Course: Grade 4 Science

Unit # 1 : Unit 1- Soils, Rocks, and Landforms

Grade Level(s): 4	**Length of Unit:** 8-9 weeks

Unit Rationale:
In the Soils, Rocks, and Landforms Module, students will be given first-hand experiences with soils and rocks and modeling experiences using tools such as topographic maps and stream tables to study changes to rocks and landforms at the Earth's surface. Students complete activities focusing on concepts that weathering by water, ice, wind, living organisms, and gravity breaks rocks into smaller pieces, erosion (water, ice, and wind) transports earth materials to new locations, and deposition is the result of a transport process that builds new land. Students conduct controlled experiments by changing specific environmental conditions to determine the impact of changing the variables of slope and amount of water in stream tables. Students interpret data from diagrams and visual representations to build explanations from evidence and make predictions of future events. They develop model mountains and represent the landforms from different perspectives to look for change. Students gain experiences that will contribute to the understanding of crosscutting concepts of patterns; cause and effect; scale, proportion, and quantity; systems and system models; structure and function; and stability and change.

Stage 1 - Desired Results

Enduring Understandings:	**Essential Questions:**
Students will understand that… ● Soils are composed of essentially the same types of materials (inorganic earth materials and humus), but the amounts of the materials vary. ● Rocks break into smaller pieces through physical and chemical weathering. ● Water moves earth materials from one location to another. ● Different processes can result in fossils. ● Fossils provide evidence of life and landscapes from the ancient past. ● A topographic map produces a representation of landforms. ● Various processes cause rapid changes to Earth's surface: landslides, earthquakes, floods, and volcanoes. ● Earth materials are renewable or nonrenewable natural resources. ● Earth materials are valuable resources.	● What is soil? ● How do weather rock pieces move from one place to another? ● How can we represent the different elevations of landforms? ● How do people use natural resources to make or build things? ● How do different people around the world respond to challenges caused by climate change?
Content:	**Skills:**

Students will know…	*Students will be able to…*
● Soils can be described by their properties. ● Soils are composed of different kinds and amounts of earth materials and humus. ● Weathering is the breakdown of rocks and minerals at or near the Earth's surface. ● The physical-weathering processes of abrasion and freezing break rocks and minerals into smaller pieces. ● Weathering is the breakdown of rocks and minerals at or near the Earth's surface. ● Chemical weathering occurs when exposure to water and air changes rocks and minerals into something new. ● Weathered rock material can be reshaped into new landforms by the slow processes of erosion and deposition. ● Erosion is the transport (movement) of weathered rock materials (sediments) by moving water or wind. ● Deposition is the settling of sediments when the speed of moving water or wind declines. ● The rate and volume of erosion relate directly to the energy of moving water or wind. ● The energy of moving water depends on the mass of water in motion and its velocity. The greater the mass and velocity, the greater the energy. ● Fossils provide evidence of organisms that lived long ago as well as clues to changes in the landscape and past environments. ● A topographic map uses contour lines to show the shape and elevation of the land. ● The change in elevation between two adjacent contour lines is always uniform. ● The closer the contour lines, the steeper the slope and vice versa. ● A profile is a side view or cross-section of a landform. ● A profile can be drawn from information given on a topographic map. ● The surface of Earth is constantly changing; sometimes those changes take a long time to occur and sometimes they happen rapidly ● Catastrophic events have the potential to change Earth's surface quickly. ● Scientists and engineers can do things to reduce the impacts of natural Earth processes on	● Observe and compare four different soils ● Speculate on where each of four soils came from: mountain, desert, river delta, or forest. ● Explore how large masses of rock break into smaller pieces. ● Tumble rocks to see how physical weathering can break rocks. ● Freeze water to see how physical weathering can break rocks. ● Plan and conduct an investigation to test rocks for interaction with 'acid rain' ● Collect and observe different soils from different locations in the schoolyard.** ● Analyze soil samples to determine how much humus and rock material are in local soils.** ● Use stream tables to observe that water moves earth materials from one location to another. ● Observe the rate at which different particle sizes of earth material settle out. ● Use stream tables to learn how environmental variables can affect erosion and deposition. ● Investigate the variables of slope and water volume (flood). ● Plan and conduct their own stream-table investigations. ● Look for evidence of erosion and for locations where deposition is in evidence.** ● Simulate a rainstorm by pouring water on various outdoor surfaces.** ● Watch a video, make models, and read an article to learn about how sedimentation processes can result in fossils. ● Build a model mountain by stacking and orienting six foam layers ● Trace outlines of foam layers to create a topographic map of the mountain. ● Use topographic maps to produce cross-sections of foam mountains. ● Gather information about volcanoes from a video. ● Compare two topographic maps. ● Have a short debate about whether two topographic maps show the same mountain. ● Watch a USGS video that explains how scientists were involved in predicting the eruption. ● Think about processes that cause rapid changes to Earth's surface: landslides, earthquakes,

humans. ● Natural resources are natural materials taken from the environment and used by humans. ● Some Natural resources are renewable (sunlight, air, and wind, water, soil, plants, and animals) and some are nonrenewable (minerals and fossil fuels). ● Geoscientists study earth materials in part to help humans use those resources wisely. ● Alternative sources of energy include solar, wind, and geothermal energy. ● Concrete is an important building material made from earth materials (limestone to make cement, sand, and gravel for aggregates, and water for mixing). ● Rocks and minerals are important for shelter and transportation. ● Earth materials are resources for artists. ● Scientists and engineers work together to improve how people use natural resources. ● Climate change describes a change in the average conditions — such as temperature and rainfall — in a region over a long period of time. People around the world work together to respond to challenges caused by climate change.	floods, and volcanoes. ● Write a story or draw a concept map to bring ideas together about soils, rocks, and landforms. ● Use local natural resources to make one concrete stepping stone. ● Search for various objects and structures and consider what natural resources were used to construct them.

NJ Student Learning Standards - Science

Performance Expectations:
Students who demonstrate understanding can:

- **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. (Investigation 1, 2)
- **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. (Investigation 1, 2)
- **4-ESS2-2** Analyze and interpret data from maps to describe patterns of Earth's features. (Investigation 2, 3)
- **4-ESS3-1** Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.
- **4-ESS3-2:** Generate and compare multiple solutions to reduce the impacts of natural Earth processes *and climate change* have on humans. (Investigation 3, 4)

3-5 Engineering Design PEs:
Students who demonstrate understanding can:

- **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.

Connected components: 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.
    1. Ask questions about what would happen if a variable is changed.
    2. Identify scientific (testable) and non-scientific (non-testable) questions.
    3. Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships.
    4. Use prior knowledge to describe problems that can be solved. •
    5. 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.

Developing and using models

1. Identify limitations of models.
2. Collaboratively develop and/or revise a model based on evidence that shows the relationships among variables for frequent and regular occurring events.
3. Develop a model using an analogy, example, or abstract representation to describe a scientific principle or design solution.
4. Develop or use models to describe and predict phenomena.
5. Develop a diagram or simple physical prototype to convey a proposed object, tool, or process.
6. Use a model to test cause-and-effect relationships or interactions concerning the functioning of a natural system.

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.
    1. Construct an explanation of observed relationships (e.g., the distribution of plants in the backyard).
    2. Use evidence (e.g., measurements, observations, patterns) to construct or support an explanation or design a solution to a problem.
    3. Identify the evidence that supports particular points in an explanation.
    4. Apply scientific ideas to solve design problems.

Engaging in argument from evidence

1. Compare and refine arguments based on an evaluation of the evidence presented.
2. Distinguish among facts, reasoned judgment based on research findings, and speculation in an explanation.

3. Respectfully provide and receive criticism from peers about a proposed procedure, explanation, or model by citing relevant evidence and posing specific questions.
4. Construct an argument with evidence, data, and/or a model.
5. Use data to evaluate claims about cause and effect.
6. Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem.

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.
    1. 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.
    1. Analyze and interpret data to make sense of phenomena using logical reasoning. (4-ESS2-2)

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
    1. Obtain and combine information from books and other reliable media to explain phenomena. (4-ESS3-1)

Disciplinary Core Ideas:

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 large-scale 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.A: Defining and delimiting an engineering problem

- 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

- Testing a solution involves investigating how well it performs under a range of likely conditions. (secondary to 4-ESS3-2)
- 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)

Crosscutting Concepts:

Cause and effect: Mechanism and explanation.

- Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2- 1)
- Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS3- 2)

Patterns

- Patterns can be used as evidence to support an explanation. (4-ESS2- 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)

Scale, Proportion, and Quantity

- In considering phenomena, it is critical to recognize what is relevant at different measures of size, time,

and energy and to recognize how changes in scale, proportion, or quantity affect a system's structure or performance.

Systems and System Models

- A system can be described in terms of its components and their interactions.

Structure and Function

- Different materials have different substructures which can sometimes be observed. • Substructures have shapes and parts that serve functions.

Stability and Change

- For natural and built systems alike, conditions of stability and determinants of rates of change or evolution of a system are critical elements of study.

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
- Engineers improve existing technologies or develop new ones to increase their benefits, to decrease known risks, and to meet societal demands. (4-ESS3-2)

Career Education (Career Readiness, Life Literacies, and Key Skills Practices and 9.2 Standards)

9.2.5.CAP.8: Identify risks that individuals and households face.
9.2.5.CAP.1: Evaluate personal likes and dislikes and identify careers that might be suited to personal likes.

CLKS Practices:

1. Consider the environmental, social, and economic impacts of decisions
2. Demonstrate creativity and innovation

Connected Careers:
Earth Scientist

Explanation of how 9.2 standards connect to the unit:
This can be connected to the unit through the discussion of how scientists and engineers can do things to reduce the impacts of natural Earth processes on humans.Through this, it can be discussed the risks households face due to the impacts of natural Earth. It also can be discussed that students may choose to pursue a career in Earth Science or engineering. Different types of jobs can require passion, aptitude, different knowledge and skills. 9.2.5.CAP.1 will address this.

Explanation of how CLKSs connect to the unit:

1. *Consider the environmental, social, and economic impacts of decisions.*
   When choosing energy resources, students will reflect on the environmental, social, and economic impact of their decisions.

2. *Demonstrate creativity and innovation.*
   Students may choose to pursue a career in engineering to design structures and develop ideas to

mitigate the effects of natural and environmental phenomena.

Explanation of how Connected Careers connect to the unit:
This career connects to this unit because students learn about different aspects of the earth. They learn the skills necessary to be an earth scientist, someone who studies the earth.

Interdisciplinary Standards

- **4.M.A.1** - Know relative sizes of measurement units within one system of units including km, m, cm. mm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table.
- **4.M.A.2** - Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.
- **SL.PI.4.4.** Report on a topic or text, tell a story, or recount an experience in an organized manner, using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.

Explanation of how interdisciplinary standards connect to the unit:

Students use a measurement scale to calculate how far rock material travels before being deposited.Students will use the four operations to solve problems presented to them.

Furthermore, students will practice listening and build on each other's contributions. It will help them articulate their understanding of a science topic, such as weathering, for example.

Technology Integration (9.4 Standards):

- **9.4.5.CI.2:** Investigate a persistent local or global issue, *such as climate change*, and collaborate with individuals with diverse perspectives to improve upon current actions designed to address the issue (e.g., 6.3.5.CivicsPD.3, W.5.7).
- **9.4.5.IML.1:** Evaluate digital sources for accuracy, perspective, credibility and relevance.
- **9.4.5.TL.5:** Collaborate digitally to produce an artifact.

Explanation of how 9.4 standards connect to the unit:
Students will analyze multiple versions of printed and digital information.Students work in teams to compile and represent digitally their observations. Students will investigate an issue and collaborate to address the issue.

Stage 2- Assessment Evidence:	
Assessment:	
Formative	**Lab experiments:** Use science journals to check student understanding of entries. **Focus Questions:** Students summarize their learning at the end of each lab experiment. **Science Journal Check:** Students record data in their science journals that describes the results during each lab. Journals are collected and assessed. **Science Notes:** Throughout the unit, students fill in content provided in the notes to act as the student textbook. Students may use prepared *notebook sheets* or may generate *free-form notebook entries* that could both be collected and assessed for student progress.
Summative	**I-Check Performance Assessments:** These are teacher-prepared formal assessments that are appropriate for the students. They are up to one period in length and are taken individually. They are given at the end of the Investigation. This is a performance-based assessment. **Survey/Posttest:** A full-period assessment that consists of content questions, multiple choice, fill-in-the-blank, and open-response questions.
Alternative	**Response Sheet:** Students provide content to answer a provided question. Evidence for an answer is required.
Benchmark	After the last unit, students will take a PostTest to gauge their understanding of the content presented during the year. The assessment will consist of a full-period assessment which consists of content questions, multiple choice, fill-in-the-blank, and open-response questions. Students will recall their knowledge of ● Soils, rocks, and landforms ● Energy ● Environments
Other	*Projects, etc.*

Stage 3 - Learning Plan	
Learning Activities: **Learning Activities:** ● Investigation 1: Soils and Weathering ● Investigation 2: Landforms ● Investigation 3: Mapping Earth's Surface ● Investigation 4: Natural Resources **Related Application/Connection/Extension:**	**Differentiation:** **ELL:** Making vocabulary more explicit through new concrete experiences or reading passages

Investigation 1: Soils and Weathering

- Part 1: Soil Composition
- Part 2: Physical Weathering
- Part 3: Chemical Weathering
- Part 4: Schoolyard Soils***

Investigation 2: Landforms

- Part 1: Erosion and Deposition
- Part 2: Stream-Table Investigations
- Part 3: Schoolyard Erosion and Deposition***
- Part 4: Fossil Evidence

Investigation 3: Mapping Earth's Surface

- Part 1: Making a Topographic Map
- Part 2: Drawing a Profile
- Part 3: Mount St. Helens Case Study
- Part 4: Rapid Changes

Investigation 4: Natural Resources

- Part 1: Introduction to Natural Resources
- Part 2: Making Concrete
- Part 3: Earth Materials in Use

G&T:

Designing individual projects or small-group investigations

Special Ed:

Modifying assessments/providing class notes

504:

Repeating, rewording and clarifying directions

Students at Risk:

More experience building explanations of the science concepts orally or in writing or drawing

Link to Science Differentiation Chart and

2021 Accommodations Chart

Core and Supplementary Instructional Materials

Teacher Pedagogical Resources:

- FOSS Kit: Soils, Rocks, and Landforms
- Soils, Rocks, and Landforms Teacher's Guide
- FOSS Science Resource books
- Nsta.org
- Fossweb.com
- Bedwell Garden

Student Materials:

- FOSS Kit: Soils, Rocks, and Landforms
- FOSS Science Resource books - *Lexile Level unavailable*

- Science Notebooks
- Nsta.org
- Fossweb.com
- Bedwell Garden
- *https://climatekids.nasa.gov/*

Notes:

Inclusion of Climate Change Opportunities 

During this unit, the inclusion of climate change can be discussed in ways that climate change is now affecting the Earth through weathering. Additionally it can be discussed through the learning outcome of alternative sources of energy including solar, wind, and geothermal energy.

Course: Science

Unit # 2: Energy

Grade Level(s): 4	**Length of Unit:** 10-11 weeks

Unit Rationale:

In the **Energy Module**, students will have first-hand experiences in physical science dealing with energy and change. Students investigate electricity and magnetism as related effects and engage in engineering design while learning useful applications of electromagnetism in everyday life. They explore energy transfer through waves, repeating patterns of motion, that result in sound and motion. Content focuses on the concept that energy is present whenever there is motion, electric current, sound, light, or heat, and that energy can transfer from one place to another. Students conduct controlled experiments by incrementally changing variables to determine how to make an electromagnet stronger and how the amount of energy transfer changes when balls of different masses hit a stationary object. Students interpret data from graphs to build explanations from evidence and make predictions of future events. They develop models to represent how energy moves from place to place in electric circuits and in waves. Students gain experiences that will contribute to the understanding of crosscutting concepts of patterns; cause and effect; system and system models; and energy and matter.

Stage 1 - Desired Results

Enduring Understandings:	**Essential Questions:**
Students will understand that… ● Electricity flows through electric current and circuits. ● Different materials can be conductors and insulators. ● Components of series and parallel circuits each have different functions. ● Electricity transfers energy to produce light and motion. ● Different objects in our environment are attracted to magnets. ● Magnetic effects can be detected with a simple compass. ● Magnetism can be induced in a piece of iron. ● The strength of the force of attraction between two magnets can be found in patterns of interaction. ● Electricity is used to make an electromagnet. ● Variables influence the strength of the magnetism produced by electromagnets.	● What is needed to make a complete pathway for current to flow in a circuit? ● What happens when two or more magnets interact? ● How does the number of winds of wire around a core affect the strength of the magnetism? ● What happens when objects collide? ● How are waves involved in energy transfer?

● Energy transfer occurs in heat, light, sound, and motion. ● Variable starting positions on ramps affect the speed of a rolling ball. ● A number of variables, such as mass and release position, affect energy transfer. ●	
Content: *Students will know…* ● An electric circuit is a system that includes a complete pathway through which electric current flows from an energy source to its components. ● Electricity transfers energy that can produce heat, light, sound, and motion. Electricity can be produced from a variety of sources. ● Conductors are materials through which electric current can flow; all metals are conductors. ● In a series circuit, there is a single pathway from the energy source to the components. ● In a parallel circuit, each component has its own direct pathway to the energy source. ● Two bulbs can be lit brightly using parallel circuitry, one in which each blue has direct access to the energy source. ● In a series circuit, all lights share a single pathway; if one light burns out, the current stops flowing, causing all the bulbs to go out. ● In a parallel circuit, each light has its own pathway to the source; if one light burns out, the current continues flowing, and the remaining bulbs continue to shine. ● Magnets interact with each other and with some materials. ● Magnets stick (attract) objects that contain iron. Iron is the only common metal that sticks to magnets. (Steel is a material mostly made of iron.) ● Magnets are surrounded by an invisible magnetic field, which acts through space and through most materials. ● When an object enters a magnetic field, the field induces magnetism in the iron object, and the object becomes a temporary magnet. ● All magnets have two poles, a north pole at one end (side) and a south pole at the other end (side). Like poles of magnets repel each other,	**Skills:** *Students will be able to…* ● Discover how to make a complete circuit using a D-cell, wires, and a light bulb. ● Discuss the electricity's pathway in the circuit and the function of each of the system's components. ● Analyze the anatomy of a lightbulb. ● Make a circuit to turn on and off. ● Use a circuit and collection of objects to determine which materials can complete the pathway (conductors) and which cannot (insulators). ● Consider foils and use evidence to confirm that foils are indeed metal. ● Find ways to operate more than one light bulb in a circuit. ● Devise a series circuit to operate two bulbs within one D-cell. ● Connect two bulbs in a way that allows both light bulbs to shine brightly using two cells or a single D-cell. ● Wire two bulbs in parallel to discover that many bulbs can be made to shine brightly on a single D-cell. ● Investigate which type of circuit would be the best design for a string of lights. ● Analyze designs and make a recommendation based on knowledge of circuitry. ● Discover that iron-containing objects stick to permanent magnets and others do not. ● Generate a rule for magnetic interaction with materials. ● Use magnets as iron detectors outdoors. ● Observe two poles of a magnet. ● Work with magnets and other objects to discover that magnetism acts through air, most metals, and all nonmetals. ● Use a balance to measure the force of attraction between magnets. Increase the distance

and opposites attract. ● The magnetic force acting between magnets declines as the distance between them decreases. ● Earth has a magnetic field. ● A magnetic field surrounds a wire through which electric current is flowing. ● The magnetic field produced by a current-carrying wire can induce magnetism in a piece of iron or steel. ● An electromagnet is made by sending electric current through an insulated wire wrapped around an iron core. ● The number of winds of wire in an electromagnet coil affects the strength of the magnetism induced in the core (more winds = more magnetism). ● The amount of electric current flowing in an electromagnet circuit affects the strength of the magnetism in the core (more current = stronger magnetism). ● A telegraph system is an electromagnet-based technology used for long-distance communication.** ● Energy is evidence whenever there is motion, electric current, sound, light, or heat. Energy can be transferred from place to place. ● Energy can be transferred by using fossil fuels or renewable sources. As the need for energy increases, the use of renewable sources will help meet energy needs. ● Kinetic energy is energy of motion; potential energy is energy of position or condition. ● The faster an object is moving, the more kinetic energy it has. ● Objects at higher positions have more potential energy. ● When objects collide, energy can transfer from between objects, thereby changing their motion. ● The faster an object is moving the more kinetic energy it has. ● When two objects interact, each one exerts a force on the other, and these forces can transfer energy. ● Objects at higher heights have more potential energy. ● Waves are a repeating pattern of motion that transfers energy from place to place.	between magnets and remeasure the force. ● Discover that a steel core becomes a magnet when current flows through an insulated wire wound around the steel core. ● Find out where to wind wire on the core to produce the strongest magnet. ● Find out how the number of winds of wire affects the strength of magnetism. ● Collect data for various numbers of wind electromagnets; graph the results. ● Predict the strength of magnetism based on a graph for the number of winds. ● Apply knowledge of circuitry and electromagnetism to build a telegraph. **** ● Explore evidence of energy when sound, heat, and light are produced, and when objects are in motion. ● Conduct structured investigations to discover how the variables of starting position on the ramp and ball size (mass) affect the speed of a rolling ball. ● Investigate the variables that determine how far a cork will move along the runway. ● Test the variables of mass and starting position to find out how these variables affect energy transfer. ● Experience waves through experiences with ropes, waves in water, spring toys, and a sound generator. ● Use videos, animations, and readings to gather information. ● Analyze compression waves to learn the general properties of waves - amplitude, wavelength, and frequency. ● Use mirrors to experience reflecting light. ● Use flashlights, mirrors, and water to observe light in numerous ways, reinforcing the idea that light can reflect and refract. ● Build a conceptual model about how light travels. ● Design series and parallel solar cell circuits and observe the effect on the speed of a motor. ● Read about alternative energy sources.

● There are sound waves, light waves, radio waves, microwaves, and ocean waves. ● Waves have properties - amplitude, wavelength, and frequency. ● Some electromagnetic waves can be detected by humans (light); others can be detected by designed technologies (radio waves). ● Light travels in a straight line and can reflect off surfaces. ● An object is seen only when light from that object enters and is detected by an eye. ● Light can refract when it passes from one transparent material into another. ● The energy of two energy sources (D-cells or solar cells) adds when they are wired in series, delivering more power than a single source. ● Two cells in parallel have the same power as a single cell.	

NJ Student Learning Standards - Science

Performance Expectations:

- **3-PS2-3:** Ask questions to determine cause-and-effect relationships of electric or magnetic interactions between two objects not in contact with each other. *(Investigation 2, 3)*
- **3-PS2-4:** Define a simple design problem that can be solved by applying scientific ideas about magnets. *(Investigation 3)*
- **4-PS3-1:** Use evidence to construct an explanation relating the speed of an object to the energy of that object. *(Investigation 4)*
- **4-PS3-2:** Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents. *(Investigation 1, 3, 4, 4)*
- **4-PS3-3:** Ask questions and predict outcomes about the changes in energy that occur when objects collide. *(Investigation 4)*
- **4-PS3-4:** Apply scientific ideas to design, test, and refine a device that converts energy from one form to another. *(Investigation 1, 2, 3, 5)*
- **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. *(Investigation 5)*
- **4-PS4-2:** Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen. *(Investigation 5)*
- **4-PS4-3:** Generate and compare multiple solutions that use patterns to transfer information *(Invest. 3)*

3-5-ETS1: Engineering Design

Students who demonstrate understanding can:

- **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. (*Investigation 1, 3, 5)*
- **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. (*Investigation 1, 3, 5)*

- **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. (*Investigation 1, 3, 5)*

Connected components:

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.
    1. 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.
    1. 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.
    1. Use evidence (e.g., measurements, observations, patterns) to construct an explanation. (4-PS3-1)
    2. Apply scientific ideas to solve design problems. (4-PS3-4)

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.
    1. Develop a model using an analogy, example, or abstract representation to describe a scientific principle. (4-PS4-1)
    2. 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.
    1. 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)

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)

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:
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)

Patterns
- Energy can be transferred in various ways and between objects through patterns. (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)

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 I
Interdependence of Science, Engineering, and Technology
- Knowledge of relevant scientific concepts and research findings is important in engineering. (4-PS4- 3)

Career Education (Career Readiness, Life Literacies, and Key Skills Practices and 9.2 Standards)

9.2.5.CAP.4: Explain the reasons why some jobs and careers require specific training, skills, and certification (e.g., life guards, child care, medicine, education) and examples of these requirements.

CLKS Practices:
1. Demonstrate creativity and innovation
2. Utilize critical thinking to make sense of problems and persevere in solving them

Connected Careers:
Electrician

Explanation of how 9.2 standards connect to the unit:
This standard is connected to the unit because through the discussion of ways of setting up circuits, the teacher can connect it to the reasons why training and skills are needed for certain jobs. For example, the teacher can explain why an electrician needs training, or else they would not connect circuits correctly

resulting in no electricity being distributed..

Explanation of how CLKSs connect to the unit:

1. *Demonstrate creativity and innovation*
   Students rely on all they know and work collaboratively to develop solutions to a number of challenges, such as solving the string of lights problem.

2. *Utilize critical thinking to make sense of problems and persevere in solving them*
   Students recall their understanding of content when attempting to overcome challenges that arise during their investigations. When one attempt fails, they try another and keep trying ideas until they meet with success.

Explanation of how Connected Careers connect to the unit:
This career is connected to this unit because students will be learning about the different ways energy is transferred and different circuits. These are some of the skills an electrician needs in order to set up electricity correctly.

Interdisciplinary Standards

Literacy / ELA Connections:

- RI.CI.4.1. Refer to details and examples as textual evidence when explaining what an informational text says explicitly and make relevant connections when drawing inferences from the text.(4-PS3-1)
- RI.IT.4.3. Describe the impact of individuals and events throughout the course of a text, explaining events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on evidence in the text. (4- PS3-1)
- W. IW.4.2. Write informative/explanatory texts to examine a topic and convey ideas and information clearly. (4-PS3-1)
- W.WR.4.5. Conduct short research projects that use multiple reference sources (print and non-print) and build knowledge through investigation of different aspects of a topic. (4-PS3-2),(4-PS3-3),(4-PS3-4)
- SL.UM.4.5. Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes.(4-PS4-1), (4-PS4-2)

Math Connections:

- **4.OA.C.5.** Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself.
- **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.

Explanation of how interdisciplinary standards connect to the unit:
Students explain events, procedures, ideas, or concepts in a scientific text, including what happened and why, based on specific information in the text. Students use sentence frames to state and discuss their observations, explain their thinking, and agree or disagree with their classmates. Students 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.

Students analyze data recorded on graphs to reveal patterns. Students solve multistep word problems and use appropriate tools strategically. Students reason abstractly and quantitatively.

Technology Integration (9.4 Standards):
Creativity and Innovation

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

Technology Literacy

- **9.4.5.TL.5:** Collaborate digitally to produce an artifact (e.g., 1.2.5CR1d)

Explanation of how 9.4 standards connect to the unit:
Students apply critical thinking and problem-solving strategies to different types of problems. Students rely on all they know and work collaboratively to develop solutions to a number of challenges, such as solving the string of lights problem.

Collaborating digitally as a team can often develop a better artifact than an individual working alone. Students work collaboratively to recall their understanding of content when attempting to overcome challenges that arise during their investigations. When one attempt fails, they try another and keep trying ideas until they meet with success. At times, ideas are combined and new and improved solutions are developed.

Stage 2- Assessment Evidence:	
Assessment:	
Formative	**Lab experiments:** Use science journals to check student understanding of entries. **Focus Questions:** Students summarize their learning at the end of each lab experiment. **Response Sheet:** Students provide content to answer a provided question. Evidence for an answer is required. **Science Journal Check:** Students record data in their science journals that describe the

	results during each lab. Journals are collected and assessed. **Science Notes:** Throughout the unit, students fill in content provided in the notes to act as the student textbook. Students may use prepared *notebook sheets* or may generate *free-form notebook entries* that could both be collected and assessed for student progress
Summative	**I-Check Performance Assessments:** These are teacher-prepared formal assessments that are appropriate for the students. They are up to one period in length and are taken individually. They are given at the end of the Investigation. This is a performance-based assessment. **Survey/Posttest:** A full-period assessment that consists of content questions, multiple choice, fill-in-the-blank, and open-response questions.
Alternative	**Response Sheet:** Students provide content to answer a provided question. Evidence for answer is required **Tutorials/Virtual Investigations:** Virtual simulations are provided for each investigation to enrich lab experiences.
Benchmark	After the last unit, students will take a PostTest to gauge their understanding of the content presented during the year. The full-period assessment consists of content questions, multiple choice, fill-in-the-blank, and open-response questions. Students will recall their knowledge of… ● Soils, rocks, and landforms ● Energy ● Environments
Other	*Projects, etc.*

Stage 3 - Learning Plan	
Learning Activities: ● Investigation 1: Energy and Circuits ● Investigation 2: The Force of Magnetism ● Investigation 3: Electromagnets ● Investigation 4: Energy Transfer ● Investigation 5: Waves **Related Application/Connection/Extension:** **Investigation 1: Energy and Circuits** ● Part 1: Lighting a Bulb ● Part 2: Conductors and Circuits ● Part 3: Series and Parallel Circuits ● Part 4: Solving the String-of-Lights Problem **Investigation 2: The Force of Magnetism**	**Differentiation:** *Active science itself provides many opportunities for differentiated instruction and is designed to maximize the science-learning opportunities. Students are allowed to express their understanding through a variety of modalities and will have multiple opportunities to demonstrate their strengths and needs and then participate in the appropriate follow-up experiences* **ELL:** Making vocabulary more explicit through new concrete experiences or reading passages

- Part 1: Magnets and Materials
- Part 2: Magnetic Fields
- Part 3: Magnetic Force

Investigation 3: Electromagnets

- Part 1: Building an Electromagnet
- Part 2: Changing the Strength
- Part 3: Reinventing the Telegraph***

Investigation 4: Energy Transfer

- Part 1: Presence of Energy
- Part 2: Rolling Balls Down Slopes
- Part 3: Collisions

Investigation 5: Waves

- Part 1: Forms of Waves
- Part 2: Light Travels
- Part 3: Engineering with Solar Cells

G&T:

Designing individual projects or small-group investigations

Special Ed:

Modifying assessments/providing class notes

504:

Repeating, rewording and clarifying directions

Students at Risk:

More experience building explanations of the science concepts orally or in writing or drawing

Link to Science Differentiation Chart and

2021 Accommodations Chart

Core and Supplementary Instructional Materials

Teacher Pedagogical Resources:

- FOSS Kit: Energy
- Energy Teacher's Guide
- FOSS Science Resource books
- Nsta.org
- Fossweb.com

Student Materials:

- FOSS Kit: Energy

- FOSS Science Resource books - *Lexile Level unavailable*
- Science Notebooks
- Nsta.org
- Fossweb.com

***All materials must list a Lexile Level (https://hub.lexile.com/find-a-book/search)*

Notes:

Inclusion of Climate Change Opportunities

The inclusion of climate change opportunities can be discussed through the lens of alternative types of lightbulbs that use less energy than older light bulbs. Additionally it can be addressed through the discussion that energy can be transferred by using fossil fuels or renewable sources. As the need for energy increases, the use of renewable sources will help meet energy needs.

Course: Science

Unit # 3 : Unit 3 - Environments

Grade Level(s): 4	**Length of Unit:** 8-9 weeks

Unit Rationale:
In the **Environments Module**, students will focus on the concepts that organisms have structures and behaviors, including sensory receptors, that serve functions in growth, survival, and reproduction, and living organisms depend on one another and on their environment for their survival and the survival of populations. Students design investigations to study preferred environments, range of tolerance, and optimum conditions for the growth and survival of specific organisms. They conduct controlled experiments by incrementally changing specific environmental conditions to determine the range of tolerance for the early growth of seeds and hatching of brine shrimp, and use these data to develop and use models to understand the impact of changes on the environment. They graph and interpret data from multiple trials of experiments and build explanations from evidence. Students gain experiences that will contribute to the understanding of crosscutting concepts of patterns; cause and effect; scale, proportion, and quantity; systems and system models; energy and matter; structure and function; and stability and change

Stage 1 - Desired Results

Enduring Understandings:	**Essential Questions:**
Students will understand that… ● Terrestrial environments have living and nonliving components (biotic and abiotic factors). ● Isopods respond to environmental factors such as water and light. ● Animals that live in leaf litter have various structures that help them survive. ● Populations have various feeding interactions in different environments. ● Terrestrial and aquatic systems (including a marine ecosystem) have producers, consumers, and decomposers within their food chains and food webs. ● Food affects a population's home range. ● Animals receive information from their environment through their sensory system and use the information to guide their actions. ● There are optimum conditions for brine shrimp hatching. ● Variation among individuals contributes to the	● How do structures and behaviors help organisms grow and survive? ● What are the roles of organisms in a food chain? ● What are some benefits of having variation within a population? ● What are some examples of plant adaptations? ● What can plants and animals tell us about climate change?

survival of a population. ● There is a range of tolerance of water for germination of seeds. ● Old trees can offer clues about what the climate in an area was like long before measurements were recorded.	
Content: *Students will know…* ● An environment is everything and nonliving that surrounds and influences an organism. ● A relationship exists between environmental factors and how well organisms grow. ● Animals have structures and behaviors that function to support survival, growth, and reproduction. These include sensory system structures. ● Designing an investigation involves controlling the factors so that the effect of one factor can be observed. ● Every organism has a set of preferred environmental conditions. ● Isopods prefer moist environments; isopods prefer dark environments. ● A relationship exists between environmental factors and how well organisms grow. ● Aquatic environments include living and nonliving factors (water and temperature). ● An aquatic environment can contain many different kinds of organisms that interact. ● The interaction of organisms with one another and with the nonliving environment is an ecosystem. ● Organisms interact in feeding relationships in ecosystems. ● Producers (plants, algae, phytoplankton) make their own food, which is also used by animals (consumers). ● Organisms may compete for resources in an ecosystem. ● Decomposers eat dead plant and animal materials and recycle the nutrients in the system. ● When the environment changes, some plants and animals survive and reproduce; others move to new locations, and some die. ● Animals communicate to warn others of danger, scare predators away, or locate others of their	**Skills:** *Students will be able to…* ● Observe mealworms and describe their structures and behaviors. ● Ask questions to determine what to do to provide a proper environment for the mealworms to thrive. ● Set up a mealworm environment: at room temperature, at a colder temperature. ● Conduct investigations to find how isopods respond to environmental factors of water and light. ● Design an isopod environment in a terrarium. ● Collect, observe, and sort small animals living in natural ground litter. ● Become familiar with the anatomical parts of animals they find in the leaf litter. ● Consider adding found organisms to existing isopod environments. ● Compare environmental factors in a terrestrial environment to environmental factors in aquatic environments. ● Monitor living and nonliving factors in guppies and goldfish aquariums. ● Create two class aquariums for guppies and goldfish. ● Work with organism cards to create food chains and food webs in a woodland ecosystem that includes terrestrial and aquatic environments. ● Simulate being animals that have poor vision or animals that are active at night. ● Investigate the environmental factor of salinity in hatching brine shrimp eggs. ● Conduct a controlled experiment to determine which one of four salt concentrations allows brine shrimp eggs to hatch. ● Monitor saltwater environments; determine which environments are conducive to hatching brine shrimp eggs. ● Analyze the results of a multiple-trial

kind, including family members. ● Organisms have sensory systems to gather information about their environment and act on it. ● Brine shrimp are crustaceans that live in marine or salt-pond environments. ● An environmental factor is one part of an environment. It can be living or nonliving. ● Organisms have a range of tolerance for environmental factors. ● Within a range of tolerance, there are optimum conditions that produce maximum reproduction and growth. ● Brine shrimp eggs can hatch in a range of sale concentrations, but more hatch in environments with optimum salt concentration. ● When environments change, some plants and animals survive and reproduce; others move to new locations, and some die. ● Individuals of the same kind differ in their characteristics, and sometimes the differences give individuals an advantage in surviving and reproducing. ● Every organism has a range of tolerance for each factor in its environment. ● Organisms have specific requirements for successful growth, development, and reproduction. ● A relationship exists between environmental factors and how well organisms grow. ● Optimum conditions are those most favorable to an organism. ● Fossils are important evidence about extinct organisms and past environments. ● Adaptations are structures and behaviors of an organism that help it survive and reproduce.	experiment; draw conclusions. ● Read about the Mono Lake ecosystem and create food webs using organism cards and information from the article. ● Manipulate brine shrimp egg environment to try to get dormant eggs to hatch and grow. ● Formulate and justify predictions; design an investigation to test their predictions. ● Complete a predator-prey simulation; find out how variations in color and size within a population affect the survival of the population. ● Set up an experiment to determine the range of water tolerance for the early growth of four different plants (barley, corn, pea, and radish). ● Make observations of plant growth (days 5, 8, 13). ● Compare the growth of plants in different environments. ● Set up a controlled experiment to test the effect of salinity on plants (barley, corn, pea, radish). ● Observe and map plant-distribution patterns in the schoolyard. ● Discuss the environmental factors that might be responsible for patterns of plant distribution in the schoolyard. ● Review environmental factors that influence plant growth (water, light, nutrients). ● Understand different adaptations of plants that allow some to thrive in dry environments and others to thrive in wet environments. ● There are ecosystems even in big cities.

NJ Student Learning Standards - Science
Performance Expectations:

- **4-LS1-1:** Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. (Investigation 1, 2, 3, 4)
- **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. (Investigation 1, 2)
- **4-ESS3-1:** Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment. (Investigation 3)

Connected components:

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.
    1. 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).
    1. Construct an argument with evidence, data, and/or a model. (4- LS1-1)

Disciplinary Core Ideas:

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.
Stability and Change

Career Education (Career Readiness, Life Literacies, and Key Skills Practices and 9.2 Standards)

Not applicable.

CLKS Practices:

1. Consider the environmental, social and economic impacts of decisions
2. Demonstrate creativity and innovation

Connected Careers:
Marine biologist

Explanation of how 9.2 standards connect to the unit:
Not applicable

Explanation of how CLKSs connect to the unit:

1. *Consider the environmental, social, and economic impacts of decisions.*
   Throughout the unit, students examine various environmental factors and their impact on living organisms.

2. *Demonstrate creativity and innovation*
   Students apply their understanding of the relationship between living organisms and their environments to design ideal living conditions for organisms. Collaboration with individuals with diverse perspectives can result in new ways of thinking and/or innovative solutions.

Explanation of how Connected Careers connect to the unit:
The career of marine biologist is connected to this unit because students will learn about the different living organisms and their environments. These are the beginning core understandings that a marine biologist needs.

Interdisciplinary Standards
Math Connections:

- **4.G.A.3** - Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.

Literacy / ELA Connections:

- W.AW.4.1. Write opinion pieces on topics or texts, supporting a point of view with reasons and information.
- W.WR.4.5. Conduct short research projects that use multiple reference sources (print and non-print) and build knowledge through investigation of different aspects of a topic. (4-ESS1-1)
- W.SE.4.6. Gather relevant information from multiple print and digital sources; take notes, prioritize and categorize information; provide a list of sources. (4-ESS1-1)

Explanation of how interdisciplinary standards connect to the unit:
Throughout the unit, students make observations and record their findings/data using different formats. Students are encouraged to show their findings using graphs, charts, and diagrams. After their results are

recorded, they study their information, looking for patterns and trends. Students will gather relevant information from multiple print and digital sources; take notes, prioritize and categorize information.

Technology Integration (9.4 Standards):
9.4.5.CI.2: Investigate a persistent local or global issue, such as climate change, and collaborate with individuals with diverse perspectives to improve upon current actions designed to address the issue (e.g., 6.3.5.CivicsPD.3, W.5.7)
9.4.5.IML.2: Create a visual representation to organize information about a problem or issue (e.g., 4.MD.B.4, 8.1.5.DA.3).
9.4.5.IML.3: Represent the same data in multiple visual formats in order to tell a story about the data.

9.4.5.CT.3: Describe how digital tools and technology may be used to solve problems.

Explanation of how 9.4 standards connect to the unit:

9.4.5.CI.2:
In this unit, students identify issues adversely impacting living organisms. They brainstorm and work collaboratively to create optimal living conditions for

9.4.5.IML.2-3:
Students record and present their findings to their peers in a multitude of ways, including charts, graphs, spreadsheets, and Google Docs. Digital tools can be used to modify and display data in various ways that can be organized to communicate ideas.

9.4.5.CT.3: *Students will begin with gathering data, seeking resources, and applying critical thinking skills.*

Stage 2- Assessment Evidence:	
Assessment:	
Formative	**Lab experiments:** Use science journals to check student understanding of entries. **Focus Questions:** Students summarize their learning at the end of each lab experiment. **Response Sheet:** Students provide content to answer a provided question. Evidence for an answer is required. **Science Journal Check:** Students record data in their science journals that describes the results during each lab. Journals are collected and assessed. **Science Notes:** Throughout the unit, students fill in content provided in the notes to act as the student textbook. Students may use prepared *notebook sheets* or may generate *free-form notebook entries* that could both be collected and assessed for student progress.

Summative	**I-Check Performance Assessments:** These are teacher-prepared formal assessments that are appropriate for the students. They are up to one period in length and are taken individually. They are given at the end of the Investigation. This is a performance-based assessment. **Survey/Posttest:** A full-period assessment that consists of content questions, multiple choice, fill-in-the-blank, and open-response questions.
Alternative	**Response Sheet:** Students provide content to answer a provided question. Evidence for an answer is required. **Tutorials/Virtual Investigations:** Virtual simulations are provided for each investigation to enrich lab experiences.
Benchmark	At the end of the unit, students will take a PostTest to gauge their understanding of the content presented during the year. The full-period assessment consists of content questions, multiple choice, fill-in-the-blank, and open-response questions. Students will recall their knowledge of… ● Soils, rocks, and landforms ● Energy ● Environments
Other	*Projects, etc.*

Stage 3 - Learning Plan

Learning Activities:

- Investigation 1: Environmental Factors
- Investigation 2: Ecosystems
- Investigation 3: Brine Shrimp Hatching
- Investigation 4: Range of Tolerance

Related Application/Connection/Extension:

Investigation 1: Environmental Factors

- Part 1: Observing Mealworms
- Part 2: Designing an Isopod Environment
- Part 3: Leaf-Litter Critters

Investigation 2: Ecosystems

- Part 1: Designing an Aquarium
- Part 2: Food Chains and Food Webs
- Part 3: Population Simulation***
- Part 4: Sound Off

Investigation 3: Brine Shrimp Hatching

- Part 1: Setting Up the Experiment

Differentiation:

ELL:

Making vocabulary more explicit through new concrete experiences or reading passages

G&T:

Designing individual projects or small-group investigations

Special Ed:

Modifying assessments/providing class notes

504:

- Part 2: Determining Range of Tolerance
- Part 3: Determining Viability
- Part 4: Variation in a Population

Investigation 4: Range of Tolerance

- Part 1: Water or Salt Tolerance and Plants
- Part 2: Plant Patterns
- Part 3: Plant Adaptations

Repeating, rewording and clarifying directions

Students at Risk:

More experience building explanations of the science concepts orally or in writing or drawing

Link to Science Differentiation Chart and

2021 Accommodations Chart

Core and Supplementary Instructional Materials

Teacher Pedagogical Resources:

- FOSS Kit: Environments
- Environments Teacher's Guide
- FOSS Science Resource books
- Nsta.org
- Fossweb.com
- NASA Climate Kids: *https://climatekids.nasa.gov/*

Student Materials:

- FOSS Kit: Environments
- FOSS Science Resource books - *Lexile Level unavailable*
- Science Notebooks
- Nsta.org
- Fossweb.com

Notes:

Inclusion of Climate Change Opportunities

The inclusion of climate change can come through the discussion of Organisms and their ecosystem. A discussion can be had of how climate change is starting affect their ecosystems.