Allamuchy Township School District
Allamuchy, NJ

Science
Grade 5

CURRICULUM GUIDE
FINAL DRAFT

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This curriculum may be modified through varying techniques, strategies and materials, as per an individual student's Individualized Education Plan (IEP).

Approved by the Allamuchy Board of Education
At the regular meeting held on October 28, 2019
And
Aligned with the New Jersey Core Curriculum Content Standards
And Common Core Content Standards

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Philosophy and Rationale

The purpose of the scientific study is to understand the world in which we live. Students are encouraged to be curious and inquisitive in a multi-sensory, material-rich environment. Students learn science by exploring and discovering; using tools, technology, and media; asking questions/making connections; communicating what they know; taking risks and being creative; networking with the community; and utilizing community resources.

Mission Statement

Building on tradition and success, the mission of the Allamuchy Township School District is to foster a caring and creative environment where students grow as learners and citizens while developing 21st century skills. We provide a culture for social emotional learning that contributes to a positive school climate, increased academic success, and a sense of ownership within the community.

The Allamuchy Learner

The Allamuchy Township School District pursues a holistic approach to encouraging the educational growth of every student. We consider each student as an individual with particular strengths and weaknesses, likes and dislikes and varying motivations. The goal of the Allamuchy educational program is to develop young people who are curious, well rounded, knowledgeable, caring, respectful and responsible so that they can evolve into self-sufficient and confident citizens and members of a diverse society.

Unit 1 - Earth Systems

Scope and Sequence
Time: Approximately 25 day

In this unit of study, students are able to describe ways in which the geosphere, biosphere, hydrosphere, and atmosphere interact.

Corresponds to Unit 6 and 7 in textbook

Stage 1: Desired Results

Content Standards

5-ESS2-1: Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.
5-ESS2-2: Describe and graph the amount and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.
5-ESS2-3: Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

Essential Questions

- How do individual communities use science ideas to protects Earth's resources and environment?

Enduring Understandings

- A system can describe in terms of its components and their interactions.
- Earth's major systems are the geosphere, hydrosphere, atmosphere, and biosphere.
- The Earth's major systems interact in multiple ways to affect Earth's surface materials and processes.
- The ocean supports a variety of ecosystems and organisms, shapes and landforms, and influences climate.
- Winds and clouds in the atmosphere interact with landforms to determine patterns of weather.
- A system can be described in terms of its components and their interactions.
- Science findings are limited to questions that can be answered with empirical evidence.
- Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, oceans, air, and even outer space.
- Individuals and communities are doing things to help protect Earth's resources and environments.

Knowledge and Skills (SWBAT embedded course proficiencies)
Students who understand the concepts are able to:

- Describe a system in terms of its components and interactions.
- Develop a model using an example to describe a scientific principle.
- Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. Examples could include:
    - The influence of oceans on ecosystems, landform shapes, and climate.
    - The influence of the atmosphere on landforms and ecosystems through weather and climate.
    - The influence of mountain ranges on the wind and clouds in the atmosphere.
- Describe a system in terms of its components and interactions.
- Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem.
- Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

Stage 2: Evidence of Understanding, Learning Objectives and Expectations

Benchmarks (embedded student proficiencies)

Assessment Methods (formative, summative, other evidence and/or student self- assessment)

Stage 3: Learning Plan

In this unit of study, students develop models to describe the interactions that occur within and between major Earth systems and conduct research to learn how humans protect the Earth's resources.

Foundational to this unit of study is the understanding of a system, its components, and the interactions that occur within the system. Initially, students may need opportunities to review familiar examples of systems. Review the rock cycle and different types of rocks. Students can then begin to think about the Earth's major systems, identifying the components and describing the interactions that occur within each.

As students become more comfortable with describing each system in terms of its components and interactions, they should begin to think about and discuss the interactions that occur between systems. Students should develop models that describe ways in which any two Earth systems interact and how these interactions affect the living and nonliving components of the Earth. Some examples include:

- The influence of oceans on ecosystems, landform shape, or climate.
- The impact of the atmosphere on landforms or ecosystems through weather and climate.
- The influence of mountain ranges on wind and clouds in the atmosphere.
- The role of living organisms (both plants and animals) in the creation of soils.

As a class, students can brainstorm additional examples. They can use any type of model, such as diagrams or physical replicas, to describe the interactions that occur between any two systems, and they can choose to enhance the model with multimedia components or visual displays.

Once the students have an understanding of the components and interactions that occur within and between Earth's major systems, they should gather information about the ways in which individual communities use science ideas to protect Earth's resources and environment. Students can work individually, in pairs, or in small groups to conduct research using books and other reliable media resources. Students' research should help them determine:

- How human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space.
- What individuals and communities are doing to help protects Earths' resources and the environment.

Students could incorporate engineering design in a number of ways as they explore human impact on the environment.

- Students may design a way to promote local, sustainable agriculture, making healthy food available to more people in their communities while having minimizing the impact on the local environment.
- Students can design ways to capture and use rainwater throughout their community to lessen the impacts of local freshwater reserves.
- Students can design and implement a variety of recycling projects that have a positive impact on the environment by increasing the reuse of materials that normally end up in landfills and decreasing our reliance on earth resources.
- Students can research and design ways to increase the use of environmentally friendly fertilizers and pesticides that do not harm the local environment. Students can create pamphlets, presentations, or even commercials that inform the local community of the impact that chemical fertilizers and pesticides have when used in and around homes and businesses and offer information on safer alternatives that are just as effective.

Students will need time to conduct research, determine criteria for success, consider constraints on available resources, and design solutions based on the information they gather. Student will need access to reliable sources of information that will help them as they work through the design process.

Suggested Activities: Guest speaker - local farmer (Emily Hennelly, Proprietor of AnyThymeFarm) to discuss their methods of farming to introduce students to above research project; create poster (betterlesson.com earth's system). **Project Learning Tree:** Reduce, Reuse, Recycle, activity 37.

Connecting with English Language Arts/Literacy and Mathematics

English Language Arts/Literacy

In this unit students can use information from print and digital sources to build their understanding of Earth's major systems and the interactions that occur within and between them. Students should use the information to make inferences, answer questions, participate in discussions, solve problems, and support their thinking about the interactions that occur among Earth's systems and the impact the humans have on Earth's resources and environments.

Mathematics

Students should reason abstractly and quantitatively when analyzing data used as evidence to explain how Earth's major systems interact and how human activities affect resources. Model with mathematics by using tables, charts, or graphs to organize data and information to support explanation about the interactions that occur within and between Earth's systems.

Modifications:

- Provide students with multiple choices of how they can represent their understandings
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena
- Structure the learning around explaining or solving a social or community-based issue.

Resources

- District approved science textbook
- Websites
- Videos
- Nonfiction/fiction sources

Unit 2- Water on the Earth

Scope and Sequence
Time: Approximately 20 days

In this unit of study, students describe and graph data to provide evidence about the distribution of water on Earth.

Corresponds to Unit 6 and 7 in textbook

Stage 1: Desired Results

Content Standards
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.
5-ESS3-1: Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

Essential Questions
How do individual communities use science ideas to protect Earth's resources and environment?

Enduring Understandings
- Standard units are used to measure and describe physical quantities such as weight and volume.
- Nearly all of Earth's available water is in the ocean.
- Most fresh water is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere.
- A system can be described in terms of its components and their interactions.
- Science findings are limited to questions that can be answered with empirical evidence.
- Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space.
- Individual and communities are doing things to help Earth's resources and environments.

Knowledge and Skills (SWBAT embedded course proficiencies)
Students who understand the concepts are able to:
- Describe physical quantities, such as weight and volume, in standard units.
- Describe and graph quantities such as area and volume to address scientific questions.
- 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 is limited to oceans, lakes, rivers, glaciers. ground water, and polar ice caps, and does not include the atmosphere).
- Describe a system in terms of its components and interactions.
- Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

Stage 2: Evidence of Understanding, Learning Objectives and Expectations

Benchmarks (embedded student proficiencies)
Assessment Methods (formative, summative, other evidence and/or student self- assessment).

Stage 3: Learning Plan

In this unit of study, students need to understand that Earth is a system made up of subsystems, all of which have multiple components that interact. Throughout this unit, students will consider scale and proportion when examining the amount of water on the Earth, and they will consider the impact that humans have on one of Earth's most valuable resources.

To begin the progression of learning in this unit, students conduct research, using informational texts and online resources, to determine the distribution of freshwater and saltwater among Earth's oceans, rivers, lakes, glaciers, groundwater, and polar ice caps. Students organize their data into graphs or charts, showing the allocation of freshwater and saltwater on Earth. After comparing and analyzing data, students should be able to conclude the following:

- Nearly all of Earth's available water is in the ocean.
- Freshwater makes up less than 3% of the total amount of water on the Earth.
- Most freshwater is found in glaciers and underground.
- Only a tiny fraction of the freshwater on Earth is in streams , lakes, wetlands, and the atmosphere.

Next, students conduct research in order to determine ways in which individuals and communities help to protect the Earth's resources and environments. Using books and other reliable media sources, as well as first-hand observations in the local community, students gather information about the ways in which humans affect the environment. They should look for examples of human activities in agriculture, industry, and in their everyday lives, and should describe both orally and in writing, ways in which these activities affect the land, oceans, streams, groundwater, air, and other organisms (plants and animals). Students should conduct research and find ways in which individual communities use science ideas to protect the Earth's resources and environments.

Working in pairs or small groups, students should gather information to prepare presentations that explains one way in which a community is minimizing the effects of human activities on Earth's resources and environment. The presentations should include both writing and speaking components. As a result of conducting research and creating presentations, students should come to understand that the ecosystem is a system that includes both living and nonliving components that interact with one another. These interactions cause changes to the system and its components. Humans are just one of many components in an ecosystem, yet our activities affect all parts of the ecosystem, many times in adverse ways.

Suggested Activity: Trout-in-the-Classroom - discusses cold water conservation, habitats, and ecosystems. Year long projects culminating with the trout release and Pequest trip in May. **Project Wild Aquatic:** "How Wet is Our Planet" pg 121; "Watershed" pg. 132; "Waters Going On?" pg 149. **Project Learning Tree"** "Every Drop Counts" pg. 163 activity 38. Water Cycle, Ocean as Environments/Biome, Ocean and Continents, Anatomy of a whale, Ocean floor features and geography/topography.**Globe Module:** Aerosols: What's Up in the Atmosphere.

Connecting with English Language Arts/Literacy and Mathematics

English Language Arts/Literacy

Students use print and digital sources to gather information and data that describes the amount of fresh water on the Earth and where it is found. As students gather information, they should organize the information into graphs, analyze and interpret the information to answer questions, and summarize the information in order to describe the amounts and percentages of fresh water on the Earth and to provide evidence about the distribution of water in oceans, lakes, streams, and reservoirs. Students also use several print and digital resources to find examples of:

- The effects of human activities in agriculture, industry, and everyday life on Earth's resources and environments.
- Ways in which communities are using science ideas to protect Earth's resources and environments.

Students summarize and paraphrase the information and use it when creating presentations that describe ways in which communities are using science ideas to protect Earth's resources and environments. The presentations should include both oral and written components, and a list of sources should be included with the presentation.

Mathematics

Students model with mathematics by using tables, charts, and/or graphs to organize data and information. This includes the amount of fresh and salt water on Earth, the locations of both, how human activities affect Earth's resources, and ways in which communities protect Earth's resources and environments. Students also reason abstractly and quantitatively when analyzing these data to use as evidence to support their thinking.

Modifications:

- Provide students with multiple choices of how they can represent their understandings
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena
- Structure the learning around explaining or solving a social or community-based issue.

Resources

- District approved science textbook
- Websites
- Videos
- Nonfiction/fiction sources

Unit 3- Properties of Matter

Scope and Sequence

Time: Approximately 22 days

In this unit of study, students describe that matter is made of particles too small to be seen by developing a model.

Corresponds to Unit 2 in textbook

Stage 1: Desired Results

Content Standards
5-PS1-1: Develop a model to describe that matter is made of particles too small to be seen.
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.
5-PS1-3: Make observations and measurements to identify materials based on their properties.

Essential Questions
When matter changes, does its weight change?

Enduring Understandings
- Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume.
- Measurements of a variety of properties can be used to identify materials.
- Natural objects exist from the very small to the immensely large.
- Matter of any type can be subdivided into particles that are too small to be seen, but even then the matter still exists and can be detected by means other than seeing.
- A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon and the effects of air on larger particles or objects.

Knowledge and Skills (SWBAT embedded course proficiencies)
Students who understand the concepts are able to:
- Measure and describe physical quantities such as weight, time, temperature, and volume.
- Make observations and measurements to produce data that can serve as the basis for evidence for an explanation of a phenomenon.
- Make observations and measurement to identify materials based on their properties. Examples of materials to be identified could include:
    - Baking soda
    - Metals
    - Minerals
    - Liquids

- Examples of properties could include:
    - Color
    - Hardness
    - Reflectivity
    - Electrical conductivity
    - Thermal conductivity
    - Response to magnetic forces

    - Solubility
- Develop a model to describe phenomena.
- Develop a model to describe that matter is made of particles too small to be seen. Examples of evidence could include:
    - Adding air to expand a basketball
    - Compressing air in a syringe
    - Dissolving sugar in water
    - Evaporating salt water

Stage 2: Evidence of Understanding, Learning Objectives and Expectations

Benchmarks (embedded student proficiencies)

Assessment Methods (formative, summative, other evidence and/or student self- assessment)

Stage 3: Learning Plan

The concepts and practices in this unit are foundational for understanding the relationship between changes to matter and its weight. During this unit of study, students will observe, measure, and identify materials based on their properties and begin to get a conceptual understanding of the particle nature of matter.

Students will focus on measuring and describing a variety of physical properties, including color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces and solubility. These observations and measurements are used to produce data that serves as the basis for evidence that can be used to identify materials. Students need opportunities to observe, measure, and describe a variety types of matter, such as baking soda, metals, minerals, and liquids. Standard units should be used to measure the properties of weight, time, temperature, and volume.

Next, students make observations, gather evidence, and develop models in order to understand that matter is made up of particles too small to be seen. Matter if any type can be subdivided into small particles. In planning and carrying out simple investigations, students will produce data to be used as evidence to support the idea that even though matter is made of particles too small to be seen, matter still exists and can be detected by means other than seeing. This evidence will be used to support students' thinking as they develop models that depict matter. For example, a model that represents solids at the particle level would show particles tightly packed, while a model that represents gases would show particles moving freely around in space. Observing such phenomena as adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, or evaporating salt water could help students to understand matter at the particle level. Students can design ways/tools to measure a given physical property, such as hardness, reflectivity, electrical or thermal conductivity, or response to magnetic forces.

Suggested Activity:

Ice cube and salty ice-cream demonstrations (sbscience.com)

Connecting with English Language Arts/Literacy and Mathematics

English Language Arts/Literacy

Students can conduct research by using text and media resources to build their knowledge of the physical properties of matter. In researching this topic, students can recall and gather information by summarizing or paraphrasing their research as they take notes in their science journals. Students can also draw evidence from informational texts to support their design choices as they build and share their models of matter at the particle level. Students can create foldables, charts, powerpoint presentations to accompany their models.

Mathematics

Mathematics is integrated into this unit when students use appropriate tools, such as balances, thermometers, and graduated cylinders, to measure properties of matter like mass, temperature, and volume. In additions, students reason quantitatively and abstractly when analyzing and interpreting data collected when measuring physical properties of matter. Students interpret mathematical data in the context of the situation, reflect on how the data helps explain the particle nature of matter, and modify or improve their models if they do not adequately represent the phenomenon they are meant to represent.

Modifications:

- Provide students with multiple choices of how they can represent their understandings
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena
- Structure the learning around explaining or solving a social or community-based issue.

Resources

- District approved science textbook
- Websites
- Videos
- Nonfiction/fiction sources

Unit 4 - Changes to Matter

Scope and Sequence
Time: Approximately 22 days

In this unit of study, students develop and understanding of the idea that regardless of the type of change that matter undergoes, the total weight of matter is conserved.

Corresponds to Unit 2 in textbook

Stage 1: Desired Results

Content Standards
5-PS1-2: Measure and graph quantities to provide evidence that regardless of the type of change occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.
5-PS1-4: Conduct an investigation to determine whether the mixing of two or more substances results in a new substance.

Essential Questions
If I have a frozen water that weighs 500 mg, how much will it weigh if the water melts?

Enduring Understandings
- Cause-and-effect relationships are routinely identified, tested, and used to explain change.
- When two or more different substances are mixed, a new substance with different properties may be formed.
- Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume.
- The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish.
- No matter what reaction or change in properties occurs, the total weight of the substances does not change.
- Science assumes consistent patterns in natural systems.

Knowledge and Skills (SWBAT embedded course proficiencies)
Students who understand the concepts are able to:
- Identify, test, and use cause-and-effect relationships to explain change.
- Conduct an investigation collaboratively to produce data that can serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials is considered.
- Conduct an investigation to determine whether the mixing of two or more substances results in new substances.
- Measure and describe physical quantities such as weight, time, temperature, and volume.
- Measure and graph quantities such as weight to address scientific and engineering questions and problems.
- Measure and graph quantities to provide evidence that regardless of the type of change that occurs when substances are heated, cooled, or mixed, the total weight is conserved. Examples of reactions or changes could include:
    - Phase changes
    - Dissolving
    - Mixing

Stage 2: Evidence of Understanding, Learning Objectives and Expectations

Benchmarks (embedded student proficiencies)

Assessment Methods (formative, summative, other evidence and/or student self- assessment)

Stage 3: Learning Plan

In this unit of study, students will use mathematical and computational thinking to understand the cause and effect relationship between physical changes in matter and conservation of weight. Throughout the unit, students need multiple opportunities to observe and document changes in matter due to physical changes, and to analyze data to explain changes that do or do not occur in the physical properties of matter.

Students begin by planning and conducting investigations to determine whether or not a new substance is made when two or more substances are mixed. As they work with a variety of substances, they should:

- Measure, observe, and document physical properties (e.g. color, mass, volume, size, shape, hardness) of two or three substances.
- Mix the original substances.
- Measure, observe, and document the physical properties of the substance produced when the original substances are mixed.
- Compare data from the original substances to data from the substances produces, and determine what changes, if any, have occurred.
- Use observations and data as evidence to explain whether or not a new substance was produced, and to explain any changes that occurred when the original substances were mixed.

With each set of substances that students investigate, it is important that they use balances to measure the mass of the original substances and the mass of the substances made when the original substances are mixed. This data should be documented so that students can analyze the data. As they compare the data, they should recognize that when two or more substances are mixed, the mass of the resulting substance equals the sum of the masses of the original substances.

Conservation of mass is a critical concept that is developed over time; therefore, students need multiple opportunities to investigate this phenomenon. Students should measure the mass of each substance, document the data they collect in a table or chart, and use the data as evidence that regardless of the changes that occur when mixing substances, the total weight of matter is conserved. Student should also have the opportunities to investigate other types of physical changes. For example, students can observe changes in matter due to heating, cooling, melting, freezing, and/or dissolving. The data should provide evidence that regardless of the type of change that matter undergoes, the mass is conserved.

Suggested Activity: Whipped Cream Ice Cubes (what will happen when we freeze whipped cream into ice cube trays?); Bill Nye "States of Matter" & "Changing States of MAtter"; States of Matter Snowman (scholastic.com)

Connecting with English Language Arts/Literacy and Mathematics

English Language Arts/Literacy

Students can conduct short research projects, using both print and digital sources, to build their understanding of physical changes to matter. While reading, they should take notes of relevant information, and summarize that information so that it can be used as evidence to explain the changes that occur as substances are heated, cooled, dissolved, or mixed. When drawing evidence from texts to support analysis, reflection, and research, students should provide a list of sources.

Mathematics

- Use appropriate tools in strategic ways when measuring physical properties of substances, such as weight or volume.

- Model with mathematics when organizing data into tables or charts, using the data as evidence to explain changes that occur.
- Convert among different-sized standard measurements units within a given measurement system and use these conversions to explain changes that occur.

Modifications:

- Provide students with multiple choices of how they can represent their understandings
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena
- Structure the learning around explaining or solving a social or community-based issue.

Resources

- District approved science textbook
- Websites
- Videos
- Nonfiction/fiction sources

Unit 5 - Energy and Matter in Organisms/Ecosystems

Scope and Sequence
Time: Approximately 45 days

In this unit of study, students develop an understanding of the idea that plants get the materials they need for growth from air and water. Using models, students can describe movement of matter among plants, animals, decomposers, and the environment, and they can explain that energy is animals' food was once energy from the sun.

Corresponds to Unit 3 and 4 in textbook

Stage 1: Desired Results

Content Standards
5-LS1-1: Support an argument that plants get the materials they need for growth chiefly from air and water.
5-LS2-1: Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.
5-LS4-4: Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.
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.

Essential Questions
What happens to the matter and energy that are part of each organism?

Enduring Understandings
- Matter is transported into, out of, and within systems.
- Plants acquire their materials for growth chiefly from air and water.
- Science explanations describe the mechanisms for natural events.
- A system can be described in terms of its components and their interactions.
- The food of almost any kind of animal can be traced back to plants.
- Organisms are related in food webs in which some animals eat plants for food and other animals eat the animal that eats plants.
- Some organisms, such as fungi and bacteria, break down dead organisms and therefore operate as decomposers.
- Decomposers eventually restores (recycles) some materials back to the soil.
- Organisms can survive only in environments in which their particular needs are met.
- Energy can be transferred in various ways and between objects.
- The energy released from food was once energy from the sun, which was captured by plants in the chemical process that forms plant matter.
- Food provides animals with the materials they need for body repair and growth and the energy they need for motion and to maintain body warmth.

Knowledge and Skills (SWBAT embedded course proficiencies)

Students who understand the concepts are able to:

- Describe how matter is transported into, out or, and within systems.
- Support an argument with evidence, data, or a model.
- Support an argument that plants get the materials they need for growth chiefly from air and water.
- Describe a system in terms of its components and interactions.
- Develop a model to describe phenomena.
- Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.
- Emphasis is on the idea that matter that is not food - such as air, water, decomposed materials in soil - is changed into matter that is food. Examples of systems could include:
    - Organisms
    - Ecosystems
    - Earth
- Energy can be transferred in various ways and between objects.
- The energy released from food was once energy from the sun, which was captured by plants in the chemical process that forms lant matter.
- Food provides animals with the materials they need for body repair and growth and the energy they need for motion and to maintain body warmth.

Stage 2: Evidence of Understanding, Learning Objectives and Expectations

Benchmarks (embedded student proficiencies)

Assessment Methods (formative, summative, other evidence and/or student self- assessment)

Stage 3: Learning Plan

In every habitat and ecosystem on earth, plants and animals survive, grow, reproduce, die, and decay. What happens to the matter and energy that are part of each organism? Where does it come from and where does it go? In this unit of study, students make observations and use models to understand how energy flows and matter cycles through organisms and ecosystems.

Students should first understand that plants acquire their material for growth chiefly from air and water. Students will need opportunities to observe a variety of plants over time. As students document plants' continual need for water and air in order to grow, they recognize that this evidence supports the argument that plants acquire their material for growth chiefly from water and air (not soil). In addition, as students observe that plants also need sunlight, they begin to recognize that plants use energy from the sun to transform air and water into plant matter. Once students understand that plants acquire material for growth from air and water, they need opportunities to observe animals and plants interacting within an ecosystem. Terrariums, such as those built in 3-liter bottles, are ideal for this because they are large enough for small plants and animals to survive and grow, yet easy to build and maintain. In these terrariums, students should observe plants growing and providing a source of food for small herbivores, carnivores consuming other animals, and decomposers consume dead plant material. All these interactions may not be observable within a single terrarium; however, a class could use a number of 3-liter bottles to set up different ecosystems, each with a few carefully chosen plants and animals. This will give students opportunities to observe different types of interactions within a variety of enclosed systems. When students record their observations of these small systems, it is important that students be able to:

- Identify the living and nonliving components of a system.
- Describe the interactions that occur between the living and nonliving components of each system.
- Develop models (such as food chains or food webs) that describe the movement of matter among plants, animals, decomposers, and the environment.

As students continue to observe each terrarium, they learn that:

- The food of almost any kind of animal can be traced back to plants.

- Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants.
- Some organisms, such as fungi and bacteria, break down dead organisms and therefore operate as decomposers.
- Decomposition eventually restores (recycles) some materials back to the soil.
- A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life.
- Organisms can survive only in environments in which their particular needs are met.
- Matter cycles between air and soil among plants and animals as these organisms live and die.
- Organisms obtain gases and water from the environment and release waste matter back into the environment.

Students can conduct research to determine the effects of newly introduced species to an ecosystem. After investigating the movement of matter in ecosystems, students revisit the concept of energy flow in systems. At the beginning of this unit of study, students learned that energy from the sun is transferred to plants, which then use that energy to change air and water into plant matter. After observing the interactions between the living and nonliving components of small ecosystems, students recognize that energy, like matter, is transferred from plants to animals. When animals consume plants, that food provides animals with the materials they need for body repair and growth and with the energy they need to maintain body warmth and for motion.

Suggested Activity: Project Wild: "No Water Off a Duck's Back" pg 3-5; "Flip the Switch for Wildlife" pg 319. **Project Learning Tree:** "Loving It Too Much" pg 147 activity 35; "Pollution Search" pg 153 activity 36; "Nature's Recyclers" pg 108 activity 24; Life on the Edge, Activity 88. Owl Pellets; Macroinvertebrates; Disney Nature Movie (usually a new movie every other year).

Connecting with English Language Arts/Literacy and Mathematics

English Language Arts/Literacy

Students should use information from print and digital sources to build their understanding of energy and matter in ecosystems. As students read, they should use the information to answer questions, participate in discussions, solve problems, and support their thinking about movement of matter and the flow of energy through the organisms in an ecosystem.

Mathematics

In this unit students should:

- Use appropriate tools in strategic ways when making and recording observations of the living and nonliving components of an ecosystem.
- Model with mathematics when using tables, charts, or graphs to organize observational data.
- Reason abstractly and quantitatively when analyzing data that can be used as evidence for explaining how matter cycles and energy flows in systems.
- Convert among different-sized standard measurement units within a given measurement system and use these conversions to help explain what happens to matter and energy in ecosystems.

Modifications:

- Provide students with multiple choices of how they can represent their understandings

- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena
- Structure the learning around explaining or solving a social or community-based issue.

Resources

- District approved science textbook
- Websites
- Videos
- Nonfiction/fiction sources

Unit 6 - Interactions Within the Earth, Sun, and Moon System

Scope and Sequence
Time: Approximately 25 days

In this unit of study, students develop an understanding of patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.

Corresponds to Unit 5 in textbook

Stage 1: Desired Results

Content Standards
5-PS2-1: Support an argument that the gravitational force exerted by Earth on objects is directed down.
5-ESS1-1: Support an argument that the apparent brightness of the sun and stars is due to their relative distances from the Earth.
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.

Essential Questions
What patterns do we notice when observing the sky?

Enduring Understandings
- Cause-and-effect relationships are routinely identified and used to explain change.
- The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center.
- Natural objects exist from the very small to the immensely large.
- 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.
- Similarities and differences in patterns can be used to sort, classify, communicate, and analyze simple rates of change for natural phenomena.
- 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 that include: day and night; daily changes in the length and direction of shadows; different positions of the sun, moon, and starts at different times of the day, month, and year.

Knowledge and Skills (SWBAT embedded course proficiencies)
Students who understand the concepts are able to:
- Identify cause-and-effect relationships in order to explain change.
- Support an argument with evidence, data, or a model.
- Support an argument that the gravitational force exerted by Earth on objects is directed down.
- Support and argument that differences in the apparent brightness of the sun compared to that of other stars is due to their relative distance from Earth.
- Sort, classify, communicate, and analyze simple rates of change for natural phenomena using similarities and differences in patterns.
- Represent data is graphical displays to reveal patterns that indicate relationships.
- Represent at 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. Examples of patterns could include: the position and motion of Earth with respect to the sun; selected stars that are visible only in particular months.

Stage 2: Evidence of Understanding, Learning Objectives and Expectations

Benchmarks (embedded student proficiencies)
Assessment Methods (formative, summative, other evidence and/or student self- assessment)

Stage 3: Learning Plan

In this unit of study, students explore the effects of gravity and determine the effect that relative distance has on the apparent brightness of stars. They also collect and analyze data in order to describe patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.

To begin this unit, students explore the effects of gravity by holding up and releasing an object (s) from a variety of heights and locations. Students should record and use their observations to describe the interaction that occurs between each object and the Earth. In addition, students should use their observations as evidence to support an argument that the gravitational force exerted by the Earth on objects is directed "down" no matter the height or location from which an object is released.

Students investigate the effect of distance on the apparent brightness of stars. Using information from a variety of print or digital sources, students learn that natural objects vary in size, from very small to immensely large. Stars, which vary in size, also range greatly in their distance from the Earth. The sun, which is also a star, is much, much closer to the Earth than any other star in the universe. Once students understand these concepts, they should explore the effect of distance on the apparent brightness of the sun in relation to other stars. This can be accomplished by modeling the effect using a light source, such as a flashlight. As students vary the distance of the light from their eyes, they should notice that the farther away the light is, the less bright it appears. Observations should again be recorded and used as evidence to support the argument that the differences in the apparent brightness of the sun compared to that of other stars is due to their relative distance from the Earth.

To continue the progression of learning, students investigate the following observable patterns of change that occur due to the position and motion of the Earth, sun, moon, and stars.

- Day and night: this pattern of change is a daily, cyclical pattern that occurs due to the rotation of the Earth every 24 hours. Students can observe model simulations using online or digital resources, or they can create models in class of the day/night pattern caused by the daily rotation of the Earth.
- The length and direction of shadows: these two interrelated patterns of change are daily, cyclical patterns that can be observed and described through direct observation. Students need the opportunity to observe a stationary object as chosen throughout the day and across a few days. They should measure and record the length of the shadow and record the direction of the shadow (using drawing and cardinal directions), then use the data to describe the patterns observed.
- The position of the sun in the daytime sky: this daily, cyclical pattern can also be directly observed. Students will need the opportunity to make and record observations of the position of the sun in the sky at chosen intervals throughout the day and across a few days. Data should then be analyzed in order to describe the pattern observed.
- The appearance of the moon in the night sky: this cyclical pattern of change repeats approximately every 28 days. STudents can use media and online resources to find data that can be displayed graphically (ex. pictures in a calendar) which will allow them to describe the patterns of change that occurs in the appearance of the moon every four months.
- The position of the moon in the night sky: this daily, cyclical pattern of change can be directly observed, but students would have to make observations of the position of the moon in the sky at chosen intervals throughout the night, which is not recommended. Instead, students can use media and online resources to learn that the moon, like the sun, appears to rise in the eastern sky and st in the western sky every night.
- The position of the stars in the night sky: because the position of the stars changes across the seasons, students will need to use media and online resources to learn about his pattern of change.

Suggested Activity: Constellation Brochure; Raritan Community College Planetarium, discuss Solar Eclipse of 2017; Video Series "The voyage of the Mimi" and student handbook. Interactive lesson with BrainPOP (www.brainpop.com); Navigation Wall Chart.

Connecting with English Language Arts/Literacy and Mathematics

English Language Arts/Literacy

Students should use information from print and digital sources to build their understanding of:

- The Earth's gravitational force on objects.
- The differences in the apparent brightness of the sun compared to that of other stars due to their relative distances from Earth.
- Patterns of change that occur due to the position and motion of the Earth, sun, moon, and stars.

Mathematics

Students reason abstractly and quantitatively when analyzing and using data as evidence to describe phenomena, including:

- The Earth's gravitational force pulls objects "down" (toward the center of the Earth).
- The differences in the apparent brightness of the stars are due to their relative distances from Earth.
- Patterns of change, such as the day/night cycle, the change in length and direction of shadows during the day, the apparent motion of the sun across the daytime sky and the moon across the nighttime sky, the changes in the appearance of the moon over a period of four weeks, and the seasonal changes in the position of the stars in the night sky.

Students will model with mathematics as they graphically represent data collected from direct observations and from multiple resources throughout the unit, and as they describe relative distances of the sun and other stars from the Earth. Students might also express relative distances between the Earth and stars using numbers that can be expressed using powers of 10.

Modifications:

- Provide students with multiple choices of how they can represent their understandings
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
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Resources

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Unit 7 - Engineering and Technology

Scope and Sequence
Time: Approximately 20 days

In this unit of study, students will discover how science and math are used in engineering. They will investigate a design process and explore how technology decisions affect society.

Corresponds to Unit 1 in textbook

Stage 1: Desired Results

Content Standards
5-ESS3-1: Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.
3-5-ETS1-1: Define a simple design problem reflecting a need or want that includes a 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.

Essential Questions
How are science and math used in engineering?
What is the design process?
How does technology affect society?

Enduring Understandings
- A system can be described in terms of its components and their interactions.
- People's needs and wants change over time, as do their demands for new and improved technologies.

Knowledge and Skills (SWBAT embedded course proficiencies)
Students who understand the concepts are able to:
- Explain the purpose of engineering and technology, and give examples of how engineering and math are used in science.
- Define problems seen in photographs and maps, using the engineering design process to find good solutions to the problems.
- Explain how society affects the evolution and development of technology, describe positive and negative and planned and unintended consequences of technology, and explain tradeoffs.
- People's needs and wants change over times, as do their demands for new and improved technologies.
- Engineers improves existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands.

Stage 2: Evidence of Understanding, Learning Objectives and Expectations

Benchmarks (embedded student proficiencies)
Assessment Methods (formative, summative, other evidence and/or student self- assessment)

Stage 3: Learning Plan

In this unit of study, students will explain the purpose of engineering and technology and give examples of how engineering is used in science. They will explore models and systems that are products of engineering and recognize that technology solves a problem or meets a need. They will learn that technologies change over time to meet people's wants and needs and investigate engineering practices and science practices by designing and communicating a solution to a problem. Students will also explore the relationship among technology, math, and measurement.

Students will investigate and apply aspects of the design process. They will ask and answer questions, and construct explanations as they design solutions to a problem. Throughout, the develop an understanding of the influence of science, engineering, and technology on the natural world.

Students will examine the engineering of certain technologies according to human wants and needs. They will explain the relationship between technology and society, indicating how technology has both positive and negative impacts on society and the natural world. Students will carry out investigations that increase awareness of engineering and technology, and learn how to identify problems and solutions.

Suggested Activity: From textbook: Charting a Solutio; Dropping off, Picking Up; 20/20 Vision (teachengineering.org)

Connecting with English Language Arts/Literacy and Mathematics

English Language Arts/Literacy

- Conduct short research projects that use several sources to build knowledge through investigations of different aspects of a topic.
- Recall relevant information from experience or gather relevant information from print and digital sources, summarize or paraphrase information in notes and finished work, and provide a list of resources.

Mathematics

- Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.
- Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane.

Modifications:

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New Jersey Core Curriculum and Common Core Content Standards

http://www.state.nj.us/education/cccs/

Integration of 21st Century Theme(s)

The following websites are sources for the following 21st Century Themes and Skills:
http://www.nj.gov/education/code/current/title6a/chap8.pdf
http://www.p21.org/about-us/p21-framework .
http://www.state.nj.us/education/cccs/standards/9/index.html

21st Century Interdisciplinary Themes (into core subjects)

- **Global Awareness**
- **Financial, Economic, Business and Entrepreneurial Literacy**
- **Civic Literacy**
- **Health Literacy**
- **Environmental Literacy**

Learning and Innovation Skills

- **Creativity and Innovation**
- **Critical Thinking and Problem Solving**
- **Communication and Collaboration**

Information, Media and Technology Skills

- **Information Literacy**
- **Media Literacy**
- **ICT (Information, Communications and Technology) Literacy**

Life and Career Skills

- **Flexibility and Adaptability**
- **Initiative and Self-Direction**
- **Social and Cross-Cultural Skills**
- **Productivity and Accountability**
- **Leadership and Responsibility**

Integration of Digital Tools

- **Classroom computers/laptops/Chromebooks**
- **Technology Lab**
- **Voice amplification device**
- **Other software programs**
- **Science Webgame: Little Alchemy**

Website Resources Grade 5 Science

- **https://www.state.nj.us/education/modelcurriculum/sci/videos**
- **https://nstahosted.org/pdfs/ngss/resources/MatrixForK-12ProgressionOfScienceAndEngineeringPracticsInNGSS.8.14.14.pdf**
- **https://www.state.nj.us/education/aps/cccs/science/resources/QR68.pdf**

Curriculum Modifications

Special Education and 504 Students

Modification are available to children who receive services under IDEA or Section 504 of the Rehabilitation Act.

GENERAL MODIFICATION:

- Allow student to have a modified test with open notes - notes should be typed up by teacher in google docs and shared with student/parent if necessary for studying purposes so that student can use technology skills to use notes in google docs to complete test
- Allow outlining, instead of writing for an essay or major project
- Computerized spell-check support
- Word bank choices for answers to test questions
- Written portion can be minimized, have part of answer typed into test and student fills in remainder of test with word bank
- Reworded questions in simpler language
- Google Slides instead of written reports
- Highlighting important words or phrases
- Modified workload or length of assignments/test
- Modified time demands
- Pass/no pass option
- Provide page numbers to help students to answer questions
- Snap Type - for students who have difficulty writing, can take a picture from I-pad so that they are able to type in answers and other information

BEHAVIOR MODIFICATIONS:

- Breaks between tasks
- Cue expected behavior - discuss with student what cue will be
- Daily feedback to student using a behavior chart (have parents sign off daily)
- Positive reinforcement
- Use of proximity
- Chart progress and maintain data
- Use peer supports and mentoring

STUDENTS AT RISK OF SCHOOL FAILURE:

Students who are considered to have a higher probability of failing academically or dropping out of school.

- Appropriate and discrete sensory stimulation
- Placement in small groups
- Additional support
- Alernative assignment with same outcomes
- Insert meaning of vocabulary several times throughout the lesson
- Use of headphones during certain times to block out noises, ie tests, quizzes, projects
- Use of closed strategies - makes question and answering easier. Closed strategies narrow the depth of the curriculum and help the student understand the focus. Also, allows students to practice answering questions in a systematic format. Helps alleviate anxiety.

ENGLISH LANGUAGE LEARNER STUDENTS (ELL)

ELL students are students who are unable to communicate fluently or learn effectively in English, wo oftem come from non-English speaking homes and backgrounds, and who typically require specialized or modified instruciton in both the English language and in their academic courses.

- Alternate Responses
- Notes in Advance
- Extended Time
- Simplified Instruction (written and verbal)
- Online and Hardcopy Dictionary
- Use lots of visuals
- Repeat/Rephrase often
- Use lower level materials when appropriate
- Provide extra practice in English
- If possible translate some things into the fluent language

GIFTED AND TALENTED STUDENTS:
Inclusion, infusion, and differential instruction across the curriculum meets the individual needs of gifted and talented students.

- Differentialed curriculum for the gifted learner
- Educational opportunities consisting of a continuum of differentiated curricula options, instructional approaches and materials
- Flexible groupings of students to facilitate differntiated instruction and curriculum

LEARNING ENVIRONMENTS:

- Extensive outside reading
- Active classroom discussion
- Innovative oral and written presentations
- Deductive and inductive reasoning
- Independent writing and research
- Challenging problem solving situations
- Interactive, independent and interdiciplinary activities

ADDITIONAL ASSESSMENT METHODS (formative, summative, other evidence and/or student self-assessment):

- Ask questions
- Define Problems
- Deveope and use models
- Plan and carry out investigations
- Analyze and interpret data
- Teacher observations
- Class discussion
- Venn diagram
- 3-D Foramtive Assessment - integrated perspective, engaging in science and engineering practice (SEP's) as part of sustained and meaningful investigations while applying disciplinary core ideas (DCIs) and cross-cutting concepts (CCCs).