Science Curriculum

Kindergarten Unit Two:
Earth’s Weather and Trees
Course Description

In unit one, students engage in an engineering challenge to develop habits of mind and classroom practices that will be reinforced throughout the school year. In unit two, students engage in systematic investigations of trees over the seasons that will bring students to a better understanding of the place of trees at school and in the community. Students will observe day-to-day changes in weather over the year, as well as the impact weather has on living things. Students will develop an understanding of what plants (and animals) need to survive and the relationship between their needs and where they live. By monitoring local weather, students experience the patterns and variations in weather and come to understand the importance of weather forecasts to prepare for severe weather. In unit three, students study natural resources and properties of materials and how those properties determine their use—wood, paper, and fabric. Students come to understand that humans use natural resources for everything they do and that people affect the world around them. Students use those materials to engineer structures, applying physical science core ideas of energy transfer. After building a repertoire of practices with materials, students investigate the effect of pushes and pulls, and apply their intuitive notion of the concept of variables to change the strength and direction of rolling balls to achieve specific outcomes. In unit four, students observe and describe the structures of fish, birds, snails, earthworms, and isopods. Appropriate classroom habitats are established, and students learn to care for the animals. In four investigations, animals are studied in pairs. Students observe and care for one animal over time, and then they are introduced to another animal similar to the first but with differences in structure and behavior. Students learn what animals need to survive and the relationship between their needs and where they live. The firsthand experiences are enriched with close-up photos of animals; some related to animals that students have observed in class and some to animals that are new. This process enhances observation, communication, and comparison. Throughout all units, students engage in science and engineering practices by asking questions, participating in collaborative investigations, observing, recording, and interpreting data to build explanations, and obtaining information from photographs. Students gain experiences that will contribute to an understanding of the crosscutting concepts of patterns; cause and effect; systems and system models; and structure and function.
Teachers may choose from a variety of instructional approaches that are aligned with 3 dimensional learning to achieve this goal. These approaches include:

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<tr>
<th>Inquiry Kit Instruction (modified)</th>
<th>Challenge Based Instruction</th>
<th>5 E Instructional Model (BSCS)</th>
<th>Culturally Relevant Instruction</th>
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<tbody>
<tr>
<td>Project-Based Instruction</td>
<td>Tinkering Pedagogy</td>
<td>Learning Progressions</td>
<td>Knowledge Integration</td>
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<td>Model-based Reasoning</td>
<td>Place-based Instruction</td>
<td>Meaningful Expertise Instruction</td>
<td>Emergent Investigations (RSS)</td>
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Unit Summary

Earth’s Weather & Trees provides students with solid experiences to help them develop an understanding of what plants (and animals) need to survive and the relationship between their needs and where they live. By monitoring local weather, students experience the patterns and variations in weather and come to understand the importance of weather forecasts to prepare for severe weather.

Throughout the module, students engage in science and engineering practices by asking questions, participating in collaborative investigations, observing, recording, and interpreting data to build explanations, and obtaining information from photographs. Students gain experiences that will contribute to an understanding of the crosscutting concepts of patterns; cause and effect; scale, proportion, and quantity; systems and system models; structure and function; and stability and change.

To a Kindergarten student, the oak on the corner, the pines at the park, and the mulberry tree at school are all giants. Systematic investigation of trees over the seasons will bring students to a better understanding of the place of trees at school and in the community. Students will observe day-to-day changes in weather over the year, as well as the impact weather has on living things.

Students also develop an understanding of patterns and variations in local weather and the use of weather forecasting to prepare for and respond to severe weather. The crosscutting concepts of patterns; cause and effect; interdependence of science, engineering, and technology; and the influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for the disciplinary core ideas. Students are expected to demonstrate grade-appropriate proficiency in asking questions, analyzing and interpreting data, and obtaining, evaluating, and communicating information. Students are also expected to use these practices to demonstrate understanding of the core ideas.
Lastly, students apply an understanding of the effects of the sun on the Earth’s surface. The crosscutting concepts of cause and effect and structure and function are called out as organizing concepts for this disciplinary core idea. Students are expected to demonstrate grade-appropriate proficiency in developing and using models; planning and carrying out investigations; analyzing and interpreting data; and designing solutions. Students are also expected to use these practices to demonstrate understanding of the core ideas.

**Student Learning Objectives**

<table>
<thead>
<tr>
<th>Use and share observations of local weather conditions to describe patterns over time. [Clarification Statement: Examples of qualitative observations could include descriptions of the weather (such as sunny, cloudy, rainy, and warm); examples of quantitative observations could include numbers of sunny, windy, and rainy days in a month. Examples of patterns could include that it is usually cooler in the morning than in the afternoon and the number of sunny days versus cloudy days in different months.] [Assessment Boundary: Assessment of quantitative observations limited to whole numbers and relative measures such as warmer/cooler.] (K-ESS2-1)</th>
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<tr>
<td>Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.* [Clarification Statement: Emphasis is on local forms of severe weather.] (K-ESS3-2)</td>
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<tr>
<td>Use observations to describe patterns of what plants and animals need to survive. [Clarification Statement: Examples of patterns could include that animals need to take in food but plants do not; the different kinds of food needed by different types of animals; the requirement of plants to have light; and, that all living things need water.] (K-LS1-1)</td>
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<tr>
<td>Make observations to determine the effect of sunlight on Earth’s surface. [Clarification Statement: Examples of Earth’s surface could include sand, soil, rocks, and water.] [Assessment Boundary: Assessment of temperature is limited to relative measures such as warmer/cooler.] (K-PS3-1)</td>
</tr>
<tr>
<td>Use tools and materials provided to design and build a structure that will reduce the warming effect of sunlight on Earth’s surface.* [Clarification Statement: Examples of structures could include umbrellas, canopies, and tents that minimize the warming effect of the sun.] (K-PS3-2)</td>
</tr>
<tr>
<td>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-ETS1-1)</td>
</tr>
<tr>
<td>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-2-ETS1-2)</td>
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### Unit Sequence

**Part A - Storyline:** We are planning a new playground for the school. We want to be sure that everyone can be cool and comfortable in the playground when the weather is hot.

**Overarching Question:** What causes surfaces in the playground to be hot? Does the same thing cause the weather to get hot?
## Concepts

- Weather is the condition in the air outdoors and can be described; weather changes.
- Sunlight warms Earth’s surface.
- Scientists use different ways to study the world.
- Events have causes that generate observable patterns.
- Temperature is how hot or cold it is; thermometers measure temperature.
- Events have causes that generate observable patterns.
- The shape and stability of structures of natural and designed objects are related to their function(s).
- 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.
- Because there is always more than one possible solution to a problem, it is useful to compare and test designs.

## Formative Assessments

**Students who understand the concepts are able to:**

- Gather evidence of weather phenomena and make predictions regarding future weather based upon this evidence.
- Gather evidence to support a claim that the Sun is responsible for heating Earth’s surface and the objects on it.
- Choose specific materials and design features that will provide shade to cool an area.

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### NJDOE Student Learning Objective | Essential Questions | Content Related to DCI’s | Sample Activities | Resources
---|---|---|---|---
**Students use evidence to create a prediction about future weather.**
**K-PS3-1, K-ESS2-1** | **What is weather?**  
**How can we predict what the weather will be like tomorrow?** | ● Weather is the condition in the air outdoors and can be described; weather changes.  
● Sunlight warms Earth’s surface. | Students learn a song about describing the weather. Each day they take turns reporting on the weather conditions. This is recorded in their Science notebooks (using symbols), preferably in chart form so that they can see patterns in the weather. Weather reporting should continue throughout the year. | What is Weather? (see resource folder)  
**Weather Words and What They Mean**  
Read Aloud on YouTube  
Weather Songs (see Resource Folder)  
Temperature (see resource folder)

**Students explore** | **How does** | ● Scientists use different ways to study the world. | Observe how the temperature of | https://educators.br
### Kindergarten Unit Two: Earth’s Weather and Trees

**Part B - Storyline:** Trees provide natural shade from the Sun. We can learn about trees that grow in our area to help use them to provide shade around our playground.

**Overarching Question:** What trees grow in our area? Do trees need the sun?

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<th>Concepts</th>
<th>Formative Assessments</th>
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</table>
| ● Trees are living plants.  
● Trees have structures: branches, leaves, trunk, and roots. | **Students who understand the concepts are able to:**  
● Describe in words or pictures what trees need in order to grow and... |

#### Unit Sequence

<table>
<thead>
<tr>
<th>how the Sun raises the temperature of objects on Earth’s surface.</th>
<th>sunlight affect the playground?</th>
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<tbody>
<tr>
<td><strong>K-PS3-1, K-ESS3-2</strong></td>
<td><strong>K-ESS3-2, K-2-ETS1-1, K-2-ETS1-2</strong></td>
</tr>
</tbody>
</table>

|● Events have causes that generate observable patterns.  
● Sunlight warms Earth’s surface.  
● Temperature is how hot or cold it is; thermometers measure temperature. | water in two containers is different when one is left in the sun and the other is left in the shade using the The Warmth of the Sun activity. |
| --- | --- |

Students will design a playground space that uses shade to keep certain spaces cool when the sun is shining.

<table>
<thead>
<tr>
<th>How can we keep the sand, soil, rocks, and water found on the playground cool during the summer?</th>
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</table>

|● Events have causes that generate observable patterns.  
● The shape and stability of structures of natural and designed objects are related to their function(s).  
● 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.  
● Because there is always more than one possible solution to a problem, it is useful to compare and test designs.  
● Sunlight warms Earth’s surface. | Draw My Own a Playground  
Observe what areas of the playground receive the most sun/least sun at different times of day.  
A place in the shade engineering challenge  
**Note:** It is a good idea to point out how trees can be used for shade, since this will lead into the next part of the unit. |
| --- | --- |

**Hartman, Gail As the Crow Flies** (Read on YouTube)  
Draw My Own Playground (in resource folder)  
A place in the shade engineering challenge (in resource folder)  
“My Playground” Toolkit Texts (Spanish text available on CD)
- Trees differ in size and shape.
- Plants have basic needs: water, light, air, nutrients, and space.
- 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.
- Different kinds of trees have different leaves
- Leaves have properties: size, shape, tip, edge, texture, and color.
- Leaves properties vary.
- Leaves can be described and compared by their properties.
- Wind is moving air; a windsock indicates wind direction and speed.
  Weather forecasts help people prepare for the severe weather that is likely in that area.
- 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.
- Seasons change in a predictable annual pattern: fall, winter, spring, and summer.
- Bark, twigs, leaves, buds, flowers, fruits, and seeds are parts of trees.
- The buds on twigs grow into leaves or flowers.
- Trees change through the seasons.
- Some trees produce seeds that can grow into new trees of the same kind.
- Some trees lose their leaves in winter; others do not.
- Trees are living, growing plants.

<table>
<thead>
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<th>NJDOE Student Learning Objective</th>
<th>Essential Questions</th>
<th>Content Related to DCI’s</th>
<th>Sample Activities</th>
<th>Resources</th>
</tr>
</thead>
</table>
| Students compare trees in and around their | *Are trees plants?*  
*What do plants* | - Trees are living plants.  
- Trees have structures: branches, leaves, trunk, and roots. | Conduct a learning walk around the school playground/around the school block to investigate different types of trees that thrive. | Treerific (in resource folder)  
Miller, Debbie S. Are |
<table>
<thead>
<tr>
<th>Activity</th>
<th>Objectives</th>
<th>Recommended Resources</th>
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</table>
| Students explore the schoolyard to determine their shared characteristics. Students explore what trees need in order to grow and thrive. | **Trees differ in size and shape.**  
**Plants have basic needs: water, light, air, nutrients, and space.**  
**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.** | Trees Alive? (Comp. Club Book)  
Informational Texts: Bulla, Clyde Roberts. A Tree is a Plant  
“My Maple Tree” in Toolkit Texts (Spanish text available on CD) |
| Students will compare the characteristics of various leaves to identify patterns. | **Different kinds of trees have different leaves**  
**Leaves have properties: size, shape, tip, edge, texture, and color.**  
**Leaves properties vary.**  
**Leaves can be described and compared by their properties.** | Students can examine leaf specimens from various trees from the schoolyard (feel free to add additional leaves from trees found in other places for variety). Students can sort leaves by various properties: size, shape, tip, edge, texture, and color. Make leaf rubbings in their notebooks of leaves based upon their sorted properties. **Note: At this point, learning the names of the types of trees is not necessary.** | Love Leaves (in resource folder)  
Miller, Debbie S. Are Trees Alive? (Comp. Club Book)  
Informational Texts: Bulla, Clyde Roberts. A Tree is a Plant  
“Tree Guide” in Toolkit Texts (Spanish text available on CD) |
| Students explore how weather may affect the growth of plants and how wind plays a special role in | **Wind is moving air; a windsock indicates wind direction and speed. Weather forecasts help people prepare for the severe weather that is likely in that area.**  
**Systems in the natural and designed world have parts that work together.** | Students investigate wind using a windsock. Discussion: can plants grow in all temperatures? Share pictures of various areas (desert, tundra, rainforest) and discuss why there might be more/less plants in this area. Read aloud of Flip, Float, Fly. | Wind (see resource folder)  
Macken, JoAnn Early. Flip, Float, Fly: Seeds on the Move (Comp. Club Book) |
## How does wind help trees?
- Living things need water, air, and resources from the land, and they live in places that have the things they need.

## Does the weather in Paterson stay the same all year long?
- Seasons change in a predictable annual pattern: fall, winter, spring, and summer.
- Bark, twigs, leaves, buds, flowers, fruits, and seeds are parts of trees.
- The buds on twigs grow into leaves or flowers.
- Trees change through the seasons.
- Some trees produce seeds that can grow into new trees of the same kind.
- Some trees lose their leaves in winter; others do not.
- Trees are living, growing plants.

## Overarching Question:
What are different types of severe weather? How can we be safe when we know severe weather is coming?

### Concepts
- Some kinds of severe weather are more likely than others in a given region. Weather scientists forecast severe weather so that the communities can prepare for and respond to these events.

### Formative Assessments
- Students who understand the concepts are able to:
  - Describe in words or pictures different types of severe weather.
  - Gather evidence to support a claim that we can keep ourselves safe during severe weather events.

### Sample Activities
- Watch the music video *Four Seasons in a Year* ([http://www.harrykindergartenmusic.com/song/154](http://www.harrykindergartenmusic.com/song/154)) sung by Harry Kindergarten. Read aloud *A Tree for All Seasons*. Draw trees and label their parts in the Science notebook. Examine real leaves (or pictures of leaves) that are different colors. Create rubbings or drawings of leaves in Science notebooks.
- The Ever Changing Seasons (see resource folder)
- Leaves of Every Color (see resource folder)
- Bernard, R. *A Tree for All Seasons*
## Learning Objective

<table>
<thead>
<tr>
<th>Students ask questions about how to better prepare for local severe weather conditions.</th>
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**K-ESS3-2, K-ESS2-1**

<table>
<thead>
<tr>
<th>Questions</th>
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<tbody>
<tr>
<td>What is severe weather?</td>
</tr>
<tr>
<td>How can we know if severe weather is going to happen?</td>
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</table>

| Some kinds of severe weather are more likely than others in a given region. Weather scientists forecast severe weather so that the communities can prepare for and respond to these events. |

| Explore various forms of severe weather using the lessons in the resource folder. |

| Severe Weather – Thunder and Lightening Not So Frightening, Storm Alert! |
| Tornadoes Dorothy Was Right! |
| Hurricanes- Tropical Storms Run Amok! |
| Blizzards – Let is Snow! |
| Snowflake Formation – Blizzard of Oz |

## Unit Project

| Severe Weather Assessment: Separate and Equal (in resource folder) |

## What It Looks Like in the Classroom

**Phenomena:** Read the local weather forecast from an online or print resource. Make a list of the words that they use to describe weather (cloudy, sunny, partly cloudy, temperature, and wind). As a class, create symbols that the students can use to record the weather each day. Examples can be found at [http://tinyurl.com/hhhg299](http://tinyurl.com/hhhg299).

In this ongoing study, students are expected to develop an understanding of patterns and variations in local weather and how they respond to the weather.

- They look for cause and effect relationships between the day’s weather and the clothing that they wear.
- They look for patterns between hazardous weather (very hot/very cold, rain, snow, and thunderstorm) and relate that to how their choices help to keep them comfortable and safe.

With adult support, students use trade books (read-alouds, big books) to learn about and discuss weather. Strategies, such as Think-Pair-Share, can be used to encourage students to think about information from books and to use that information to ask and answer questions about key details. With guidance, students use online media resources to view examples of severe weather. They can ask questions in order to understand how severe weather affects people and communities and to determine how communities
prepare for and respond to severe weather.

Students learn that we can help people to be safe from hazardous weather (thunderstorms, hurricanes, and nor-Easters,) through engineering. Students begin by comparing and contrasting hazardous weather events. With the support of the teacher, they ask scientific questions about how each type of weather is hazardous, gather information that will help them understand the types of problems they might face when severe weather conditions exist, and in and around their homes, schools, and communities, and work together to design ways to keep people safe during hazardous weather events.

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 (weather conditions) and make predictions (what will the weather be like tomorrow?). 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 (See Appendix B, Weather Chart). 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 can be used to describe temperature. Students may also record temperature in degrees Fahrenheit 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, snow storms)?
- 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?

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.

Students also observe how local plants (trees) provide shade from the sun, are dependent upon the sun for survival and that some trees change throughout the year due to changes in the amount of sunlight they receive.

Scientists use different ways to study the world. In this unit’s 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 or shallow plastic containers; one container can be placed in direct sunlight, and the other can be placed out of direct sunlight. After a period of 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 (e.g., shade trees, umbrellas, large hats, canopies).
- As a class, students determine what the design should be able to do (criteria). 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. (Groups can place their structures in a sunny area, then compare the relative temperature of the ground under the structure and the ground in direct sunlight.).
- 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 reduced 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.

### Modifications

(Note: Teachers identify the modifications that they will use in the unit. See NGSS Appendix D: All Standards, All Students/Case Studies for vignettes and explanations of the modifications.)

- Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.
- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- 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.
- Provide ELL students with multiple literacy strategies.
- Collaborate with after-school programs or clubs to extend learning opportunities.
- Restructure lesson using UDL principals ([http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA](http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA)).

### Research on Student Learning

| N/A |

### Prior Learning

| N/A |

### Future Learning

#### Earth Science

**Grade 2**
- Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe.
- Wind and water can change the shape of the land.

**Grade 3**
- Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next.
- Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years.
- A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts.

**Grade 4**
- Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around.
A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts.

**Physical Science**

Grade 1

- Objects can be seen if light is available to illuminate them or if they give off their own light.
- Some materials allow light to pass through them, others allow only some light through and others block all the light and create a dark shadow on any surface beyond them, where the light cannot reach. Mirrors can be used to redirect a light beam.

**Engineering**

Grade 4

- Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. *secondary*

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### Interdisciplinary Connections

**English Language Arts**

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.

As students learn about different types of plants, animals and the environments in which they live, they will use models, such as diagrams, drawings, physical replicas, or dioramas, to represent the relationships between the needs of living things and the places they live in the natural world. Using models in this way gives students an opportunity to use simple informative writing to provide additional detail that will enhance their visual displays.

**Mathematics**

Students make comparisons of objects using relative temperature [hotter, colder, warmer, cooler] and describe the objects as warmer or cooler. Students can
classify the objects into categories (warmer/cooler), then count and compare the number of objects in each category. Data should be organized and compared so that students understand that placing objects in the sun generates an observable pattern of change (i.e., the objects get warmer). 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 charts or by diagramming the situation mathematically.

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 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 then 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 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.

<table>
<thead>
<tr>
<th>Unit Vocabulary</th>
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<tbody>
<tr>
<td>observe</td>
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<tr>
<td>trees</td>
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<td>branch</td>
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<td>desert</td>
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<td>forest</td>
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<td>fruit</td>
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<td>Moon</td>
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<td>pattern</td>
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<td>Sun</td>
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<td>tree</td>
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<td>weather</td>
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<td>wind sock</td>
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<td>severe weather</td>
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<td>tornado</td>
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<td>forecast</td>
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<td>snowflake wind</td>
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<td>blizzard</td>
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<td>lightening</td>
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<td>safe</td>
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<td>river</td>
<td>trunk</td>
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<tr>
<td>root</td>
<td>valley</td>
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</table>

### Educational Technology Standards

8.1.2.A.1, 8.1.2.A.2, 8.1.2.A.3, 8.1.2.A.5, 8.1.2.B.1, 8.1.2.C.1, 8.1.2.D.1, 8.1.2.E.1, 8.1.2.F.1

- ➢ Technology Operations and Concepts
  - o Identify the basic features of a computer and explain how to use them effectively.
  - o Create a document using a word processing application.
  - o Compare the common uses of at least two different digital applications and identify the advantages and disadvantages of using each.
  - o Enter information into a spreadsheet and sort the information.
- ➢ Creativity and Innovation
  - o Illustrate and communicate original ideas and stories using multiple digital tools and resources.
- ➢ Communication and Collaboration
  - o Engage in a variety of developmentally appropriate learning activities with students in other classes, schools, or countries using various media formats such as online collaborative tools and social media.
- ➢ Digital Citizenship
  - o Develop an understanding of ownership of print and non-print information.
- ➢ Research and Information Literacy
  - o Use digital tools and online resources to explore a problem or issue.
- ➢ Critical Thinking, Problem Solving, and Decision-Making
  - o Use geographic mapping tools to plan and solve problems.

### Career Ready Practices

Career Ready Practices describe the career-ready skills that all educators in all content areas should seek to develop in their students. They are practices that have been linked to increase college, career, and life success. Career Ready Practices should be taught and reinforced in all career exploration and preparation programs with increasingly higher levels of complexity and expectation as a student advances through a program of study.

**CRP1. Act as a responsible and contributing citizen and employee**

Career-ready individuals understand the obligations and responsibilities of being a member of a community, and they demonstrate this understanding every day...
through their interactions with others. They are conscientious of the impacts of their decisions on others and the environment around them. They think about the near-term and long-term consequences of their actions and seek to act in ways that contribute to the betterment of their teams, families, community and workplace. They are reliable and consistent in going beyond the minimum expectation and in participating in activities that serve the greater good.

**CRP4. Communicate clearly and effectively and with reason.**
Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others’ time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.

**CRP6. Demonstrate creativity and innovation.**
Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.

**CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.**
Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.

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**Appendix A: NGSS and Foundations for the Unit**

<table>
<thead>
<tr>
<th>Use and share observations of local weather conditions to describe patterns over time. [Clarification Statement: Examples of qualitative observations could include descriptions of the weather (such as sunny, cloudy, rainy, and warm); examples of quantitative observations could include numbers of sunny, windy, and rainy days in a month. Examples of patterns could include that it is usually cooler in the morning than in the afternoon and the number of sunny days versus cloudy days in different months.] [Assessment Boundary: Assessment of quantitative observations limited to whole numbers and relative measures such as warmer/cooler.] (K-ESS2-1)</th>
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<tr>
<td>Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.* [Clarification Statement: Emphasis is on local forms of severe weather.] (K-ESS3-2)</td>
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<tr>
<td>Use observations to describe patterns of what plants and animals (including humans) need to survive. [Clarification Statement: Examples of patterns could include that animals need to take in food but plants do not; the different kinds of food needed by different types of animals; the requirement of plants to have light; and, that all living things need water.] (K-LS1-1)</td>
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</table>
### Make observations to determine the effect of sunlight on Earth’s surface.  
*Clarification Statement: Examples of Earth’s surface could include sand, soil, rocks, and water.*  
*Assessment Boundary: Assessment of temperature is limited to relative measures such as warmer/cooler.*  

(K-PS3-1)

### Use tools and materials provided to design and build a structure that will reduce the warming effect of sunlight on Earth’s surface.  
*Clarification Statement: Examples of structures could include umbrellas, canopies, and tents that minimize the warming effect of the sun.*  

(K-PS3-2)

### 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-ETS1-1)

### 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-2-ETS1-2)

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

<table>
<thead>
<tr>
<th>Science and Engineering Practices</th>
<th>Disciplinary Core Ideas</th>
<th>Crosscutting Concepts</th>
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</table>
| **Analyzing and Interpreting Data** | **ESS2.D: Weather and Climate**  
- 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. (K-ESS2-1)  
- **ESS3.B: Natural Hazards**  
- Some kinds of severe weather are more likely than others in a given region. Weather scientists forecast severe weather so that the communities can prepare for and respond to these events. (K-ESS3-2)  
- **PS3.B: Conservation of Energy and Energy Transfer**  
- Sunlight warms Earth’s surface. (K-PS3-1), (K-PS3-2)  
- **ETS1.A: Defining and Delimiting an Engineering Problem**  
- A situation that people want to change or improve. (K-2-ETS1-2)  
| **Asking Questions and Defining Problems** | **Patterns**  
- Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (K-ESS2-1)  
| **Obtaining, Evaluating, and Communicating Information** | **Cause and Effect**  
- Events have causes that generate observable patterns. (K-ESS3-2), (K-PS3-1), (K-PS3-2)  
| **Planning and Carrying Out Investigations** | **Structure and Function**  
- The shape and stability of structures of natural and designed objects are related to their function(s). (K-2-ETS1-2)  
| **Constructing Explanations and Designing Solutions** | Connections to Nature of Science  
| Science Knowledge is Based on Empirical Evidence  
- Scientists look for patterns and order when making observations about the world. (K-ESS2-1)  
| Scientific Investigations Use a Variety of Methods  
- Scientists use different ways to study the world.  |
**Developing and Using Models**

- Develop a simple model based on evidence to represent a proposed object or tool. (K-2-ETS1-2)

- Asking questions, making observations, and gathering information are helpful in thinking about problems. (K-2-ETS1-1)

- Before beginning to design a solution, it is important to clearly understand the problem. (K-2-ETS1-1)

**ETS1.B: Developing Possible Solutions**

- 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. (K-2-ETS1-2)

**English Language Arts**

Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-PS3-1),(K-PS3-2) W.K.7

Directly compare two objects with a measurable attribute in common, to see which object has “more of”/“less of” the attribute, and describe the difference. (K-PS3-1) K.MD.A.2

Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text. (K-2-ETS1-1) RI.2.1

With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers. (K-2-ETS1-1),(K-2-ETS1-3) W.2.6

**Mathematics**

Directly compare two objects with a measurable attribute in common, to see which object has “more of”/“less of” the attribute, and describe the difference. (K-PS3-2) K.MD.A.2

Reason abstractly and quantitatively. (K-2-ETS1-1),(K-2-ETS1-3) MP.2

Model with mathematics. (K-2-ETS1-1),(K-2-ETS1-3) MP.4

Use appropriate tools strategically. (K-2-ETS1-1),(K-2-ETS1-3) MP.5

Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph.
Recall information from experiences or gather information from provided sources to answer a question. (K-2-ETS1-1), (K-2-ETS1-3) W.2.8

Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings. (K-2-ETS1-2) SL.2.5

Use a combination of drawing, dictating, and writing to compose opinion pieces in which they tell a reader the topic or the name of the book they are writing about and state an opinion or preference about the topic or book. (K-ESS2-2) W.K.1

Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic. (K-ESS2-2) W.K.2

Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-LS1-1) W.K.7

Add drawings or other visual displays to descriptions as desired to provide additional detail. (K-ESS3-1) SL.K.5

With prompting and support, ask and answer questions about key details in a text. (K-ESS2-2) R.K.1

| (K-2-ETS1-1),(K-2-ETS1-3) 2.MD.D.10 | Directly compare two objects with a measurable attribute in common, to see which object has “more of”/“less of” the attribute, and describe the difference. (K-LS1-1) K.MD.A.2 |
| Reason abstractly and quantitatively. (K-ESS3-1) MP.2 |
| Model with mathematics. (K-ESS3-1) MP.4 |
| Counting and Cardinality (K-ESS3-1) K.CC |

Rubric(s): See resource folder

Field Trip Ideas: NEW JERSEY STATE MUSEUM Trenton, NJ [http://www.state.nj.us/state/museum/dos_museum_school.html](http://www.state.nj.us/state/museum/dos_museum_school.html)
PENNINGS ORCHARD Warwick, NY - [http://www.penningsorchard.com/blog/](http://www.penningsorchard.com/blog/)
LIBERTY SCIENCE CENTER - [http://lsc.org/plan-your-visit/](http://lsc.org/plan-your-visit/)