Allamuchy Township School District
Allamuchy, NJ

Science
Kindergarten

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
And
Aligned with the New Jersey Core Curriculum Content Standards
And Common Core Content Standards

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Philosophy and Rationale

Science, technology, and engineering influence and permeate every aspect of modern life. The primary goal of the science curriculum is to develop substantive science literacy in all students. The program must provide students with opportunities to expand, change, enhance, and modify the ways in which they view the world. Some knowledge of science and engineering is required to engage with the major public policy issues of today as well as to make informed everyday decisions. Students will be empowered to express and share points of view, solve problems, and make decisions based on evidence. Teachers facilitate an environment that promotes student's thinking, honesty, curiosity, and questioning. As a human endeavor, science seeks to provide an explanation of phenomena occurring in the natural world. This endeavor merges three pillars: Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts.

Project-based learning activities provide opportunities for students to develop materials that show evidence of their engagement with issues raised in the course and, more practically, that may be adapted for their own courses in the future.

Mission Statement

The mission of the Allamuchy Township District, in partnership with the larger community, is to provide a comprehensive, caring program for all of our students which:

*Nurtures the unique talents and interests of each individual
*Supports social responsibility and a love of learning
*Embraces the total development of each student intellectually, morally and physically
*Develops confidence, creativity and skills necessary to face the challenges of a technologically advanced and ever-changing society
*Promotes a culture of mutual respect with all other community members
*Supports the attainment of the New Jersey Core Curriculum Content Standards

The District seeks to exceed objective standards of achievement set by both the State and Federal government and to provide an educational experience beyond the boundaries established by the Core Curriculum Standards.

Unit 1 - Pushes and Pulls

Scope and Sequence
Time: Approximately 29 days

In this unit of study, students apply an understanding of the effects of different strengths or different directions of pushed and pulls on the motion of an object to analyze a design solution.

Corresponds to Unit 2 in textbook

Stage 1: Desired Results

Content Standards

- **K-PS2-1:** Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.
- **K-PS2-2:** Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.
- **K-2-ETS1-3:** Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

Essential Questions

What does science have to do with playing sports?

Enduring Understandings

- People use different ways to study the world.
- Simple tests can be designed to gather evidence to support or refute student ideas about causes.
- Pushes and pulls can have different strengths and directions.
- Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it.
- When objects touch or collide, they push on one another and can change motion.
- A bigger push or pull makes things speed up or slow down more quickly.
- Simple tests can be designed to gather evidence to support or refute student ideas about causes.
- Pushes and pulls can have different strengths and directions.
- Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it.
- A situation that people want to change or create can be approached as a problem to be solved through engineering. Such problems may have many acceptable solutions.
- Because there is always more than one possible solution to a problem, it is useful to compare and test designs.

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

- People use different ways to study the world.
- Simple tests can be designed to gather evidence to support or refute student ideas about causes.
- Pushes and pulls can have different strengths and directions.
- Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it.
- When objects touch or collide, they push on one another and can change motion.
- A bigger push or pull makes things speed up or slow down more quickly.
- Simple tests can be designed to gather evidence to support or refute student ideas about causes.
- Pushes and pulls can have different strengths and directions.
- Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it.

- A situation that people want to change or create can be approached as a problem to be solved through engineering. Such problems may have many acceptable solutions.
- Because there is always more than one possible solution to a problem, it is useful to compare and test designs.

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 plan and carry out investigations in order to understand the effects of different strengths and different directions of pushes and pulls on the motion of an object. Students will also engage in a portion of the engineering design process to determine whether a design solution works as intended to change the speed or direction of an object.

Scientists often design simple tests in order to gather evidence that can be used to understand cause-and-effect relationships. In this unit's progression of learning, kindergarteners need adult guidance to collaboratively plan and conduct simple investigations to discover and compare the effects of pushes and pulls on the motion of an object. Students will need opportunities to push and pull a variety of objects, such as balls, toy cars, pull toys, cans, tops, and boxes. Students should push/pull these objects first with varying strengths, and then in a variety of directions. They should also explore the effects of pushing objects into one another, as well as into walls and other stationary objects. Students should record their observations using pictures and words, and should participate in class discussions on the effects of varying the strength or direction of a push or pull on an object.

As students engage in these types of simple force and motion investigations, they will learn that:

- Pushes and pulls can have different strengths and directions.
- Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it.
- When objects touch or collide, the object's motion can be changed.
- The force of the push or pull will make things speed up or slow down more quickly. To enhance students' experiences, teachers can schedule time for students to investigate these force and motion concepts using playground equipment, such as swings, seesaws, and slides. Teachers can also use trade books and multimedia resources to enrich students' understanding. As students participate in discussions, they should be encouraged to ask questions, share observations, and describe cause-and-effect relationships between forces (pushes and pulls) and the motion of objects.

As students come to understand the force and motion concepts outlined above, they should engage in the engineering design process as follows.

- Students are challenged to design a simple way to change the speed or direction of an object using a push or pull from another object.
- As a class, students determine what the design should be able to do (criteria). For example:
    - An object should move a second object a certain distance;
    - An object should move a second object so that the second object follows a particular path;
    - An object should change the direction of the motion of a second object;

      and/or
    - An object should knock down other specified objects.
- Students determine the objects that will move/be moved (balls, ramps, blocks, poker chips) and the types of structures (ramps or barriers) and materials (rubber bands, paper tubes, cardboard, foam, wooden blocks) that can be used to meet this challenge.
- Groups of students then develop a simple drawing or diagram and use given materials to build their design. Groups should be given a predetermined amount of time to draw and build their designs.

- Groups share their designs with the class, using their drawings or diagrams, and then test their designs.
- Students make and use observations to determine which of the designs worked as intended, based on the criteria determined by the class.

While engaging in this process, students should use evidence from their observations to describe how forces (pushes and pulls) cause changes in the speed or direction of an object.

In this unit of study, students learn that problem situations can be solved through engineering, and that because there is always more than one possible solution to a problem, it is useful to compare and test designs. Students will use what they have learned about the effect of pushes and pulls of varying strength and direction on the motion of an object to determine whether a design solution works as intended. This process is outlined in greater detail in the previous section.

Suggested Activities: Take a canvas outside with some paint and put it in a box. Squirt paint (using the Pushing force) onto the canvas and throw four marbles in the box. Your students can take turns using the canvas to create a ramp by pulling one side up higher than the other and let gravity pull the marbles down the ramp! In this way, you create a collaborative piece of art by using GRAVITY! With this activity you are reinforcing the concept that gravity pulled down! You can showcase your piece of artwork in the classroom. (pinterest)

Kindergarten will enjoy exploring motion by interacting with materials that spin such as tops and gyroscopes.

Read **I Fall Down** by: Vicki Cobb

Watch: Rube Goldberg YouTube Videos and Star Wars YouTube Volkswagen Commercial - force.

Connecting with English Language Arts/Literacy and Mathematics

English Language Arts/Literacy

In order to integrate English Language Arts into this unit, students need the opportunity to participate in shared research that will enhance their understanding of the effect of forces (pushes and pulls) on objects. This could include exploring simple books and other media or digital resources. With prompting and support, students should ask and answer questions about key details in texts in order to seek help, get information, or clarify something that they do not understand. With support from adults, students will also recall information from experiences to answer questions and clarify their thinking. With support and/or collaboration, they can use digital tools to produce and publish simple informative writing or to document their observations of the simple force and motion systems they design and build.

Mathematics

During this unit of study, students will make connections to Mathematics in a number of ways. Kindergartners can use simple nonstandard units to measure the distances that two different objects travel when pushed or pulled or the distances that an object travels when varying the strength of a push or a pull. If using two objects, students can compare them using a measurable attribute, such as weight, to see which object has "more of" or "less of" the attribute, and describe the effect that increased weight has on the distance that an object travels. As students conduct multiple trials with the two objects (or with a single object, varying the strength of the push or pull), they can document the distance traveled in a simple graph. Then they can analyze the data in order to describe the cause- and-effect relationship between forces and motion of objects. As students collect and analyze data, they are learning to reason abstractly and quantitatively and use appropriate tools strategically.

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 - Basic Needs of Living Things

Scope and Sequence
Time: Approximately 45 days

In this unit of study, students develop an understanding of what plants and animals need to survive and the relationship between their needs and where they live. Students compare and contrast what plants and animals need to survive and the relationship between the need of living things and where they live.

Corresponds to Unit 3 in textbook

Stage 1: Desired Results

Content Standards
K-LS1-1: Use observations to describe patterns of what plants and animals (including humans) need to survive.
K-ESS3-1: Use a model to represent the relationship between the needs of different plants and animals (including humans) and the places they live.
K-ESS2-2: Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.

Essential Questions
Where do plants and animals live and why do they live there?

Enduring Understandings
- Scientists look for patterns and order when making observations about the world.
- Patterns in the natural and human-designed world can be observed and used as evidence.
- Plants need water and light to live and grow.
- Systems in the natural and designed world have parts that work together.
- Living things need water, air, and resources from the land, and they live in places that have the things they need.
- Systems in the natural and designed world have parts that work together.
- Plants can change their environments.
- Things that people do to live comfortably can affect the world around them. People can make choices that reduce their impacts on the land, water, air, and other living things.

Knowledge and Skills (SWBAT embedded course proficiencies)
Students who understand the concepts are able to:
- Observe and use patterns in the natural world as evidence.
- Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions.
- Use observations to describe patterns in what plants need to survive. Examples of patterns could include:
    - Plants do not need to take in food.
    - All pants require light.
    - all living things need water.

- Use observations to describe patterns in what animals need to survive. Examples of patterns could include:
    - Animals need to take in food, but plants do not.
    - Different kinds of food are needed by different types of animals.
    - All living things need water.
- Observe that systems in the natural and designed world have parts that work together.
- Use a model to represent relationships between the needs of different plants and the places they live in the natural world. (Plants, animals, and their surroundings make up a system.)
- Examples of relationships could include that grasses need sunlight, so they often grow in meadows.
- Examples of models include diagrams, drawings, physical replicas, dioramas, dramatizations, or storyboards.
- Use a model to represent the relationships between the needs of different animals and the
- places they live in the natural world. (Plants, animals, and their surroundings make up a system.)
- Examples of relationships could include that deer eat buds and leaves and therefore usually live in forested areas.
- Examples of models include diagrams, drawings, physical replica, dioramas, dramatizations, and storyboards.
- Observe that systems in the natural and designed world have parts that work together.
- Use a model to represent relationships between the needs of different plants and the places they live in the natural world. (Plants, animals, and their surroundings make up a system.)
- Examples of relationships could include that grasses need sunlight, so they often grow in meadows.
- Examples of models include diagrams, drawings, physical replicas, dioramas, dramatizations, or storyboards.

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 unit should begin with observable phenomena. The purpose of presenting phenomena to students is to start them thinking and wondering about what they observe. After students have observed the event, they can work individually, with partners, or in a small group to develop questions about what they saw. The questions will lead them into investigational opportunities throughout the unit that will help them answer their questions.

The questions students share about this unit will be used to guide them in identifying patterns of what plants and animals need to survive. For example, a pattern may include the types of food that specific organisms eat or that animals consume food but plants do not. Furthermore, students' questions and investigations will also guide them in developing models that reflect their understanding of the inter-relationship between an organism and its environment.

- Prior to starting the unit, display pictures of living and nonliving things. Direct students to sort the pictures into two groups: living and nonliving. Ask students to explain how they decided which pictures represented living things and which represented non-living things.
- Watch the PBS video "Is It Alive?" Stop after each picture and ask students if it's alive or not. Ask them to explain how they can tell. (This activity will also provide an opportunity to pre-assess students' understandings and/or misconceptions. It will also provide an opportunity for students to think about what having life means.)

- Watch the TeacherTube video "Living or Non-Living?" (This activity provides similar experiences for students as the PBS video. The difference is that after each picture and question, the narrator provides the answer with reasoning.)

In this unit's progression of learning, students first learn that scientists look for patterns and order when observations about the world and those patterns in the natural world can be observed and used as evidence. Students conduct firsthand and media- based observations of a variety living things and use their observations as evidence to support the concepts:

- Plants do not need to take in food, but do need water and light to live and grow.
- All animals need food in order to live and grow, that they obtain their food from plants or from other animals, that different kinds of food are needed by different kinds of animals, and that all animals need water.

After determining what plants need to survive, kindergarteners learn that plants are systems, with parts, or structures, that work together, enabling plants to meet their needs in a variety of environments. The vast majority of plants have similar structures, such as roots, stems, and leaves, but the structures may look different depending on the type or variety of plant. Although there are many varieties of plants, their structures function in similar ways, allowing the plants to obtain the water and light they need to survive. In other words, each variety of plant has structures that are well-suited to the environment in which it lives. As students learn about different types of plants and the environments in which they live, they use models, such as diagrams, drawings, physical replicas, or dioramas, to represent the relationships between the needs of plants and the places they live in the natural world. For example, grasses need sunlight, so they often grow in meadows. Cacti, which live in places subject to drought, have thick, wide stems and modified leaves (spines) that keep water within the plant during long periods without rain.

After determining what animals need to survive, kindergarteners learn that animals are systems that have parts, or structures, that work together, enabling animals to meet their needs in a variety of environments. Many animals have similar structures, such as mouths or mouthparts, eyes, legs, wings, or fins, but the structures may look different, depending on the type or species of animal. Although there are many types of animals, their structures function in similar ways, allowing them to obtain the water and food they need to survive. In other words, each type of animal has structures that are well-suited to the environment in which they live. As students learn about different types of animals and the environments in which they live, they use models, such as diagrams, drawings, physical replicas, or dioramas, to represent the relationships between the needs of animals and the places they live in the natural world. For example, deer eat buds and leaves; therefore, they usually live in forested areas; pelicans eat fish, therefore they live near the shorelines of oceans or seas.

The final portion of the learning progression focuses on the understanding that plants and animals are system with parts, or structures, that work together. Students use what they have learned about plants and animals to make further observations to determine ways in which plants and animals change their environment to meet their needs. For example:

- Tree roots can break rocks and concrete in order to continue to grow, plants will expand their root systems in search of water that might be found deeper in the earth, and plants can be found growing around and through man-made structures in search of light.
- A squirrel digs in the ground to hide food, and birds collect small twigs to build nests in trees. Students need opportunities to make observations, and then, with adult guidance, to use their observations as evidence to support a claim for how an animal can change its environment to meet its needs.

Suggested Activities: Growing Up Wild: Wildlife is Everywhere pg 24; Who Lives in a Tree? pg 30; Hiding in Plain Sight, pg 34; Looking at Leaves, pg 16.

Connecting with English Language Arts/Literacy and Mathematics

English Language Arts/Literacy

After students observe plants and animals in a variety of settings (e.g. ant farms, fish in an aquarium, plants growing, insects in a jar), the teacher asks them to share their thoughts about what the plants and animals need using expressions like, "I think …" and "I agree with …" To help summarize patterns in the needs of plants and animals, teachers can list all of the "needs" the class has discussed on the board using word and pictures/symbols (e.g. sun, water, food). Students, individually or with a partner, draw a picture of a plant on one half of a piece of paper, and an animal on the other half. Then they draw and/or write the needs of the plant and of the animal next to each picture. Students can verbally complete the sentence frame, "Plants are different from animals because _____." This concept is important plants do need nutrients. Students can represent this idea with a Venn Diagram.

Mathematics

Kindergarten students use attributes to sort objects. For example, a large portion of IS1 involves sorting plants and animals based on patterns in their needs. Students can sort organisms based on whether they are a plant or an animal, whether they live on water or land, and whether an animal eats only plants, only animals, or both.

With adult support, kindergarteners use simple measurements to describe various attributes of plants and animals. Kindergarteners can use simple, nonstandard units to measure the height of plants or the amount of water given to plants. For example, they might use Unifix cubes to measure height or count the number of scoops of water given to a plant on a daily or weekly basis. Students should work in groups to measure and record their data. They also use measurements to describe various attributes of animals. Kindergarteners can use simple nonstandard units to measure such attributes as height, length, or weight. They can also count numbers of appendages or other body parts. They might use Unifix cubes to measure height or length and wooden blocks to measure weight. Students should work in groups to measure and record their data.

With adult guidance and questioning, students can learn to analyze their data. As students use data to compare the amount of growth that occurs in plants that get varying amounts of water or sunlight, they are given the opportunity to compare the amount of growth that occurs in plants that get varying amounts of water or sunlight, they are given the opportunity to reason abstractly and quantitatively. For example, students can measure and compare the height of a sunflower grown in the shade compared to the height of a sunflower grown in the sun, or they can count and compare the number of leaves on bean plants that receive different amounts of water daily. These investigations will give students evidence to support claims about the needs of plants. Students should also have opportunities to solve one-step addition/subtraction word problems based on their collected data.

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 - Effects of the Sun

Scope and Sequence
Time: Approximately 29 days

In this unit of study, students apply an understanding of the effects of the sun on the Earth's surface.

Corresponds to Unit 4 in textbook

Stage 1: Desired Results

Content Standards
K-PS3-1: Make observations to determine the effects of sunlight on Earth's surface.
K-PS3-2: Use tools and materials provided to design and build a structure that will reduce the warming effect of sunlight on Earth's surface.
K-2-ETS1-1: Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
K-2-ETS1-2: Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

Essential Questions
How does weather affect our daily lives?
How can we use science to keep a playground coll in the summertime?

Enduring Understandings
- Daily and seasonal weather conditions affect what we do, what we wear and how we feel.
- Science includes observations, collections of data, and communication skills.
- Sunlight warms Earth's surface.
- Events have causes that generate observable patterns.

Knowledge and Skills (SWBAT embedded course proficiencies)
Students who understand the concepts are able to:
- Observe patterns in events generated by cause-and-effect relationships
- Make observations to collect data that can be used to make comparisons.
- Make observations to determine the effect of sunlight on Earth's surface. Examples of Earth's surface could include:
    - Sand
    - Soil
    - Rocks
    - Water

- Describe how the shape and stability of structures are related to their function.
- Use tools and materials provided to design and build a device that solves a specific problem or a solution to a specific problem.
- Use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area.

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 investigate the effects of the sun on the surface of the Earth. Throughout the unit, students make observations in order to describe patterns of change. With adult support, they design and build a structure that will reduce the warming effect of sunlight, and then conduct tests to determine if the structure works as intended.

Scientists use different ways to study the world. In this units' progression of learning, students work like scientists to investigate the warming effect of sunlight on the surface of the Earth. They will conduct simple investigations in order to make observations and collect data that can be used to make comparisons. Students should test a variety of materials that are found naturally on the surface of the Earth, including sand, soil, rocks, and water. Samples of each of these materials can be placed on two separate paper plates of shallow plastic containers; one container can be placed in direct sunlight, and the other can be placed out of direct sunlight. After a period ot time, students should compare the relative temperature of each. Students should record their observations, then analyze and compare the data to determine if there is a pattern. They should draw the conclusion that the sun has the same warming effect on all the materials found on the surface of the Earth.

As students come to understand that the sun warms the surface of the Earth, they should engage in the engineering design process as follows:

- Students are challenged to design and build a structure that will reduce the warming effects of the sun.
- Students brainstorm a list of objects that reduce the warming effects of the sun.
- As a class, students determine what the design should be able to do. For example:
    - The structure must reduce the warming effects of the sun.
    - The structure should be built using materials provided by the teacher.
    - The structure should be easy to carry and fit through the doorway of the classroom.

- Groups of students then use simple drawings or diagrams to design a structure, and use given tools and materials to build their design. Groups should be given a predetermined amount of time to draw and build their designs.
- Groups share their designs with the class, using their drawings or diagrams, and then test their designs outside.
- Students make and use observations to determine if the designs worked as intended, then compare the strengths and weaknesses of how each design performed.

While engaging in this process, students should use evidence from their observations to describe how their structures reduce the warming effect of sunlight.

Through this process, students learn that the shape and stability of structures of designed objects are related to their function. They will use tools and materials to design and build their structures. Because there is always more than one possible solution to a problem, students will test and compare their designs, then analyze data to determine if their structures work as intended.

Suggested Activities:

- Casting Shadows Across Literacy and Science: This lesson introduces shadows by taking students on a shadow walk. Ideally this should be done on a sunny day in the schoolyard, but it can be a simple walk around the classroom.
- A Big Star: This reading passage explains what the sun is and that it provides heat to the Earth.
- Cooler in the Shadows: This lesson includes several activities where students observe, explore, and analyze shadows. Students will make inferences about the cause of shadows (ngss.nsta.org).
- Shadow Smile - Sid the Science Kid: teaches students all about shadows (pbslearningmedia.org).

Connecting with English Language Arts/Literacy and Mathematics

English Language Arts/Literacy

With guidance and support from adults, students recall information from experiences and gather information from books (read-alouds, big books) and other resources about the warming effects of the sun. Strategies such as Think-Pair-Share can be used to encourage students to think about and use information from books to answer questions and share their thinking. Kindergartners can add drawings or other visual displays to descriptions to provide additional detail about the structures they built to reduce the warming effects of the sun. With guidance and support from adults, students produce and publish their descriptions and observations of the structures they designed and built.

Mathematics

Students make comparisons of objects using relative temperature and describe the objects as warmer or cooler. Students can classify the objects into categories then count and compare the number of objects in each category. Data should be organized and compare so that students understand that placing objects in the sun generates an observable pattern of change. Kindergarteners attend to the meaning of various quantities using a variety of measurement tools, such as thermometers without scale markings, to determine if an object has gotten warmer when placed in the sun. They mathematically represent real-world information by organizing their data into simple graphs or by diagramming the situation mathematically.

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 Weather

Scope and Sequence
Time: Approximately 40 days

In this unit of study, students develop an understanding of patterns and variations in local weather and the use of weather forecasting to prepare for and respond to severe weather.

Corresponds to Unit 5 in textbook

Stage 1: Desired Results

Content Standards
K-ESS2-1: Use and share observations of local weather conditions to describe patterns over time.
K-ESS3-2: Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.
K-2-ETS1-1: Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

Essential Questions
What is the weather like today and how is it different from yesterday?
How does the sunlight affect the Earth?
What can protect us from overexposure to sunlight?
How can we protect Earth's surface?

Enduring Understandings
- Weather is the combination of sunlight, wind, snow, or rain and temperature in a particular region at a particular time.
- People measure these conditions to describe and record the weather and to notice patterns over time.
- People look for patterns in the weather data when they organize and order when making observations about the world.
- Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.
- Some kinds of severe weather are more likely than others in a given region.
- Weather scientists forecast severe weather so that communities can prepare for and respond to these events.
- Events have causes that generate observable patterns.
- People depend on various technologies in their lives; human life would be very different without technology.

Knowledge and Skills (SWBAT embedded course proficiencies)
Students who understand the concepts are able to:
- Observe patterns on a weather chart (e.g. have we had more sunny or cloudy days and what is your evidence?).
- Observe patterns in events generated by cause-and-effect relationships.
- Read grade-appropriate texts and/or use media to obtain scientific information to describe patterns in the natural world.
- Ask questions based on observations to find more information about the designed world.

- Ask questions to obtain information about the purpose of weather forecasting to prepare for and respond to severe weather.
- Define a simple problem that can be solved through the development of a new or improved object or tool.
- Ask questions, make observations, and gather information about a situation people want to change in order to define a simple problem that can be solved through the development of a new or improved object or tool.

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 are expected to develop an understanding of patterns and variations in local weather and the use of weather forecasting to prepare for and respond to severe weather. Throughout the unit, students will look for patterns and cause-and-effect relationships as they observe and record weather events.Students will have opportunities to ask scientific questions, analyze and interpret data, and communicate their findings to others.

In this unit of study, students learn that problem situations can be solved through engineering, and that in order to design a solution, we must first define the problem. As described in the narrative above, students define problems caused by severe weather events by asking specific questions, making observations, and gathering information that will help them understand the types of problems they might face when severe weather conditions exist in and around their homes, schools, and communities.

In this unit's progression of learning, students first develop an understanding that patterns in the natural world can be observed and documented, and that, like scientists, they can use these patterns as evidence to describe phenomena and make predictions. In order to observe patterns in weather, kindergartners will learn that weather is the combination of sunlight, wind, precipitation, and temperature in a particular region at a particular time. By observing and recording daily weather events—such as sunny, cloudy, rainy, and windy—students can analyze both qualitative and quantitative data. Recording and analyzing data over time will reveal recognizable weather patterns that can be used to make predictions. Examples of weather patterns may include:

- Snow and colder temperatures generally occur in the winter.
- Clouds may bring rain or snow.
- Rain occurs more often in the spring.
- Warmer/hotter temperatures occur in the summer.
- It is generally cooler in the morning and warmer in the afternoon.

At this grade level, it is developmentally appropriate to describe temperature in relative terms; therefore,vocabulary words such as hot, warm, cool, cold, and warmer/cooler should be used to describe temperature,rather than accurately measuring and describing temperature in degrees Celsius and relate the number of degrees with descriptors such as hot, warm, cold, cool, and warmer/colder.

Students also learn that weather events have causes that generate observable patterns over time, and that these patterns help weather scientists predict severe weather. Kindergarteners need opportunities to learn about severe weather, especially those types that tend to occur in the local region in which they live. By using a variety of media and technology, such as computers, radio, and television, and by reading grade-appropriate texts about weather and weather events, students can learn about types of severe weather that are common to their region. In addition, they come to understand that people depend on technology to help us predict and solve problems, and without it, our lives would be very different.

In order to apply their learning, students need opportunities to ask questions about weather forecasting and how it can help us prepare for and respond to different types of severe weather. When kindergartners ask questions, make observations, gather weather information, and look for patterns of change in the weather, it prepares them to think about how to best prepare for and respond to local severe weather. As part of this unit of study, students are challenged to investigate how people prepare for and solve problems caused by severe weather. With adult guidance, students should define weather problems by asking questions, making observations, and gathering information about severe weather situations. Some questions students might want to consider include the following:

- What kinds of severe weather events tend to occur in New Jersey (e.g. thunderstorms, hurricanes, flooding, snowstorms)?
- What do people do in response to these types of severe weather events?
- What kinds of tools can people use to solve problems caused by severe weather conditions (e.g. umbrellas, sandbags, salt, gravel, shovels, snow blowers)?
- What other solutions might people use for problems caused by severe weather (e.g. closing schools and businesses; sending out emergency workers to restore utilities; sending out early warnings; stockpiling food, water, and other supplies; having a portable generator)?
- What kinds of problems would we face if we had a lot of rain in a short period of time?
- What problems might we have if our community experienced flooding?
- What kinds of problems might occur if strong winds caused damage (e.g. knocked over trees, damaged power lines, damaged homes and businesses)?
- What kinds of precautions do people take during a hurricane? A tornado? A Nor'easter? Why?

Suggested Activities: Education.com: make a snow gauge, making rain, cloud observations, make a silly weather vane, drip drip drop. **Growing up Wild:** Looking at leaves pg 16. kidsactivitiesblog.com: jello snacks (clouds); practice reading a thermometer. **Season Module:** *The Mystery of the Missing Hummingbird*: teacher can read this book aloud to the students and do the activities that come along with this book, from **Globe.gov**.

Connecting with English Language Arts/Literacy and Mathematics

English Language Arts/Literacy

With the teachers support the students collectively research and write about how people predict the weather. The Students listen to non-fiction stories about the weather and how people describe weather (rainy, sunny, cloudy, cool, warm, etc.). They also watch videos of meteorologists at the SciJinks It's all about weather! website. With prompting and support, the students ask and answer questions about key details in the text and SciJinks videos.

Students demonstrate their understanding of the texts and videos by being able to orally answer such questions as who, what, where, when, why, and how. With guidance and support from adults and in collaboration with peers, students use digital tools to produce and publish writing about the patterns that they see in their weather observations.

Throughout the school year, students recall information from experiences or gather information from provided sources to answer a question.

Mathematics

With adult support, students measure and record various types of weather (e.g. rainfall or snow amounts, relative temperature at different times of the day and over a period of time). They mathematically represent real-world information by organizing their data into simple weather charts and graphs. Kindergarteners attend to the meaning of various quantities using a variety of units of measure and use counting to analyze data and determine patterns in charts and graphs. By using media resources, students explore how weather scientists represent real-world weather data with picture representations, charts, and graphs. They can use this information to think about how weather scientists use tools to collect and record weather data in order to determine patterns

of change. Students will attend to the meaning of various quantities used in simple weather charts and graphs, both from classroom observations and from media sources, by counting and comparing severe weather data with daily weather data (e.g. relative amounts of rainfall, snowfall). By analyzing data from weather graphs and charts, young students begin to understand how severe weather affects people and communities and that weather scientists play an important role in predicting severe weather conditions.

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 Basic Needs of Humans

Scope and Sequence
Time: Approximately 27 days

In this unit of study, students develop an understanding of what humans need to survive and the reltionship between their needs and where they live.

Corresponds to Unit 6 in textbook

Stage 1: Desired Results

Content Standards
K-ESS3-1: Use a model to represent the relationship between the needs of humans and the places they live.
K-ESS3-3: Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.
K-2-ETS1-1: Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

Essential Questions
How do people impact the environment as they gather and use what they need to live and grow?

Enduring Understandings
- Events have cases that generate observable patterns.
- Things that people do to live comfortably can affect the world around them.
- People can make choices that reduce their impacts on the land, water, air, and other living things.
- Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people.
- A situation that people want to change or create can be approached as a problem to be solved through engineering.
- Asking questions, making observations, and gathering information are helpful in thinking about problems.
- Before beginning to design a solution, it is important to clearly understand the problem.

Knowledge and Skills (SWBAT embedded course proficiencies)
Students who understand the concepts are able to:
- Observe patterns in events generated due to cause-and-effect relationships.
- Communicate solutions with others in oral and/or written forms using models and/or drawings that provide detail about scientific ideas.
- Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.
- Ask questions based on observations to find more information about the natural and/or designed world.
- Define a simple problem that can be solved through the development of a new or improved object or tool.
- Ask questions, make observations, and gather information about a situation that people want to change in order to define a simple problem that can be solved through the development of a new or improved object or tool

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 develop an understanding of the impact that humans have on the land, water, air, and other living things in the local environment and engage in a portion of the engineering design process in order to communicate solutions that can reduce these impacts.

To help students recognize the impact that humans have on the living and nonliving components of the local environment, they need opportunities to observe and think about the things that people do to live comfortably. Over a period of a few days, students can observe their families in their day-to-day lives, paying attention to what they eat, what they throw away, when and how they use water, how they warm or cool their home, what types of appliances and gadgets they use, how they maintain their home and yard, what resources are used to make the clothes they wear, how they travel from place to place, and how they communicate with others. During whole-group discussions, students can share their observations and then discuss the concept of comfortable lifestyles. This list could include:

- Plants and animals for food.
- Trees, rocks, sand, and other materials for building homes and schools.
- Local reserves of water for drinking, washing clothes, showering, washing dishes, watering lawns, and cooking.
- Gas and oil for cars and buses.
- Electricity to power the appliances in their homes.
- Land for homes, schools, parks, parking lots, and landfills.

Then the class can discuss how obtaining and using these types of resources affects the local environment. To help with these discussions, teachers can use books, multimedia resources, field trips, or even invite guest speakers to the classroom. As students participate in the discussions, they should be encouraged to ask questions, share observations, and describe cause-and-effect relationships between human use of resources and human impact on the environment.

As students come to understand that things people do to live comfortably can affect the world around them, they are ready to engage in the engineering design process. The process should include the following steps:

- As a class or in groups, students participate in shared research to find examples of ways that people solve some of the problems created by humans' use of resources from the environment. For example, people in the community might choose to:
    - Recycle plastic, glass, paper, and other materials in order to reduce the amount of trash in landfills.
    - Plant trees in areas where trees have been cut down for lumber to renew regional habitats for local wildlife.
    - Set up rainwater collection systems so that rainwater can be used to maintain landscaping instead of using water from local reserves.
- Groups of students then develop a simple sketch, drawing, diagram, or physical model to illustrate how the solution reduces the impact of humans on land, water, air and/or other living things in the local environment.
- Groups need the opportunity to communicate their solutions with the class in oral and/or written form, using their sketches, drawing, diagrams, or models to help explain how the solution reduces the human impact on the environment.

While engaging in this process students should learn that even though human affect the environment in many ways, people can make choices that reduce their impacts on the land, water, air, and other living things in the environment.

Suggested Activities: **Growing Up Wild:** Less is More pg 62. **Project Learning Tree:** Environmental Exchange Box, Activity 20; Energy Sleuths, Activity 39. Cloudinstitute.org: Where Do Apples Grow?; How Can We Take Care of Our Commons?; Is That Trash or Treasure.

Connecting with English Language Arts/Literacy and Mathematics

English Language Arts/Literacy

With adult support, students participate in shared research in order to find examples of ways that humans reduce their impact on the land, water, air, and other living things in the local environment. With prompting and support, students will ask and answer questions about key details in a text. Students, with adult support and/or peer collaboration, can also use simple books and media resources to gather information and then use drawings, simple informative writing (or dictation), and visual displays to represent some of the ways that people lessen their impact on the environment. With support from adults, students will recall information from experiences or gather information provided from sources to answer questions. Students can clarify their ideas, thoughts, and feelings using simple informative writing.

Mathematics

With adult support, students will classify data by one attribute, sort data into categories, and graph the data. For example, students can keep track of the amount of materials recycled over a period of time. They can classify recycled trash as paper, plastic, or glass, then count and graph these data, using bar graphs or picture graphs. Students should have opportunities to analyze and compare the data and then use the data to solve problems. As students work with their data, they are learning to reason and quantitatively, model by diagramming the situation mathematically, and use appropriate tools strategically.

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 -Engineering and Technology

Scope and Sequence
Time: Approximately 27 days

In this unit of study, students will define a simple problem that can be solved by developing a new or improved tool.

Corresponds to Unit 1 in textbook

Stage 1: Desired Results

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

Essential Questions
What does an Engineer Do?
How can we use a design process?

Enduring Understandings
- People encounter questions about the natural world every day.
- The shape and stability of structures of natural and designed objects are related to their function (s).

Knowledge and Skills (SWBAT embedded course proficiencies)
Students who understand the concepts are able to:
- Use observations and questions to identify engineers as workers who find solutions to problems.
- Use observations and analyze a situation to solve a problem.
- Identify a problem that needs a solution.
- Describe an object or action that solves a problem.

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 define a simple problem that can be solved through the development of a new or improved object or tool. Student designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solution to other people. Because there is always more than one possible solution to a problem, it is useful to compare and test designs. Students will ask questions, make observations, and gather information that are/could be helpful in thinking about the problem. Student need to clearly understand the problem before beginning to design a solution.

Suggested Activities: Download the App: Kodable - this is a problem solving app that also teaches basic computer programming to students. Take you iPad on a walk in the woods to create a field journal with images with your students, you could also download an app that allows you to add voice or text to your journal.

Connecting with English Language Arts/Literacy and Mathematics

English Language Arts/Literacy

With prompting students should be able to ask and answer questions about key detail in a text. With adult guidance students should be able to recall information and ask questions. Have students draw to descriptions to provide additional details.

Mathematics

Students can represent a number of objects, as well as count "how many?". With guidance students should be able to correctly name basic shapes regardless of their orientations or overall size.

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

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**