Belvidere Clusterwide Curriculum

Science

5th Grade

Updated Summer, 2024

All Belvidere Cluster curriculum and instruction areas are aligned to the New Jersey Student Learning Standards (NJSLS) in accordance with the NJ Department of Education's curriculum implementation requirements.

Curriculum Coordinator:
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Author:
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UNITS	Duration	Essential Questions:
Unit 1: Ecosystems	1st Trimester	• Why would a hawk move to New York City? • What do plants eat? • Where do fallen leaves go? • Do worms really eat dirt? • Why do you have to clean a fish tank but not a pond? • Why did the dinosaurs go extinct? • What's the difference between weather and **climate change**? What contributes to **climate change** in the world? • What is **global warming** and its effects on ecosystems? What are ways to prevent **global warming** from happening? • How could we grow food on Mars?
Unit 2: Chemical Reactions & Properties of Matter	2nd Trimester	• Are magic potions real? • Could you transform something worthless into gold? • What would happen if you drank a glass of acid? • What do fireworks, rubber, and silly putty have in common? • Why do some things explode? • What happened to the stone gargoyles over time?
Unit 3: Water Cycle & Earth's Systems	2nd Trimester	• Water on Earth's Surface • Water as a Natural Resource • The Water Cycle • Natural Disasters & Engineering • **Climate Change & the Hydrosphere**
Unit 4: Sun, Stars, & Planets	3rd Trimester	• How fast does the Earth spin? • Who set the first clock? • How can the sun tell you the season? • Why do the stars change with the seasons? • What are the wandering stars? • Why is gravity different on other planets? • Could there be life on other planets? • How can you tell time at night?

Student Learning

Career Education (NJDOE CTE Clusters)

21st Century Life and Careers

- 9.1.2.CR.1: Recognize ways to volunteer in the classroom, school and community.
- 9.1.2.FP.1: Explain how emotions influence whether a person spends or saves.
- 9.2.2.CAP.1: Make a list of different types of jobs and describe the skills associated with each job.
- 9.2.2.CAP.2: Explain why employers are willing to pay individuals to work.
- 9.4.2.CI.1: Demonstrate openness to new ideas and perspectives
- 9.4.2.CT.3: Use a variety of types of thinking to solve problems (e.g., inductive, deductive).
- 9.4.2.DC.6: Identify respectful and responsible ways to communicate in digital environments

Technology:

- 8.1.2.CS.1: Select and operate computing devices that perform a variety of tasks accurately and quickly based on user needs and preferences.
- 8.1.2.NI.1: Model and describe how individuals use computers to connect to other individuals, places, information and ideas through a network.
- 8.1.2.NI.2: Describe how the Internet enables Individuals to connect with others worldwide.
- 8.2.2.ITH.3: Identify how technology impacts or improves life.
- 8.2.2.ITH.4: Identify how various tools reduce work and improve daily tasks.
- 8.2.2.NT.2: Brainstorm how to build a product, improve a designed product, fix a product that has stopped working, or solve a simple problem.
- 8.2.2.ETW.1: Classify products as resulting from nature or produced as a result of technology.
- 8.2.2.EC.1: Identify and compare technology used in different schools, communities, regions, and parts of the world.

Modifications and Accommodations:

<u>Special Education</u>

- Printed copy of board work/notes provided
- Additional time for skill mastery
- Assistive technology
- Behavior management plan
- Center-Based Instruction
- Check work frequently for understanding
- Computer or electronic device utilization
- Extended time on tests/ quizzes
- Have student repeat directions to check for understanding
- Highlighted text visual presentation
- Modified assignment format
- Modified test content
- Modified test format
- Modified test length
- Multiple test sessions
- Multi-sensory presentation
- Preferential seating
- Preview of content, concepts, and vocabulary
- Reduced/shortened written assignments
- Secure attention before giving instruction/directions
- Shortened assignments
- Student working with an assigned partner

- Teacher initiated weekly assignment sheet
- Use open book, study guides, test prototypes
- Cubing activities
- Exploration by interest
- Flexible grouping
- Goal setting with students
- Jigsaw
- Mini workshops to re-teach or extend skills Open-ended activities
- Think-Pair-Share
- Varied supplemental materials
-
- **ELL**
- Allowing students to correct errors (looking for understanding)
- Teaching key aspects of a topic Eliminate nonessential information Using videos, illustrations, pictures, and drawings to explain or clarify
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slideshows, videos, etc.) to demonstrate student's learning
- Allowing students to correct errors (looking for understanding)
- Allowing the use of note cards or open-book during testing
- Decreasing the amount of work presented or required
- Having peers take notes or providing a copy of the teacher's notes
- Modifying tests to reflect selected objectives
- Providing study guides
- Reducing the number of answer choices on a multiple choice test
- Tutoring by peers
- Explain/clarify key vocabulary terms
-
- **At Risk**
- Allowing students to correct errors (looking for understanding)
- Teaching key aspects of a topic Eliminate nonessential information allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slideshows, videos, etc.) to demonstrate student's learning
- Allowing students to select from given choices .
- Allowing the use of note cards or open-book during testing
- Collaborating (general education teacher and specialist) to modify vocabulary, omit or modify items to reflect objectives for the student, eliminate sections of the test, and determine how the grade will be determined prior to giving the test
- decreasing the amount of work presented or required .
- Having peers take notes or providing a copy of the teacher's notes
- Marking students' correct and acceptable work, not the mistakes
- Modifying tests to reflect selected objectives
- Providing study guides
- Reducing the number of answer choices on a multiple choice test
- Tutoring by peers
- Using authentic assessments with real-life problem-solving
- Using true/false, matching, or fill in the blank tests in lieu of essay tests
- using videos, illustrations, pictures, and drawings to explain or clarify
- Flexible grouping
- Goal setting with students
- Jigsaw
- Mini workshops to re-teach or extend skills Open-ended activities

- Think-Pair-Share
- Varied supplemental materials
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- **Gifted and Talented**
- Alternative formative and summative assessments
- Choice boards
- Games and tournaments
- Group investigations
- Independent research and projects Interest groups for real world application
- Learning contracts
- Leveled rubrics
- Multiple intelligence options
- Personal agendas
- Project-based learning
- Problem-based learning
- Stations/centers
- Think-Tac-Toes
- Tiered activities/assignments
- Tiered products_____
-
- **504**
- Printed copy of board work/notes provided
- Additional time for skill mastery
- Assistive technology
- Behavior management plan
- Center-Based Instruction
- Check work frequently for understanding
- Computer or electronic device utilization
- Extended time on tests/ quizzes
- Have student repeat directions to check for understanding
- Highlighted text visual presentation
- Modified assignment format
- Modified test content
- Modified test format
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- Multiple test sessions
- Multi-sensory presentation
- Preferential seating
- Preview of content, concepts, and vocabulary
- Reduced/shortened written assignments
- Secure attention before giving instruction/directions
- Shortened assignments
- Student working with an assigned partner
- Seacher initiated weekly assignment sheet
- Use open book, study guides, test prototype
- Exploration by interest
- Flexible grouping
- Goal setting with students
- Mini workshops to re-teach or extend skills Open-ended activities
- Think-Pair-Share
- Varied supplemental materials

Unit 1 Overview: Ecosystems

Unit 1 Summary: In this unit, students explore how organisms depend on one another and form an interconnected ecosystem. Students investigate food chains, food webs, and the importance of producers, consumers, and decomposers. Students understand and describe the main aspects of **climate change** and how it affects the planet.

Essential Questions:

- Why would a hawk move to New York City?
- What do plants eat?
- Where do fallen leaves go?
- Do worms really eat dirt?
- Why do you have to clean a fish tank but not a pond?
- Why did the dinosaurs go extinct?
- What's the difference between weather and **climate change**? What contributes t**o climate change** in the world?
- What is **global warming** and its effects on ecosystems? What are ways to prevent **global warming** from happening?
- How could we grow food on Mars?

New Jersey Student Learning Standards

New Jersey Student Learning Standards: Science

- 5-LS1-1 Support an argument that plants get the materials they need for growth chiefly from air and water.
  [Clarification Statement: Emphasis is on the idea that plant matter comes mostly from air and water, not from the soil.]
- 5-LS2-1 Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.
  [Clarification Statement: Emphasis is on the idea that matter that is not food (air, water, decomposed materials in soil) is changed by plants into matter that is food. Examples of systems could include organisms, ecosystems, and the Earth.] [Assessment Boundary: Assessment does not include molecular explanations.]
- 5-PS3-1 Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.
- [Clarification Statement: Examples of models could include diagrams, and flowcharts.]
- **5-ESS3-1** Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources, environment, and address **climate change** issues

Interdisciplinary Connections:
English Language Arts:

- 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.
- RL.5.1. Quote accurately from a text, and make relevant connections when explaining what the text says explicitly and when drawing inferences from the text.
- RI.5.2. Determine two or more main ideas of a text and explain how they are supported by key details; summarize the text.
- RI.5.3. Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text.
- RI.5.6. Analyze multiple accounts of the same event or topic, noting important similarities and differences in the point of view they represent.
- RI.5.7. Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.
- RI.5.10. By the end of year, read and comprehend literary nonfiction at grade level text-complexity or above, with scaffolding as needed.
- 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.
- W9. Draw evidence from literary or informational texts to support analysis, reflection, and research.
- W.5.2. Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
- W.5.9. Draw evidence from literary or informational texts to support analysis, reflection, and research.

SEL: Self Awareness

- Recognize the impact of one's feelings and thoughts on one's own behavior
- Recognize one's personal traits, strengths, and limitations

- Recognize the importance of self-confidence in handling daily tasks and challenge

Disciplinary Core Ideas

- Animals are all around us--even in cities. We can learn to spot them by bearing in mind one of the most basic relationships that all animals have with each other: some of them are predators and others are prey. (Where there are prey, there are predators, and vice versa.)
- Because predators depend on prey, all animals ultimately depend on plants--even carnivores that do not eat plants. Plants in turn derive their growth material primarily from water and air.
  DCIs: LS1.C, Foundational for LS2.B
- Decomposers are yet another category of living things, which consume dead plant and animal material and produce soil. Fungi--of which mushrooms and mold are types--is a conspicuous decomposer found everywhere, even in your home.
  DCIs: LS2.A, Foundational for LS2.B
- Earthworms aren't pests, they are decomposers!
- They eat dead and decaying matter, bacteria, and animal waste that is in soil. Worm castings (their excretions) release the nutrients from their food back into the soil. In addition to water and carbon dioxide from the air, plants need these nutrients to grow. Worms help gardens, not hurt them.
  DCIs: LS2.A, LS2.B, *Supplementary* LS1.C
- All living things in an ecosystem depend on one another. In a pond, fish depend on plants as food and as a source of oxygen. Decomposers break down dead plant and animal matter, releasing micronutrients into the water. They also give off carbon dioxide. Plants take in carbon dioxide and give off oxygen. If one part is removed, the ecosystem would not function.
  DCIs: LS2.A, LS2.B
- It is believed that an asteroid impact *could* have caused the dinosaurs to go extinct. When the asteroid hit the earth it filled the sky with dust, ash and debris which blocked sunlight. Plants all over the world couldn't get the sun's energy they needed to grow. When plants died out, the herbivores would eventually die as well, followed by the carnivores. Ultimately, the asteroid collapsed the dinosaur's food web causing a mass extinction.
  DCIs: PS3.D, LS1.C
- Weather and climate change are two different concepts. **Climate change** is having an impact on the Earth, and in turn, it is negatively affecting ecosystems throughout the planet. Individuals can curb **global warming** and engage in behaviors that will positively impact ecosystems.
  5-ESS3-1, MS-ESS3-5, ESS3,D
- **Global Warming** (a large part of climate change) is the increase in temperature of Earth.
- **Global Warming** is caused by greenhouse gasses. These gasses include carbon dioxide, ozone, methane and water vapor. Deforestation, pollution, and farming are some of the causes. Individuals can prevent **Global Warming** from happening if they do their part in the society and help their ecosystem from getting destroyed.
  5-ESS3-1, MS-ESS3-5, ESS3,D
- Living things get their energy through food chains. Most of the matter that makes up plants comes from the air. All food can be traced back to plants. Decomposers break down dead things and recycle nutrients. Organisms in an ecosystem depend on one another to cycle energy and nutrients. All energy in an ecosystem first came from the sun.
  DCIs: LS2.A, LS2.B, LS1.C

Science and Engineering Practices

- Students **construct models** of different food chains by linking cards representing different organisms. The chains are used to explain the relationship between predators and prey. Students **argue using evidence and reasoning** about which organisms can be linked together and in what order.
- Students **plan an investigation** to determine whether or not air has weight. As a whole class, students **conduct an investigation** to compare the weights of balloons with and without air. Students **analyze and interpret data** from the investigation to **explain** what happened and how the evidence may **explain** how plants gain weight.
- Students **ask questions** about what conditions they think will induce and prevent the growth of mold. Students **plan and conduct an investigation** to test different conditions. Students **analyze and interpret data** that they record from their experiments to **explain** how different conditions impact mold growth.
- Students observe worm behavior to help them determine a worm's role in a garden. Then, they **conduct an investigation** to test if worms prefer damp or dry places. They **create an argument** using the investigation's results as **evidence** to support a claim about the worm's preferences. Lastly, students **plan and carry out an investigation** to answer a question they have about worms.
- Students **develop a model** to show the flow of energy and matter within an ecosystem. Then, students **develop a model** of a pond ecosystem. They add different living things to the pond, considering what each organism needs to eat and how much carbon dioxide each organism adds or removes from the ecosystem.
- Students develop a model of a dinosaur food web to show how all animals get their energy. They use the model to help construct an explanation about how an asteroid killed all of the dinosaurs.
- Students will examine the different climates on the planet and be able to explain how climate and weather are two different concepts. Students will utilize prior learning to develop an understanding of how ecosystems are negatively impacted by climate change. In the second part of this lesson, students will explore **global warming** and write an argument for ways to reduce **global warming.**
- Students will **e**xamine **Global Warming** and how it is affecting ecosystems. Students will utilize prior learning to develop an understanding of how ecosystems are negatively impacted by **Global Warming**. In the second part of this lesson, students will create a **global warming** poster and display ways to reduce global warming.
- Students evaluate a list of proposed organisms for a Mars habitat. They write an argument for or against the proposal as a good ecosystem. In Part 2, students make recommendations on how to improve the ecosystem.

Crosscutting Connections

- By constructing chains of relationships between organisms, students are exposed to an example of a system. Food chains set students up for considering energy & matter flow.
- Students observe that deflating a balloon causes the balloon to weigh less, leading to the conclusion that air has weight. This lays the foundation for an understanding of conservation of matter by considering how plants gain weight as they grow due to the air they absorb
- Students observe patterns in the rates of change in the mold terrariums. They note similarities and differences to analyze how mold grows on different foods under different conditions.
- Students recognize that earthworms are part of a system, a food chain, with other organisms. Earthworms help matter flow back into the food chain.
- Students recognize the living organisms in a habitat as a system, an ecosystem. If one organism were

to disappear, the whole ecosystem would break down.

- Students identify the sun as the ultimate source of energy in an ecosystem. The sun's energy is used by plants to grow and transferred through an ecosystem in the form of food.
- Students are starting to explore the interconnected relationship between the Earth's systems.
- Students are continuing to explore the interconnected relationship between the Earth's systems.
- A system is a group of related parts that make up a whole and can carry out functions its individual parts cannot. A system can be described in terms of its components and their interactions. Energy can be transferred in various ways and between objects.

Unit 1 Student Learning Objectives

Students will know:

- How the members of any food chain or food web are connected to, or dependent upon, each other
- The conservation of matter by considering how plants gain weight as they grow due to the air they absorb.
- The similarities and differences to analyze how mold grows on different foods under different conditions.
- The critical role earthworms play in decomposing dead material and releasing nutrients into the soil.
- The ways plants, animals, and decomposers interact in an ecosystem.
- The food web from the time of the dinosaurs and its hypothesized impact on their extinction.
- The different types of climates around the world.
- The difference between weather and **climate change** and how it affects the ecosystem.
- Discover what causes **global warming** and ways it can be prevented.
- How to apply their conceptual understanding to a new scenario.

Students will be able to:

- Differentiate between and explain the roles of producers, consumers, herbivore, carnivore, omnivore, and decomposer
- Construct a food web that correctly shows the relationship between the sun, producers, consumers, and decomposers
- Demonstrate understanding of the transfer of energy within food webs
- Plan an investigation to determine whether or not air has weight
- Observe that deflating a balloon causes the balloon to weigh less, leading to the conclusion that air has weight
- Conduct an investigation to compare the weights of balloons with and without air.
- Analyze and interpret data from the investigation to explain what happened and how the evidence may explain how plants gain weight
- Ask questions about what conditions they think will induce and prevent the growth of mold
- Plan and conduct an investigation to test different conditions
- Analyze and interpret data that they record from their experiments to explain how different conditions impact mold growth
- Observe patterns in the rates of change in the mold terrariums
- Observe earthworms
- Design a "fair test" investigation of earthworm behavior
- Develop a model of a pond ecosystem
- Investigate the hypothesis that an asteroid impact caused the extinction of the dinosaurs
- Follow the flow of energy through the food web and figure out why dinosaurs went extinct but some

other animals survived
- Write a letter to the President of the United States explaining their concerns about the **changing climate** and how it is affecting the Earth
- Evaluate a proposal of organisms for a Mars habitat ecosystem.
- Write an argument for or against the proposed ecosystem.

Unit 1 Assessments

Formative Assessments: Entrance/Exit Tickets Science Notebook Entries, Activities
Summative Assessments: Science Lesson Assessments, Rubrics for Exploration
Benchmark Assessments: End of Unit Assessment
Alternative Assessment:
- Interactive Notebook
- Vocabulary

Unit 2 Overview: Chemical Reactions & Properties of Matter

Unit 2 Summary: Students investigate the properties of matter by dissolving everyday chemicals to make solutions and by exploring simple yet surprising chemical reactions. Through these investigations, students begin to build conceptual models for the particulate nature of matter.

Essential Questions:
- Are magic potions real?
- Could you transform something worthless into gold?
- What would happen if you drank a glass of acid?
- What do fireworks, rubber, and silly putty have in common?
- Why do some things explode?
- What happened to the stone gargoyles over time?

New Jersey Student Learning Standards

New Jersey Student Learning Standards: Science

- 5-PS1-1. Develop a model to describe that matter is made of particles too small to be seen. [Clarification Statement: Examples of evidence supporting a model could include adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water.] [*Assessment Boundary: Assessment does not include the atomic-scale mechanism of evaporation and condensation or defining the unseen particles.*]

- 5-PS1-2 Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved. [Clarification Statement: Examples of reactions or changes could include phase changes, dissolving, and mixing that form new substances.] [*Assessment Boundary: Assessment does not include distinguishing mass and weight.*]

- 5-PS1-3 Make observations and measurements to identify materials based on their properties. [Clarification Statement: Examples of materials to be identified could include baking soda and other powders, metals, minerals, and liquids. Examples of properties could include color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, and solubility; density is not intended as an identifiable property.] [*Assessment Boundary: Assessment does not include density or distinguishing mass and weight.*]

- 5-PS1-4 Conduct an investigation to determine whether the mixing of two or more substances results in new substances.

Interdisciplinary Connections:

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.
- RL.5.1. Quote accurately from a text, and make relevant connections when explaining what the text says explicitly and when drawing inferences from the text.
- RI.5.2. Determine two or more main ideas of a text and explain how they are supported by key details; summarize the text.
- RI.5.3. Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text.
- RI.5.7. Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.
- RI.5.10. By the end of year, read and comprehend literary nonfiction at grade level text-complexity or above, with scaffolding as needed.
- 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.W9. Draw evidence from literary or informational texts to support analysis, reflection, and research.
- W.5.2. Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
- W.5.9. Draw evidence from literary or informational texts to support analysis, reflection, and research.

SEL:

- SelfAwarenes-Recognize one's personal traits, strengths, and limitations • Recognize the importance

of self-confidence in handling daily tasks and challenges

Mathematics:

- 5.MD.A.1 - Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems. (5-PS1-2)
- 5.MD.C.3 - Recognize volume as an attribute of solid figures and understand concepts of volume measurement. (5-PS1-1)
- 5.MD.C.4 - Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units. (5-PS1-1)
- 5.NBT.A.1 - Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left. (5-PS1-1)
- 5.NF.B.7 - Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. (5-PS1-1)
- MP.2 - Reason abstractly and quantitatively. (5-PS1-1), (5-PS1-2), (5-PS1-3)
- MP.4 - Model with mathematics. (5-PS1-1), (5-PS1-2), (5-PS1-3)
- MP.5 - Use appropriate tools strategically. (5-PS1-2), (5-PS1-3)

Disciplinary Core Ideas

- Experiment with mixing different substances together to make a potion. Hypothesize if potions could transform materials. DCIs: Foundational PS1.A and PS1.B
- Observe and investigate the many materials around them--the substances which things are made of. They discover that substances are able to change form, and that some substances may even appear to vanish.. DCIs: Foundational PS1.A and PS1.B
- Discover acids--a set of substances that is extremely reactive (undergoes chemical changes easily). A chemical reaction happens when different substances are mixed and it causes some kind of change. We can tell a chemical change is happening by observing indications such as fizzing, a color change, or dissolving. DCIs: PS1.A
- Making observations and experimenting with substances is important. For example, when acids react with other substances, they form entirely new substances. The new substance will have different properties from the original substances. Some of these properties are useful. Chemical reactions are how we get new substances and discover new properties. DCIs: PS1.B
- Gasses can be visible or invisible and are made up of many tiny particles that you can't see. All explosions are caused by a buildup of gas moving outward that bursts the container they are in. DCIs: PS1.A
- Substances can change other substances. Substances can change but not disappear. Acids are very reactive substances. Chemical reactions are the mixing of two or more substances that create a new substance. Gasses are made of particles too small to be seen.
- Foundational PS1.A and PS1.B

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 to describe phenomena. (5-PS1-1)

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.
    - 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. (5-PS1-4)
    - Make observations and measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (5-PS1-3)

Using Mathematics and Computational Thinking

- Mathematical and computational thinking in 3–5 builds on K–2 experiences and progresses to extending quantitative measurements to a variety of physical properties and using computation and mathematics to analyze data and compare alternative design solutions.
    - Measure and graph quantities such as weight to address scientific and engineering questions and problems. (5-PS1-2)

Crosscutting Connections

Cause and Effect

- Students explore how substances undergo change.
- Scale, Proportion, and Quantity
- Natural objects exist from the very small to the immensely large. (5-PS1-1)
- Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume. (5-PS1- 2),(5-PS1-3)

Unit 2 Student Learning Objectives

Students will know:

- What an alchemist is.
- That acids are a group of substances with a reputation for being reactive.
- The idea that chemical reactions create new materials that have useful and interesting properties.
- Add to, change, and/or revise their initial argument using the evidence they have learned throughout the Mysteries.
- Support their final argument with a particle model showing what causes the stone to change over time.

Students will be able to:

- Experiment with various liquids in order to see if they can change the appearance of copper pennies.
- Test the properties of a series of unknown liquids in order to identify which are acids.
- Test for acids, then apply it to several common household substances in order to identify which contain acid.
- Conduct an investigation to determine if the mixing of various substances results in a new substance.
- Investigate and model how gasses cause explosions.
- Observe how gas bubbles produce inflation.
- Conduct an investigation to determine whether the mixing of two or more substances results in new substances

Unit 2 Assessments

Formative Assessments:

- Entrance/Exit Tickets, Science Notebook Entries, Activities

Summative Assessments:

- Science Lesson Assessments, Rubrics for Exploration

Benchmark Assessments:

- End of Unit Assessment
- NGSS aligned assessment

Alternative Assessments:

- Journal
- STEM Activities

Unit 3 Overview: Water Cycle & Earth's Systems

Unit 3 Summary: Students consider the profound importance of water as a natural resource. Students investigate the distribution of water, how it cycles through Earth's systems, and explore how it affects human societies.

Essential Questions:

- What is the importance of water on Earth's Surface?
- What is the importance of Water as a Natural Resource?
- Describe the Water Cycle.
- How do Natural Disasters & Engineering affect Earth systems?
- What water related issues impact **Climate Change &** the Hydrosphere**?**

New Jersey Student Learning Standards

New Jersey Student Learning Standards: Science

- 5-ESS2-1. Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. [Clarification Statement: Examples could include the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere on landforms and ecosystems through weather and climate; and the influence of mountain ranges on winds and clouds in the atmosphere. The geosphere, hydrosphere, atmosphere, and biosphere are each a system.] [Assessment Boundary: Assessment is limited to the interactions of two systems at a time.]
- 5-ESS2-2. Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth. [Assessment Boundary: Assessment is limited to oceans, lakes, rivers, glaciers, ground water, and polar ice caps, and does not include the atmosphere.]
- 5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

Interdisciplinary Connections:

- **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.
- RL.5.1. Quote accurately from a text, and make relevant connections when explaining what the text says explicitly and when drawing inferences from the text.
- RI.5.2. Determine two or more main ideas of a text and explain how they are supported by key details; summarize the text.
- RI.5.3. Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text.
- RI.5.7. Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.
- RI.5.10. By the end of year, read and comprehend literary nonfiction at grade level text-complexity or above, with scaffolding as needed.
- 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.W9. Draw evidence from literary or informational texts to support analysis, reflection, and research.
- W.5.2. Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
- W.5.9. Draw evidence from literary or informational texts to support analysis, reflection, and research.
-
- **SEL:**
- 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.
-
- **Mathematics:**
- 5.MD.A.1 - Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems. (5-PS1-2)
- 5.MD.C.3 - Recognize volume as an attribute of solid figures and understand concepts of volume measurement. (5-PS1-1)

- 5.MD.C.4 - Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units. (5-PS1-1)
- 5.NBT.A.1 - Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left. (5-PS1-1)
- 5.NBT.B.6 Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.
- 5.NF.B.7 - Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. (5-PS1-1)
- 5.G.A Graph points on the coordinate plane to solve real-world and mathematical problems.
- MP.2 - Reason abstractly and quantitatively. (5-PS1-1), (5-PS1-2), (5-PS1-3)
- MP.4 - Model with mathematics. (5-PS1-1), (5-PS1-2), (5-PS1-3)
- MP.5 - Use appropriate tools strategically. (5-PS1-2), (5-PS1-3)

Disciplinary Core Ideas

- Water is our most basic human need. Despite the fact that Earth is a watery planet, Earth's water is mostly salt water--a form not fit to drink. Easily accessible fresh water is a surprisingly small amount by comparison. Of that fresh water, much of it is frozen in glaciers and ice caps.
  DCIs: ESS2.C
- Most people get their drinking water from water that's located underground, where there turns out to be a surprisingly large amount within structures called "aquifers." People use science ideas about the location of aquifers to make decisions about where to build communities.
  DCIs: ESS2.C, Foundational for ESS3.C & ESS2.A
- Evaporation of ocean water is the ultimate source of rain, and thus all our easily accessible fresh water. (All water on Earth's surface is part of an interconnected system, the hydrosphere.)
  DCIs: Foundational for ESS2.A
- Hurricanes start out as small storms over the ocean. As they move across the ocean, warm water evaporates into the storm cloud, making the hurricane grow bigger and bigger. Hurricanes bring tons of rain, flooding entire cities. Engineers design solutions to protect towns from extreme flooding.
  DCIs: ESS2.A, ETS1.A, ETS1.B, ETS1
- **Climate change** is having an impact on all of Earth's systems. The systems are interdependent on each other. This lesson will specifically address the effect that climate change has on the hydrosphere.

Science and Engineering Practices

- Students analyze and interpret data from world maps to determine the relative amounts of fresh, salt and frozen water. Students use mathematics and computational thinking to calculate areas on a map and graph values to compare and graph quantities of fresh, salt and frozen water on Earth.
- Students are asked to determine where the best place is to settle a new town by considering the features of the landscape and what they know about where to find water. Students obtain, evaluate and communicate information from different sources about topography, plants and soil to inform their decision. Students argue using evidence to justify where their town should be built.
- Students create a model of the ocean and sky (hydrosphere and atmosphere). Students use the model to plan and carry out an investigation to determine how temperature influences evaporation and condensation.
- Students define the problem that a town needs protection from flooding. They obtain and communicate information about different types of engineers and work as a team to design solutions using their different types of flood protection. Students use mathematics and computational thinking to design a solution under budget.
- Students will explain how **climate change** is negatively impacting the hydrosphere. They will obtain

information and develop a model that demonstrates how a change to the hydrosphere can impact another sphere.

Crosscutting Connections

- Students use standardized units of area to compare the quantity of fresh, salt and frozen water on Earth. Students use proportional reasoning to represent quantities in their graph comparing different types of water.
- Students reason about information they get about natural patterns to determine where underground water is most likely to be found. These patterns involve correlations between elevation and water depth as well as how plant and soil patterns can give clues about where drinkable water may be found.
- Students reason about how the hydrosphere and atmosphere systems interact to produce rain. Students model the systems to explain how rain is created.
- Students reason about how the hydrosphere and atmosphere systems interact to produce hurricanes and extreme flooding. They also consider the impact of hurricanes on the biosphere and geosphere system.
- Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things,including humans). Earth's systems interact in multiple ways to affect Earth's surface materials and processes.

Unit 3 Student Learning Objectives

Students will know:

- The different types of water on Earth and where they are found.
- The best place to settle a new town.
- How to determine whether or not air has weight.
- How plants gain weight as they grow due to the air they absorb.
- How the hydrosphere and atmosphere **systems** interact to produce rain.
- How to save a town from a hurricane.
- What **Climate Change** is and ways that the geosphere, biosphere, hydrosphere, and/or atmosphere interact. (Geosphere (i.e solid and molten rock, soil, sediment, continents, mountains). Hydrosphere (i.e. water and ice in the form of rivers, lakes, glaciers). Atmosphere (i.e, wind,oxygen). Biosphere (i.e. plants, animals [including humans]).

Students will be able to:

- Analyze and interpret data from world maps to determine the relative amounts of fresh, salt and frozen water
- Use mathematics and computational thinking to calculate areas on a map and graph values to compare and graph quantities of fresh, salt and frozen water on Earth.
- Use proportional reasoning to represent quantities in their graph comparing different types of water.
- Analyze how a NASA astronaut's traits changed during his "year in space." Then they measure some of their physical traits (arm strength, height, and balance) and predict how their own traits might change after living in space.
- Determine where is the best place to settle a new town by considering the features of the landscape and what they know about where to find water.
- Use science ideas about the location of aquifers to make decisions about where to build communities.
- Analyze and interpret data from the investigation and how the evidence may explain how plants gain weight.
- Use proportional reasoning to represent quantities in comparing different types of water.
- Determine how temperature influences evaporation and condensation.

- Reason about how the hydrosphere and atmosphere **systems** interact to produce hurricanes and extreme flooding.
- Consider the impact of hurricanes on the biosphere and geosphere system.
- Identify and describe relationships (interactions) within and between the parts of the Earth systems identified in the model that are relevant to the example (e.g.,the atmosphere and the hydrosphere interact by exchanging water through evaporation and precipitation; the hydrosphere and atmosphere interact through air temperature changes, which lead to the formation or melting of ice).

Unit 3 Assessments

- **Formative:** Entrance/Exit Tickets, Science Notebook Entries, Activities
- **Summative:** Science Lesson Assessments, Rubrics for Exploration
- **Benchmark:** End of Unit Assessment
- **Alternative Assessment:** Interactive Notebook

Unit 4 Overview: Sun, Stars, & Planets

Unit 4 Summary: Students explore the Earth, Sun, Moon, and stars using observations of shadows and changing patterns in the sky. Students also explore the planets of our Solar System and begin to consider what might lie beyond.

Essential Questions:

- How fast does the Earth spin?
- Who set the first clock?
- How can the sun tell you the season?
- Why do the stars change with the seasons?
- What are the wandering stars?
- Why is gravity different on other planets?
- Could there be life on other planets?
- How can you tell time at night?

New Jersey Student Learning Standards

New Jersey Student Learning Standards: Science

- 5-PS2-1 Support an argument that the gravitational force exerted by Earth on objects is directed downwards.
- [Clarification Statement: "Down" is a local description of the direction that points toward the center of the spherical Earth.] [Assessment Boundary: Assessment does not include mathematical representation of gravitational force.]
-
- 5-ESS1-1 Support an argument that the apparent brightness of the sun and stars is due to their relative distances from the Earth.
- [Assessment Boundary: Assessment is limited to relative distances, not sizes, of stars. Assessment does not include other factors that affect apparent brightness (such as stellar masses, age, stage).]
-
- 5-ESS1-2 Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky Clarification Statement: Examples of patterns could include the position and motion of Earth with respect to the sun and selected stars that are visible only in particular months.] [Assessment Boundary: Assessment does not include causes of seasons.]

Interdisciplinary Connections:

English Language Arts

- 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.
- RL.5.1. Quote accurately from a text, and make relevant connections when explaining what the text says explicitly and when drawing inferences from the text.
- RI.5.2. Determine two or more main ideas of a text and explain how they are supported by key details; summarize the text.
- RI.5.3. Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text.
- RI.5.6. Analyze multiple accounts of the same event or topic, noting important similarities and differences in the point of view they represent.
- RI.5.7. Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.
- RI.5.10. By the end of year, read and comprehend literary nonfiction at grade level text-complexity or above, with scaffolding as needed.
- 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.
- W9. Draw evidence from literary or informational texts to support analysis, reflection, and research.
- W.5.2. Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
- W.5.9. Draw evidence from literary or informational texts to support analysis, reflection, and research.

SEL

Social Awareness

- 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

Disciplinary Core Ideas

- **ESS1.A:** The Universe and its Stars The sun is a star that appears larger and brighter than other stars because it is closer. Stars range greatly in their distance from Earth. (5-ESS1-1)
- **ESS1.B:** Earth and the Solar System The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the sun, moon, and stars at different times of the day, month, and year. (5-ESS1-2)
- **PS2.B:** Types of Interactions The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center. (5-PS2-1)

Science and Engineering Practices

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).
    - Support an argument with evidence, data, or a model. (5- PS2-1)

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.
    - Represent data in graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships. (5-ESS1-2)

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).
    - Support an argument with evidence, data, or a model. (5- ESS1-1)

Crosscutting Connections

Patterns

- Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena. (5- ESS1-2)

Scale, Proportion, and Quantity

- Natural objects exist from the very small to the immensely large. (5-ESS1- 1)

Cause and Effect

- Cause and effect relationships are routinely identified and used to explain change. (5-PS2-1)

Unit 4 Student Learning Objectives

Students will know:

- That the sun moving across the sky is a pattern that can be explained.
- How shadows change throughout the day.
- The reasons we see different stars during different seasons.
- The parts (the planets and sun) that make up the whole (the solar system).
- The order of the planets and their relative distance from the sun, and each other.

- That gravity exists on all planets and moons, but the amount of gravity is different because it depends on how massive the object is.
- Discover that the Earth is in the "Goldilocks Zone" — a distance from the Sun with the right amount of light and heat for life to exist
- Patterns in the sky to invent a way to tell time at night.

Students will be able to:

- Carry out an investigation to explore the phenomena of the sun appearing to move across the sky.
- Investigate using two models, one of the sun rotating around the Earth and another of the Earth rotating around the sun.
- Create an argument using the evidence they gathered in the investigation to explain why the sun rises and sets.
- Observe the pattern of the rising and setting sun.
- Notice the similar patterns between two different models and understand which one is accurate.
- Carry out an investigation to determine how the position of the sun changes the direction of the shadow at different times of day.
- Interpret data from their shadow clock to determine what time of day it is.
- Observe patterns in the change of shadow length and position throughout the day.
- Use shadow patterns to determine what time of day it is, without the use of a clock.
- Make an argument that supports the claim that the Earth orbits around the sun
- Observe the seasonal pattern of stars
- Note the change of constellations that are visible in the night sky, based on the season
- Use the information as evidence to argue that Earth is orbiting the Sun, and we only see a part of the night sky at a time.
- Draw the sun and the planets at their relative distances from one another.
- Observe an immensely large system of natural objects.
- Create scale models in order to interact with these systems.
- Measure how high they can jump on Earth.
- Calculate how high they could jump on other places in our Solar System.
- Evaluate other solar systems and plan a space mission to a planet with conditions similar to those on Earth.
- Evaluate if there could be life on other planets.
- Use a flagpole to make a shadow clock as an example.
- Evaluate possible patterns
- Suggest multiple ways to measure time with those patterns
- Describe their final design and how it works.

Unit 4 Assessments

Formative: Entrance/Exit Tickets, Science Notebook Entries, Activities

Summative: Science Lesson Assessments, Rubrics for Exploration

Benchmark: End of Unit Assessment

Alternative Assessment: Interactive Notebook

Unit 5 Overview: Electricity, Light, and Heat

Unit 5 Summary: Students investigate the different forms of energy! Students obtain information about how heat energy, solar energy, wind energy, and water energy can be transformed into electrical energy. They also construct devices that convert energy from one form into another, such as heat into motion and electricity into light.

Essential Questions:

- What is the best way to light up a city?
- What if there were no electricity?
- How long did it take to travel across the country before there were cars and planes?

New Jersey Student Learning Standards

New Jersey Student Learning Standards: Science

- 4-PS3-2 Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.
- 4-PS3-4 Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.
- 4-ESS3-1. Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.
- 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-ETS1-3. 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 Connections:

Speaking and Listening:

- SL.4.1 Engage effectively in a range of collaborative discussions
- SL.4.2 Paraphrase information presented in diverse media, including orally

ELA:

- RI.4.3. Analyze in detail how a key individual, event, or idea is introduced, illustrated, and elaborated in a text (e.g., through examples or anecdotes).
- RI.4.4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings.
- RI.4.7. Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue.
- RI.4.10 Read and comprehend informational texts
- W.4.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly
- W.4.4 Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience
- W.4.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic
- W.4.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information and provide a list of sources.
- W.4.9 Draw evidence from informational texts to support analysis, reflection and research

SEL:

Social Awareness

- 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

Arts / Music / Visual and Performing Arts:

- Anchor Standard 1: Conceptualizing and generating ideas.
- Anchor Standard 2: Organizing and developing ideas. Anchor Standard 3: Refining and completing products.

Mathematics

- 4.OA.A.3 Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.
- MP.4 Model with mathematics.

- 4.G.A.1 Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.

Social Studies

- 6.1.5.GeoPP.1: Compare and contrast characteristics of regions in the United States based on culture, economics, and physical characteristics to understand the concept of regionalism.
- 6.1.5.GeoPP.2: Describe how landforms, climate and weather, and availability of resources have impacted where and how people live and work in different regions of New Jersey and the United States.

Health/P.E.

- 2.1.5.PGD.1: Identify effective personal health strategies and behaviors that reduce illness, prevent injuries, and maintain or enhance one's wellness (e.g., adequate sleep, balanced nutrition, ergonomics, regular physical activity).
- 2.2.5.PF.5: Determine how different factors influence personal fitness and other healthy lifestyle choices (e.g., heredity, physical activity, nutrition, sleep, technology).
- 2.2.5.N.1: Explain how healthy eating provides energy, helps to maintain healthy weight, lowers risk of disease, and keeps body systems functioning effectively.
- 2.3.5.PS.1: Develop strategies to reduce the risk of injuries at home, school, and in the community.

Disciplinary Core Ideas

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)

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)

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)

Science and Engineering Practices

Asking Questions and Defining Problems

- Asking questions and defining problems in grades 3–5 builds on grades 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)

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)

Unit 5 Student Learning Objectives

Students will know:

- Although the lives of animals can be very different, they all have in common birth, growth, reproduction, and death.
- The role of mosquitoes in carrying diseases such as malaria.
- How and why flowers are pollinated.
- Why plants grow fruit.
- While there is great diversity among flowering plants, they all share similar life cycles.
- That plants start from seeds, grow, and eventually reproduce through the process of pollination.

Students will be able to:

- Develop a model to compare the life stories of different animals.
- Evaluate the merits of different solutions for getting rid of mosquitoes at various locations in a town.
- Design a solution to help the town deal with an abundance of mosquitoes resulting from a very rainy summer.
- Make flower models out of paper and bee models out of pipe cleaners.
- Fly their bees from flower to flower and observe what happens to the flower's pollen during this process.
- Examine common grocery produce and predict if each item is a science fruit or science vegetable.
- Observe and predict how changes to the pollinators affect plant reproduction, which affects the life cycles of those plants.

Unit 5 Assessments

Formative: Entrance/Exit Tickets, Science Notebook Entries, Activities, etc.

Summative: Science Lesson Assessments, Rubrics for Exploration

Benchmark: End of Unit Assessment

Alternate Assessment:
Interactive Notebook

Unit 6 Overview: Sound, Waves, and Communication

Unit 6 Summary: Students investigate the science of sound. Students construct physical devices to feel the vibrations that allow us to communicate across distances. Students also use digital devices to visualize the characteristics of different sound waves that cause us to hear different things.

Essential Questions:

- How do you send a secret code?
- How far can a whisper travel?
- What would happen if you screamed in outer space?
- Why are some sounds high and some sounds low?
- How can you make sound waves visible?

New Jersey Student Learning Standards

New Jersey Student Learning Standards: 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.

Interdisciplinary Connections:

Speaking and Listening:

- SL.4.1 Engage effectively in a range of collaborative discussions
- SL.4.2 Paraphrase information presented in diverse media, including orally
- SL.4.5 Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes.

ELA:

- RI.4.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.
- RI.4.3. Analyze in detail how a key individual, event, or idea is introduced, illustrated, and elaborated in a text (e.g., through examples or anecdotes).
- RI.4.4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings.
- RI.4.7. Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue.
- RI.4.9 Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably
- RI.4.10 Read and comprehend informational texts
- W.4.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly
- W.4.4 Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience
- W.4.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic

Mathematics:

- MP.4 Model with mathematics.
- 4.G.A.1 Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.

Health/P.E.:

- 2.1.5.PGD.1: Identify effective personal health strategies and behaviors that reduce illness, prevent injuries, and maintain or enhance one's wellness (e.g., adequate sleep, balanced nutrition, ergonomics, regular physical activity).

SEL:

- Social Awareness - 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

Disciplinary Core Ideas

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. (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)

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)

Connections to Nature of Science

- Scientific Knowledge is Based on Empirical Evidence
    - Science findings are based on recognizing patterns. (4- PS4-1)

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)

Unit 6 Student Learning Objectives

Students will know:

- How digital devices encode complex information so that it can be transferred over long distances
- About the connection between sounds and vibration.
- The factors that affect the pitch and loudness of sound produced by vibrating objects.
- The role that air plays in enabling a sound vibration to travel.
- How sound is transmitted, reflected and/or absorbed by different materials.
- How sound is affected by different materials in different environments.
- That sound is a wave.

- The structure and function of the human ear.

Students will be able to:

- Generate their own codes in order to transfer information across the classroom
- Make telephones using cups and string.
- Modify the design of their telephones using different types of supplies to see if they can improve the sound quality.
- Explore sound vibrations.
- Experiment with sound to understand how it moves through the air and then consider what would happen in an environment like space where there is no air.
- Draw the waves that different sounds make using a virtual oscilloscope, a machine that shows images of sound waves.
- Vibrate a rope to make waves that look like the ones made by the oscilloscope
- Design and build a device that uses the vibrations of sound to make visible patterns

Unit 6 Assessments

Formative: Entrance/Exit Tickets, Science Notebook Entries, Activities, etc.

Summative: Science Lesson Assessments, Rubrics for Exploration

Benchmark: End of Unit Assessment

Alternate Assessment:
Interactive Notebook