, Sound Waves, by Michael Dahl, How Does Sound Change?, by Robin Johnson, Loud or Soft, High or Low, by Jennifer Boothroyd

Reading A to Z: Most Books are in English and Spanish

How Sound Works, Level U

Sound All Around, Level M

Rainbows, Level J

Drums Around the World, No Level

Powwow Beat, No Level

Video Links:

Energy Transfer

How to See Sound

Screaming Balloons

Properties of Light

Bending Light

Simple Light Science

Grow a Rainbow

Exploring Magnets

Cape May City Elementary School District Grade 4 Science Curriculum
Unit III Overview

Content Area: Science

Unit Title: Unit III

4-LS1: From Molecules to Organisms: Structures and Processes

Target Course/Grade Level: Grade 4

Unit Summary: Learning Goal

- Students will identify internal and external structures of living things, and use a model to describe information transfer of an animal.
    - All plants & animals have structures that help them survive.
    - Each structure has a specific function.
    - Animal structures may appear similar or different depending on where they live.
    - The concept of humans mimicking nature to solve problems is introduced at the first grade level through the NGSS. Biomimicry is an important concept in engineering. Many examples, such as glow sticks inspired by fireflies, adhesive inspired by gecko's feet, and swimwear inspired by shark skin could be explored.

Interdisciplinary Connections:

- Science, Technology, English / Language Arts, Health, Social Emotional Learning, Mathematics, Social Studies

Career Readiness: Life Literacies and Key Skills Standards:

- Career Readiness, Life Literacies and Key Skills
  - These include critical thinking, problem solving, creativity, innovation, collaboration, teamwork and leadership, cross-cultural understanding, and interpersonal communication and science.
  - Incorporation of relevant technologies as tools as part of instruction (i.e. Chromebooks, Touch screen devices, manipulatives, certified assistive technologies for students with special needs, etc.)
  - Developing effective communication
  - Developing Independent Learning Strategies
  - Incorporating Science, Technology, Engineering, and Mathematical themes into daily lessons

Learning Targets:

4-LS1-1 Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. [Clarification Statement: Examples of structures could include thorns, stems, roots, colored petals, heart, stomach, lung, brain, and skin.] [Assessment Boundary: Assessment is limited to macroscopic structures within plant and animal systems.]

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. [Clarification Statement: Emphasis is on systems of information transfer.] [Assessment Boundary: Assessment does not include the mechanisms by which the brain stores and recalls information or the mechanisms of how sensory receptors function.]

Unit Activity	Suggested Learning Activities
III.	**Science and Engineering Practices:** Developing and Using Models Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. Use a model to test interactions concerning the functioning of a natural system. (4-LS1-2) Engaging in Argument from Evidence Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). Construct an argument with evidence, data, and/or a model. (4- LS1-1) **DCI:** LS1.A: Structure and Function Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. (4-LS1-1) LS1.D: Information Processing Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions. (4-LS1-2) **Crosscutting Concepts:**Systems and System Models A system can be described in terms of its components and their interactions. (4-LS1-1), (4-LS1-2)

Bird Wing Challenge-Lesson Activity:

Video Preview

Overview:
Use the engineering design process to make a glider inspired by the structure of bird wings.

Materials:
1 Wooden skewer
1 Pair of scissors
1 Roll of tape
1 Handful of straws
1 Handful of coins
Sheets of sturdy construction paper for each student

Directions:
1. Fold the construction paper in half lengthwise.
2 Fold two of the corners toward the center. Use the coin to crease the edges.
3 Fold the wings back over the folded corners to create the glider shape.
4 Have an adult help you poke a hole at the edge of the fold under the wing (see video).
5 Insert the wooden skewer through the hole and tape it down to create support for the wings.
6 Send your glider on a test flight.
7 Try replacing the skewer with straws which are lighter and hollow, like bird bones.
8 Try another test flight.
9 Also, you might try changing the shape of the wings to make them even narrower.
10 Try adding a tail. Birds use their tails to help them control their flight.
11 Cut a triangular piece of construction paper, insert it into the back of the fold and tape in place.
12 Test the glider again.

Try other modifications based on bird structures - this activity is all about designing your own & testing it!
How It Works: Using the structures of living things to help inspire engineering designs is called biomimicry. Birds and other living things have structures that serve a specific function. When humans need to solve similar problems they can turn to animals and plants for answers. In engineering, we often build and test designs over and over. It improves each time!

Gifted and Talented: Enrichment Links and Writing Prompts

Links:
Mimic Makers
Extended Bird Wing Lesson
Why Do Biceps Bulge?
Why Do Birds Have Beaks?
Why Are Polar Bears White?
How Does Your Brain Control Your Body?
How Can Some Animals See in the Dark?
Butterfly Adaptations

Writing Prompts:
Draw or write sentences to finish the prompts.

"How do structures help animals and plants survive?"
"What is biomimicry?"
"Do structures have to be made by humans?"
"What are internal structures?"
"What are external structures?"
"What is the function of the color on a butterfly wing?"
"What structure helps a cactus from being eaten?"
"What are some functions and structures of a whip spider?"
"List some functions of different typesseed structures."
"What is the largest, heaviest seed in the world?"

At-Risk, Including ELL: Resources to Enhance Understanding

Books: How Do Animals Adapt?, **by** Bobbie Kalman and Niki Walker, Great Adaptations, by Kenneth Catania, Can You Guess Who I am?, by Radka Piro and Lida Larina, Plant Adaptations: How We Live in Our Habitat, by Sarah Lalonde, Polar, Desert, Ocean, Rainforest Animal Adaptations, Amazing Animal Adaptations Books

Reading A to Z: Most Books are in English and Spanish

Living in Deserts, Level W

Amazing Animal Adaptations, Level W

Puffins, Level W

The Amazing Amazon, Level X

Biomimicry, Level Y

Video Links:

Read About Structures and Function

Polar Bears are Actually Black

Paper Plane Flies Like a Bird

Why Do Roses Have Thorns?

Adaptations of Plants

Plant Survival

Dr. Binocs Animal Adaptations and Dr. Binocs Plant Adaptations

Cape May City Elementary School District Grade 4 Science Curriculum
Unit IV Overview

Content Area: Science

Unit Title: Unit IV

Our Earth:

- **4-ESS1: Earth's Place in the Universe, 4-ESS2: Earth's Systems, 4-ESS3: Earth and Human Activity**

Target Course/Grade Level: Grade 4

Unit Summary: Learning Goal

- In this unit of study, students apply their knowledge of natural Earth processes, rock formations, fossils in rock, changes to landscape,topographical maps, and then generate and compare multiple renewable and non-renewable energy solutions to reduce the impacts of natural Earth processes (earthquakes, tsunamis, volcanos, and floods), and climate change on humans. This unit is based on 4-ESS1-1, 4-ESS2-1, 4-ESS2-2, 4-ESS3-2, 3-5-ETS1-2, and 3-5-ETS1-3.

Interdisciplinary Connections:

- Science, Technology, English / Language Arts, Health, Social Emotional Learning, Mathematics, Social Studies

Career Readiness: Life Literacies and Key Skills Standards:

- Career Readiness, Life Literacies and Key Skills
- These include critical thinking, problem solving, creativity, innovation, collaboration, teamwork and leadership, cross-cultural understanding, and interpersonal communication and science.
- Incorporation of relevant technologies as tools as part of instruction (i.e. Chromebooks, Touch screen devices, manipulatives, certified assistive technologies for students with special needs, etc.)
- Developing effective communication
- Developing Independent Learning Strategies
- Incorporating Science, Technology, Engineering, and Mathematical themes into daily lessons

Learning Targets:

4-ESS1-1 Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time. [Clarification Statement: Examples of evidence from patterns could include rock layers with marine shell fossils above rock layers with plant fossils and no shells, indicating a change from land to water over time; and, a canyon with different rock layers in the walls and a river in the bottom, indicating that over time a river cut through the rock.] [Assessment Boundary: Assessment does not include specific knowledge of the mechanism of rock format

4-ESS2-1 Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation. [Clarification Statement: Examples of variables to test could include angle of slope in the downhill movement of water, amount of vegetation, speed of wind, relative rate of deposition, cycles of freezing and thawing of water, cycles of heating and cooling, and volume of water flow.] [Assessment Boundary: Assessment is limited to a single form of weathering or erosion.]

4-ESS2-1 Analyze and interpret data from maps to describe patterns of Earth's features. [Clarification Statement: Maps can include topographic maps of Earth's land and ocean floor, as well as maps of the locations of mountains, continental boundaries, volcanoes, and earthquakes.]

• **4-ESS3-1** Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment. [Clarification Statement: Examples of renewable energy resources could include wind energy, water behind dams, and sunlight; non-renewable energy resources are fossil fuels and fissile materials. Examples of environmental effects could include loss of habitat due to dams, loss of habitat due to surface mining, and air pollution from burning of fossil fuels.]

4-ESS3-2 Generate and compare multiple solutions to reduce the impacts of natural Earth processes and climate change have on humans. [Clarification Statement: Examples of solutions could include designing an earthquake resistant building and improving monitoring of volcanic activity.] [Assessment Boundary: Assessment is limited to earthquakes, floods, tsunamis, and volcanic eruptions.]

Unit Activity	Suggested Learning Activities
IV.	**Science and Engineering Processes:** Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. Identify the evidence that supports particular points in an explanation. (4-ESS1-1) Planning and Carrying Out Investigations Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions. Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (4-ESS2-1) Analyzing and Interpreting Data Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used. Analyze and interpret data to make sense of phenomena using logical reasoning. (4-ESS2-2) Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution. (4-ESS3-2) Obtaining, Evaluating, and Communicating Information Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluate the merit and accuracy of ideas and methods. Obtain and combine information from books and other reliable media to explain phenomena. (4- ESS3-1) **DCI:** ESS1.C: The History of Planet Earth Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed. (4-ESS1-1) ESS2.A: Earth Materials and Systems Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2- 1) ESS2.B: Plate Tectonics and LargeScale System Interactions The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges. Maps can help locate the different land and water features areas of Earth. (4-ESS2-2) ESS2.E: Biogeology Living things affect the physical characteristics of their regions. (4- ESS2-1) ESS3.A: Natural Resources Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not. (4-ESS3-1) ESS3.B: Natural Hazards A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts. (4-ESS3-2) (Note: This Disciplinary Core Idea can also be found in 3.WC.) ETS1.B: Designing Solutions to Engineering Problems Testing a solution involves investigating how well it performs under a range of likely conditions. (secondary to 4-ESS3-2) **Crosscutting Concepts:** Patterns can be used as evidence to support an explanation. (4-ESS1-1) Connections to Nature of Science Scientific Knowledge Assumes an Order and Consistency in Natural Systems Science assumes consistent patterns in natural systems. (4-ESS1-1) (4-ESS2- 2) Cause and Effect Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2- 1) Cause and Effect Cause and effect relationships are routinely identified and used to explain change. (4-ESS3-1) Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS3- 2) Connections to

Engineering, Technology, and Applications of Science Interdependence of Science, Engineering, and Technology Knowledge of relevant scientific concepts and research findings is important in engineering. (4-ESS3- 1) Influence of Science, Engineering and Technology on Society and the Natural World Over time, people's needs and wants change, as do their demands for new and improved technologies. (4-ESS3-1) Engineers improve existing technologies or develop new ones to increase their benefits, to decrease known risks, and to meet societal demands. (4-ESS3-2)

Science Role Play!-Lesson Plan Activity:

Overview:

"How do weathering, erosion, and deposition cause change to the Earth's surface from wind, water and ice?" Look at the table below. Decide on your role, audience and topic.

For example: If you choose the role of a 50 year old Oak Tree, you would be writing a letter to a squirrel telling him how your life has been affected by weathering, erosion, and deposition.

You are strongly encouraged to think creatively and utilize technology as you explain how water is continuously moving on and above the Earth.

It is highly recommended that you use science books, and other online resources when planning your explanation. Use examples from the books and videos reviewed in class too.

Present your finished work to the class! Have fun!

YOUR ROLE	AUDIENCE	TOPIC
I am a geologist!	4th grade class	Create a presentation discussing weathering, erosion, and deposition in your own community to your class.
I am a 50 year old oak tree!	Squirrel	Write a letter to the squirrel explaining how its life has been affected by weathering, erosion, and deposition
I am a rock!	Mother Nature	Write a speech to Mother Nature to explain how "You "Crack Me Up" through weathering.
Choose your own role! You must review the details with the teacher before you begin.	Choose an appropriate audience related to your role.	Write a letter to your audience discussing the effects of climate change or how a natural disaster has affected you.

Gifted and Talented: Enrichment Links and Writing Prompts

Links:

Renewable vs. Non-Renewable Energy
Topography for Kids
Mini-Clip: Weathering and Erosion
Weathering, Erosion, and Deposition
How Was the Grand Canyon Formed?
Yellowstone-Supervolcano
Plastics and the Earth-Ecobricking

Elephants Warn of a Tsunami
How Glaciers Change the World
Squirrels and Oak Trees

Writing Prompts:

Draw or write sentences to finish the prompts.

"What do the shapes of landforms and rock formations tell us about the past?"

"How can evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation be observed or measured?"

"How could you survive a landslide?"

"Will a mountain last forever?"

"Why do volcanoes explode?"

"Could you have a volcano in your backyard?"

"Tell about some renewable energy sources."

At-Risk, Including ELL: Resources to Enhance Understanding

Books: Let's Go Rock Collecting, Eruptions, 180 Days of Science, by Lauren Homayoun, How Hugh Bennett Saved America's Soil, by Darcy Pattison and Peter Willis, Weathering and Erosion (Science Readers: Content and Literacy) by Torrey Maloof, Cracking Up: A Story About Erosion (Science Works), by Jacqui Bailey and Matthew Lilly, Everything Volcanoes and Earthquakes, by Kathy Furgang, All About Natural Disasters for Kids: Volcanoes, Tornadoes, Hailstorms, Drought, hurricanes, Flood, Tsunami, Avalanche, Earthquakes, Landslides, Sinkholes, Space disasters, Forest fire and more, by Sandhya Warekar, Our World Out of Balance: Understanding Climate Change and What We Can Do by Andrea Minoglio and Laura Fanelli, Professor Figgy's Weather and Climate Science Lab for Kids: 52 Family-Friendly Activities Exploring Meteorology, Earth Systems, and Climate Change, by Jim Noonan and Martha Stewart, Greta and the Giants: inspired by Greta Thunberg's stand to save the world, by Zoë Tucker and Zoe Persico

Reading A to Z: Most Books are in English and Spanish

What Do You Think About Climate Change?, Level Y
Plight of the Polar Bear, Level Q
Thanks to Our Atmosphere, Level W
Earthquakes, Volcanos, Tsunamis, Level Q
Threats to Our Atmosphere, Level W

Video Links:

The Grand Canyon
Fun Facts About the Grand Canyon
The Power of Water
Little Bins for Little Hands
30 Kids Science Ideas

Cape May City Elementary School District Grade 4 Science Curriculum

Unit V Overview

Content Area: Science

Unit Title: Unit V

3-5-ETS1: Engineering Design

Target Course/Grade Level: Grade 4

Unit Summary: Learning Goal

Students will ask questions, make observations, and gather information about a situation people want to change.

- They will define a simple problem that can be solved through the development of a new or improved object or tool.\
- Students are expected to demonstrate grade-appropriate proficiency in asking questions and defining problems, planning and carrying out investigations, constructing explanations, and designing solutions. Students are also expected to use these practices to demonstrate their understanding of the core ideas.

Interdisciplinary Connections:

- Science, Technology, English / Language Arts, Health, Social Emotional Learning, Mathematics, Social Studies

Career Readiness: Life Literacies and Key Skills Standards:

- Career Readiness, Life Literacies and Key Skills
  - These include critical thinking, problem solving, creativity, innovation, collaboration, teamwork and leadership, cross-cultural understanding, and interpersonal communication and science.
  - Incorporation of relevant technologies as tools as part of instruction (i.e. Chromebooks, Touch screen devices, manipulatives, certified assistive technologies for students with special needs, etc.)
  - Developing effective communication
  - Developing Independent Learning Strategies
  - Incorporating Science, Technology, Engineering, and Mathematical themes into daily lessons

Learning Targets:

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.

Unit Activity	Suggested Learning Activities
V.	**Science and Engineering Practices:** Asking Questions and Defining Problems Asking questions and defining problems in 3–5 builds on K–2 experiences and progresses to specifying qualitative relationships. Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost. (3-5-ETS1-1) Planning and Carrying Out Investigations Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions. Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. (3-5-ETS1-3) Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design problem. (3-5-ETS1-2) **DCI:** ETS1.A: Defining and Delimiting Engineering Problems Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. (3-5-ETS1-1) ETS1.B: Developing Possible Solutions Research on a problem, such as climate change, should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. (3-5-ETS1-2) At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs. (3-5-ETS1-2) Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved. (3-5- ETS1-3) ETS1.C: Optimizing the Design Solution Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. (3-5-ETS1-3) **Crosscutting Concepts:** Connections to Engineering, Technology, and Applications of Science Influence of Engineering, Technology, and Science on Society and the Natural World People's needs and wants change over time, as do their demands for new and improved technologies. (3-5-ETS1-1) Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. (3-5-ETS1-2)  **Be An Engineer-Will It Stick?-Lesson Plan Activity** **Background Knowledge: Adhesives through the Ages:** The first adhesives were natural gums and other plant resins. Archaeologists have found 6000-year-old ceramic vessels that had broken and been repaired using plant resin. Most early adhesives were animal glues made by rendering animal products such as the Native American use of buffalo hooves. Native Americans in what is now the eastern United States used a mixture of spruce gum and fat as adhesives and as caulk to waterproof seams in their birch bark canoes. During the times of Babylonia, tar-like glue was used for gluing statues. Also, Egypt was

one of the most prominent users of adhesives. The Egyptians used animal glues to adhere tombs, furniture, ivory, and papyrus. Also, the Mongols used adhesives to make their short bows. In Europe in the Middle Ages, egg whites were used to decorate parchments with gold leaves. In the 1700s, the first glue factory was founded in Holland, which manufactured hide glue. Later, in the 1750s, the British introduced fish glue. As the modernization continued, new patents were issued by using rubber, bones, starch, fish, and casein. Modern adhesives have improved flexibility, toughness, curing rate, temperature and chemical resistance.

Will it Stick?: Whether a glue or adhesive "sticks" depends on more than just the glue formulation. It also depends on the materials being "stuck" together, how they are structured or attached, and how much load they must carry. For example, even the strongest glue connecting two popsicle sticks could not withstand the weight of a television set. And, some glues, though stronger, might increase the cost of a product to the point that a consumer would not buy it.

Engineering Considerations: As engineers develop new products (or seek to improve existing ones) they have to determine which materials to use — in many cases including the selection of appropriate adhesives or glues to meet the demands of the job. They will also need to develop a plan for how the materials will fit and stay together, and a method for attaching the parts in a way so that the parts will stay together while in normal use. Usage factors such as temperature, humidity, force, and anticipated damage will also be evaluated and tested prior to mass manufacturing.

Sticky Notes –3M and the Post-it Note: A Post-it note (or simply Post-it), invented and manufactured by 3M, is a piece of stationery with a re-adherable strip of adhesive on the back, designed for temporarily attaching notes to documents, computer displays, and so forth. While now available in a wide range of colors, shapes, and sizes, the most common size of Post-it note is a 3-in (7.5-cm) square, trademark canary yellow in color. The notes use a unique low-tack adhesive that enables the Post-its to be easily attached and removed without leaving marks or residue. The names "Post-it" and "Post-it note"—as well as the canary yellow color—are trademarks of 3M, the company which invented and manufactures them. Accepted generic terms for competitors include "sticky notes" or "repositionable" or "repositional notes;" nonetheless, Post-it note is frequently used as a generic term for any such product.

caraman-bigstock.com

It All Began with a Mistake: The Post-it note was invented in 1968 by Dr. Spencer Silver, a 3M

scientist who stumbled upon a glue that was not sticky enough. In 1974, a colleague of his, Arthur Fry, was singing in a church choir and frustrated that his bookmarks kept falling out of his hymnal. In a moment of insight, Fry realized that Silver's reusable adhesive would provide precisely what he needed, and the Post-it note concept was born. If it could be coated on paper, Silver's adhesive would hold a bookmark in place without damaging the page on which it was placed. Fry requested a sample of the adhesive that Silver developed and began experimenting. He coated only one edge of the paper so that the portion extending from a book would not be sticky. Fry used some of his experiments to write notes to his boss. Both Silver and Fry eventually both won 3M's highest honors for research and numerous awards within the international engineering community. 3M launched the product in 1977 but it failed as consumers had not yet tried the product and could not easily visualize how they might use it. A year later 3M swamped Boise, Idaho with samples. 90% of people who tried them said that they would buy the product. By 1980 the product was sold nationwide and a year later they were launched in Canada and Europe. More Post-it note history is available at www.post-it.com/3M/en_US/post-it/contact-us/about-us/.

Be An Engineer-Will It Stick?-Lesson Activity

Materials: Each Team Gets:

- 30 popsicle sticks
- 10 paper clips
- 2 sheets of paper
- One identical can of soup or soda – about 10 oz or 300 grams

Building Materials (To share) – Safety note: super glue or crazy glue is not recommended

- A variety of glue options: Each team can choose one option.
    - School or washable glue
    - Wood glue
    - Craft glue
    - Gel glue
    - Rubber cement
    - Glue sticks

Design Challenge:
You are a team of engineers who have been given the challenge of building a structure that can withstand the weight of a can of soup or soda. The can must be at least 2 inches or 5 centimeters above a tabletop surface. Your materials include popsicle sticks, paper clips, paper, and glue — but you'll have to decide which glue works best for your design! Be sure to do some glue testing before you begin the project.

Criteria

- Must withstand the weight of a can of soup or soda
- Can must be at least 2 inches or 5 centimeters above the tabletop surface.

	Constraints You have one hour to build the structure. Use only the materials provided. You must wait at least 24 hours to do the final test. **Testing Process:** Once the structure is built and the glue is dry, place the can on the top. **Evaluation Questions to Answer: Use a journal or a piece of paper to answer.** 1. Did you succeed in creating a structure to hold the can? If so, why do you think your design worked? If not, why did it fail? 2. How did you test your glues to make your glue selection? Did your testing process work well and provide you with the information/research you needed to make a decision? 3. If you had to do it all over again, what would you do differently? Why? 4. Do you think you would have been able to complete this project easier if you were working alone? Why? Why not? Certificate of Completion

Gifted and Talented: Enrichment Links and Writing Prompts

Links:
Meet an Engineer
STEM Fields
Games for STEM
Try Engineering Tuesday
Wind Energy
Wind Power Video
Filtering Water
Writing Prompts:
Draw or write sentences to finish the prompts.
"How can wind be an energy source?"
"What is engineering?"
"What kind of engineer would you like to become? Why?"
"How could you make dirty water visibly cleaner?"

At-Risk, Including ELL: Resources to Enhance Understanding

Books: Awesome Engineering Activities for Kids: 50+ Exciting STEAM Projects to Design and Build (Awesome STEAM Activities for Kids) Part of: Awesome STEAM Activities for Kids (9 Books), How to Be an Engineer (Careers for Kids) by Carol Vorderman, Mistakes That Worked: 40 Familiar Inventions & How They Came to Be, by Charlotte Foltz Jones and John O'Brien, The Magic School Bus at the Water Works, by Joanna Cole
Reading A to Z: Most Books are in English and Spanish
The Steam Engine, Level P
Building Big Dreams, Level S
Lewis Howard Latimer, Level Y
Hoover Dam, Level Z
Video Links:
What is Engineering?
Explore Different Types of Engineers.

Cape May City Elementary School District Grade 1 Science Curriculum

Evidence of Learning

Specific Formative Assessments Utilized in Daily Lessons:

- Suggested Formative Assessment
- Daily independent practice
- Peer Discussions
- Student Portfolio
- Reading/Writing Conferences
- Self-Evaluations
- Anecdotal Notes
- Open-Ended Responses
- Journal Entries
- Reading Logs
- Exit Tickets

Summative Assessment Utilized throughout Units:

- Performance Task
- Technology Task

Benchmarks:

- Quarterly Benchmarks Generated by the Teacher / Curriculum Committee

Modifications for English Language Learner's [ELL]

- Teacher tutoring
- Peer tutoring
- Online Resources
- Cooperative Learning Groups
- Modified Assignments
- Differentiated Instruction
- Response to Intervention (www.help4teachers.com)
- Provide additional examples and opportunities for additional problems for repetition with visuals and manipulatives
- Picture vocabulary
- Picture books
- Simplified language for understanding
- Reader's Theater
- Modify Homework, Assignments and Assessment (can be oral if necessary)
- Cooperative learning
- Retell stories using props
- Additional Center work focusing on alphabet and HFW
- Additional Phonemic Awareness teaching and practice
- Re-teach alphabet and alphabet sounds

- Sentence frames with word bank and pictures
- Songs
- Total Physical Response
- Picture word wall

Modifications for Special Education Students [IEPs]:

- Follow all IEP accommodations for each student as to meet each student's individual need
- For extra strategies please review list above in the ELL category for students who have IEPs
- Provide instructional breaks / practice chunking
- Circling back to original topic
- Lexile score modifications

Modifications for students with 504s:

- Adhere to the modifications of the 504
- For extra strategies please review list above in the ELL category for students who have IEPs
- Provide instructional breaks / practice chunking
- Circling back to original topic
- Lexile score modifications

Modifications Gifted and Talented Students:

- Advanced Lexile Resources
- Independent Study
- Advanced Assignments

Modifications At-Risk/Basic Skills:

- Teacher tutoring
- Supplemental / Pull Out Teaching
- Peer tutoring
- Cooperative Learning Groups / Centers
- Modified Assignments
- Differentiated Instruction
- Response to Intervention (www.help4teachers.com)
- Provide additional examples and opportunities for additional problems for repetition with visuals and manipulatives
- Picture vocabulary
- Picture books
- Simplified language for understanding
- Reader's Theater
- Modify Homework, Assignments and Assessment (can be oral if necessary)
- Cooperative learning
- Retell stories using props
- Additional Center work focusing on alphabet and HFW

- Additional Phonemic Awareness teaching and practice
- Re-teach alphabet and alphabet sounds
- Sentence frames with word bank and pictures
- Songs
- Total Physical Response
- Picture word wall

Teacher Notes:

- **Career Readiness, Life Literacies, and Key Skills:** Rapid advancements in technology and subsequent changes in the economy have created opportunities for individuals to compete and connect on a global scale. In this increasingly diverse and complex world, the successful entrepreneur or employee must not only possess the requisite education for specific industry pathways but also employability skills necessary to collaborate with others and manage resources effectively in order to establish and maintain stability and independence. This document outlines concepts and skills necessary for New Jersey's students to thrive in an ever-changing world. Intended for integration throughout all K–12 academic and technical content areas, the New Jersey Student Learning Standards- Career Readiness, Life Literacies, and Key Skills (NJSLS-CLKS) provides the framework for students to learn the concepts, skills, and practices essential to the successful navigation of career exploration and preparation, personal finances and digital literacy that rewards innovation, creativity, and adaptation to change.

Project-based Learning Tasks:

- Ongoing student portfolio assessments [created by faculty] to monitor student progress.

Vocabulary:

- In-text vocabulary should be incorporated into every unit. Word journals, vocabulary walls, and/or various other activities should be utilized by the instructor to teach vocabulary.
- Story, key details, retell, describe, main topic, rhyming words, syllables, story elements, character, setting, question, question words, front cover, back cover, title page, narrative, favorite, informational text, rules, connection, discuss, conversation, information, illustrator, author, illustrate, picture

The Research Process:

- The research process must be integrated within each course curriculum. Students will be provided with opportunities to investigate issues from thematic units of study. As the NJSLS indicate, students will develop proficiency with MLA or APA format as applicable.
- https://owl.purdue.edu/owl/research_and_citation/apa_style/apa_formatting_and_style_guide/general_format.html
- https://owl.purdue.edu/owl/research_and_citation/mla_style/mla_formatting_and_style_guide/mla_formatting_and_style_guide.html

Technology:

- Students must engage in technology applications integrated throughout the curriculum, though technology provided by us in their individual classroom, and in our technology centered classrooms.
- BrainPop
- Time for Kids Magazine online
- Scholastic Magazine online
- Google Earth
- Nationalgeographic.com

Resources:

- Ancillary resources and materials used to deliver instruction are included below:

- Learning New Jersey Model Curriculum
- ThinkCentral
- Achieve3000
- Reading A-Z.com
- Abcmouse .com
- EnchantedLearning,Com
- Sing Along Songs
- Scholastic.com
- Bilingualplanet.com
- Frog street
- Press.com
- 122 teachme.com
- Starfall
- www.teacherspayteachers.com
- www.udl.org
- http://www.state.nj.us/education/aps/cccs/ss/
- www.macmillanmh.com –downloadable graphic organizers

Career Education & Resources:

- **NJDOE CTE (https://www.nj.gov/education/cte/)**
- Careers are Everywhere Workbook (https://lmci.state.tx.us/shared/careersareeverywhere.asp)
- Career Bingo (http://www.breitlinks.com/careers/career_pdfs/careerbingo.pdf)
- Vocational Information Center / Career Exploration Guides and Resources for Younger Students (http://www.khake.com/page64.html)

Differentiation Strategies

Differentiation strategies can require varied amounts of preparation time. High-prep strategies often require a teacher to both create multiple pathways to process information/demonstrate learning and to assign students to those pathways. Hence, more ongoing monitoring and assessment is often required. In contrast, low-prep strategies might require a teacher to strategically create process and product choices for students, but students are allowed to choose which option to pursue given their learning profile or readiness level. Also, a low-prep strategy might be focused on a discrete skill (such as vocabulary words), so there are fewer details to consider. Most teachers find that integration of one to two new low-prep strategies and one high-prep strategy each quarter is a reasonable goal.

Low Prep Strategies	
Varied journal prompts, spelling or vocabulary lists	Students are given a choice of different journal prompts, spelling lists or vocabulary lists depending on level of proficiency/assessment results.
Anchor activities	Anchor activities provide meaningful options for students when they are not actively engaged in classroom activities (e.g., when they finish early, are waiting for further directions, are stumped, first enter class, or when the teacher is working with other students). Anchors should be directly related to the current learning goals.
Choices of books	Different textbooks or novels (often at different levels) that students are allowed to choose from for content study or for literature circles.

Choices of review activities	Different review or extension activities are made available to students during a specific section of the class (such as at the beginning or end of the period).
Homework options	Students are provided with choices about the assignments they complete as homework. Or, students are directed to specific homework based on student needs.
Student-teacher goal setting	The teacher and student work together to develop individual learning goals for the student.
Flexible grouping	Students might be instructed as a whole group, in small groups of various permutations (homogeneous or heterogeneous by skill or interest), in pairs or individuals. Any small groups or pairs change over time based on assessment data.
Varied computer programs	The computer is used as an additional center in the classroom, and students are directed to specific websites or software that allows them to work on skills at their level.
Multiple Intelligence or Learning Style options	Students select activities or are assigned an activity that is designed for learning a specific area of content through their strong intelligence (verbal-linguistic, interpersonal, musical, etc.)
Varying scaffolding of same organizer	Provide graphic organizers that require students to complete various amounts of information. Some will be more filled out (by the teacher) than others.
Think-Pair-Share by readiness, interest, and/or learning profile	Students are placed in predetermined pairs, asked to think about a question for a specific amount of time, then are asked to share their answers first with their partner and then with the whole group.
Mini workshops to re-teach or extend skills	A short, specific lesson with a student or group of students that focuses on one area of interest or reinforcement of a specific skill.
Orbitals	Students conduct independent investigations generally lasting 3-6 weeks. The investigations "orbit" or revolve around some facet of the curriculum.
Games to practice mastery of information and skill	Use games as a way to review and reinforce concepts. Include questions and tasks that are on a variety of cognitive levels.
Multiple levels of questions	Teachers vary the sorts of questions posed to different students based on their ability to handle them. Varying questions is an excellent way to build the confidence (and motivation) of students who are reluctant to contribute to class discourse. Note: Most teachers would probably admit that without even thinking about it they tend to address particular types of questions to particular students. In some cases, such tendencies may need to be corrected. (For example, a teacher may be unknowingly addressing all of the more challenging questions to one student, thereby inhibiting other students' learning and fostering class resentment of that student.)
High Prep Strategies	
Cubing	Designed to help students think about a topic or idea from many different angles or perspectives. The tasks are placed on the six sides of a cube and use commands that help support thinking (justify, describe, evaluate, connect, etc.). The students complete the task on the side that ends face up, either independently or in homogenous groups.

Tiered assignment/ product	The content and objective are the same, but the process and/or the products that students must create to demonstrate mastery are varied according to the students' readiness level.
Independent studies	Students choose a topic of interest that they are curious about and want to discover new information on. Research is done from questions developed by the student and/or teacher. The researcher produces a product to share learning with classmates.
4MAT	Teachers plan instruction for each of four learning preferences over the course of several days on a given topic. Some lessons focus on mastery, some on understanding, some on personal involvement, and some on synthesis. Each learner has a chance to approach the topic through preferred modes and to strengthen weaker areas
Jigsaw	Students are grouped based on their reading proficiency and each group is given an appropriate text on a specific aspect of a topic (the economic, political and social impact of the Civil War, for example). Students later get into heterogeneous groups to share their findings with their peers, who have read about different areas of study from source texts on their own reading levels. The jigsaw technique allows you to tackle the same subject with all of your students while discreetly providing them the different tools they need to get there.
Multiple texts	The teacher obtains or creates a variety of texts at different reading levels to assign strategically to students.
Alternative assessments	After completing a learning experience via the same content or process, the student may have a choice of products to show what has been learned. This differentiation creates possibilities for students who excel in different modalities over others (verbal versus visual).
Modified Assessments	Assessments can be modified in a variety of ways – for example by formatting the document differently (e.g. more space between questions) or by using different types of questions (matching vs. open ended) or by asking only the truly essential questions.
Learning contracts or Personal Agendas	A contract is a negotiated agreement between teacher and student that may have a mix of requirements and choice based on skills and understandings considered important by the teacher. A personal agenda could be quite similar, as it would list the tasks the teacher wants each student to accomplish in a given day/lesson/unit. Both Learning contracts and personal agendas will likely vary between students within a classroom.
Compacting	This strategy begins with a student assessment to determine level of knowledge or skill already attained (i.e. pretest). Students who demonstrate proficiency before the unit even begins are given the opportunity to work at a higher level (either independently or in a group).
Literature circles	Flexible grouping of students who engage in different studies of a piece of literature. Groups can be heterogeneous and homogeneous.
Learning Centers	A station (or simply a collection of materials) that students might use independently to explore topics or practice skills. Centers allow individuals or groups of students to work at their own pace. Students are constantly reassessed to determine which centers are appropriate for students at a particular time, and to plan activities at those centers to build the most pressing skills.
Tic-Tac-Toe Choice Board (sometimes called "Think-Tac-Toe"	The tic-tac-toe choice board is a strategy that enables students to choose multiple tasks to practice a skill, or demonstrate and extend understanding of a process or concept. From the

	board, students choose (or the teacher assigns) three adjacent or diagonal. To design a tic-tac-toe board: - Identify the outcomes and instructional focus - Design 9 different tasks - Use assessment data to determine student levels - Arrange the tasks on a tic-tac-toe board either randomly, in rows according to level of difficulty, or you may want to select one critical task to place in the center of the board for all students to complete.

Curriculum Development Resources/Instructional Materials:

List or Link Ancillary Resources and Curriculum Materials Here:

- New Jersey Student Learning Standards (https://www.nj.gov/education/cccs/)
    - NJSLS Science (https://www.nj.gov/education/modelcurriculum/sci//)

Board of Education Approved Text(s)

Scholastic Magazine

National Geographic for Kids

Time Magazine for Kids

STEMScopes