Science- Kindergarten

Unit # 1	**Title:** Weather	**Pacing:** 10 days

Stage 1- Desired Results

Established Goals/NJSLS Standards

Next Generation Science Standards/NJSLS

ESS2.D: Weather and Climate
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)

ESS3.B: Natural Hazards
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)

ETS1.A: Defining and Delimiting an Engineering Problem
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)

English Language Arts Standards:

- Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-ESS2-1) W.K.7
- With prompting and support, ask and answer questions about key details in a text. (K-ESS3-2) RI.K.1
- Ask and answer questions in order to seek help, get information, or clarify something that is not understood. (K-ESS3-2) SL.K.
- 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) W.2.6
- Recall information from experiences or gather information from provided sources to answer a question. (K-2-ETS1-1) W.2.8

Mathematics Standards:

- Reason abstractly and quantitatively. (K-ESS2-1),(K-2-ETS1-1) MP.2
- Model with mathematics. (K-ESS2-1),(K-ESS3-2),(K-2-ETS1-1) MP.4
- Use appropriate tools strategically. (K-2-ETS1-1) MP.5
- Counting and Cardinality (K-ESS3-2) K.CC
- Know number names and the count sequence. (K-ESS2-1) K.CC.A
- Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object. (K-ESS2-1) K.MD.A.1
- Classify objects into given categories; count the number of objects in each category and sort the categories by count. (K-ESS2-1) K.MD.B.3
- 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. (K-2-ETS1-1) 2.MD.D.10

Enduring Understandings ***Students will understand…***	**Essential Questions** ***Students will consider...***
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) **ETS1.A: Defining and Delimiting an Engineering Problem** ● A situation that people want to change or create can be approached as a problem to be solved through engineering. (K-2-ETS1-1)	● How can someone predict what the weather will be tomorrow? ● How does weather forecasting help us to prepare for dangerous weather?
Knowledge ***Students will know…***	**Academic Vocabulary**
● 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 encounter questions about the natural world every day. ● People depend on various technologies in their lives; human life would be very different without technology. ● Before beginning to design a solution, it is important to clearly understand the problem. ● Asking questions, making observations, and gathering information are helpful in thinking about problems. ● A situation that people want to change or create can be approached as a problem to be solved through engineering.	● Weather ● Sunlight ● Wind ● Snow ● Rain ● Hail ● Cloud ● Severe weather ● Thunderstorm ● Thunder ● Lightning ● Tornato ● Hurricane ● Blizzard ● Precaucions ● Meteorologist ● Temperature ● Hot ● Warm ● Cold ● Fall ● Winter ● Spring ● Summer ● Region ● Measure ● Degrees Fahrenheit ● Patterns ● Observations ● Evidence ● Nor’easter ● Flooding ● Damage

Skills

Students will be able to…

- Observe patterns in our Weather Chart including
  - Have we had more sunny days or cloudy days? What is your evidence?
  - When was it warmest this week? What is your evidence?
  - Is this week sunnier or cloudier than last week? What is your evidence?
  - Has the weather gotten warmer or cooler over the past two weeks? 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. (Emphasis is on local forms of 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.
- (Assessment of quantitative observations limited to whole numbers and relative measures such as warmer/cooler.)

21ST Century/ Interdisciplinary Themes	**21st Century Skills**
Global Awareness Financial, Business, & Entrepreneurial Literacy Civic Literacy **Environmental Literacy** Health Literacy	**Creativity & Innovation** **Communication & Collaboration** **Media Literacy** **Critical Thinking & Problem Solving** **Information Literacy** **Information, Communication, & Technology** **Life & Career Skills**

Stage 2- Assessment Evidence

from the NJ DOE Model Curriculum

What is the weather like today and how is it different from yesterday?

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. 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.

Stage 2- Assessment Evidence Continued

Summative Assessment 1

Standard: **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)

- *Overview:* Students will journal and record their observations regarding the daily weather to identify patterns of change.
- *Assessment:* Completion using sticker system
- *Resources:* Notebook, pencil

Summative Assessment 2

Standard: **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)

- *Overview:* Students will complete the Severe Weather Assessment from a better lesson.com and then will explain what to do to prepare for and respond to severe weather to a partner.
- *Assessment:* Severe Weat*her Assessment*
- *Resources:* https://betterlesson.com/lesson/637236/severe-weather-assessment-separate-and-equal, pencil, partner

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Summative Assessment 3

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)

- *Overview:* Interview someone at home 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.
- *Assessment:* Students will present projects to class and completion using sticker system.
- *Resources:* Someone to interview, pencil, paper

Formative Assessments	***Student Self-Assessment***	***Common Assessments***
• Projects • Project and problem-based learning activities • Graphic organizers • Collaborative learning projects • Formative checks (whiteboards) • Center Activities • Class discussion and participation in activities • Teacher observation	• Reflection activities (on the learning goal, on summative assessments, on collaborative work, on projects) • Responses to inquiry-based questions • Think-pair-share activities • Student revising knowledge throughout the unit	• Summative assessments • Performance tasks • Probes • Teacher observation and documentation

Stage 3- Learning Plan

Suggested Learning Activities

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.

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. severe 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.

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.

Suggested Learning Activities Continued

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?

Resources/Instructional Materials

(articles, novels, websites, books, magazines, art, media)

- Weather Words and What They Mean by Gail Gibbons
- When Spring Comes by Kevin Henkes
- Snowballs by Lois Ehlert
- Winter Lullaby by Barbara Seuling
- What Will the Weather Be Like Today? by Paul Rodgers
- Where does the Butterfly go when it Rains? by May Garelick
- The Snowy Day by Ezra Jack Keats
- White Snow, Bright Snow by Alvin Tresselt
- When a Storm Comes Up by Allan Fowler
- Weather Patterns: This lesson is the first in a two-part series on the weather. The study of the weather in these early years is important because it can help students understand that some events in nature have a repeating pattern. It also is important for students to study the earth repeatedly because they take years to acquire the knowledge that they need to complete the picture. The full picture requires the introduction of such concepts as temperature, the water cycle, and other related concepts. In the second activity, What's the Season, students identify the seasonal patterns in temperature and precipitation.
- Weather Walks: Students learn about weather by taking walks during various weather conditions over the course of time. Walks take place during sunny, rainy, windy, or snowy conditions. The lesson is divided into four sections with activities assigned to each of the weather conditions being observed. Suggested activities include appropriate investigations to help students observe and describe weather phenomenon through first hand experiences.
- Science- Weather: This is a free interactive learning activity designed for individual students and can easily be used as a whole class interactive whiteboard activity. This particular title explores weather in relationship to season and temperature. Students learn to use a thermometer as a tool for recording temperature and identify the four seasons through measurable changes in the thermometer readings.
- About the Weather: This lesson is about using local weather to make observations, measure, collect, and record data to describe patterns over time. Students will count types of outdoor clothing worn by classmates and use the data to look for patterns in weather over months and seasons.
- **Connections Between Practices in *NGSS*, Common Core Math, and Common Core ELA:** The presenter was Sarah Michaels from Clark University. In this seminar Dr. Michaels talked about connecting the scientific and engineering practices described in A Framework for K–12 Science Education with the Common Core State Standards in Mathematics and English Language Arts.

Resources/Instructional Materials Continued

- **Weather and Climate Basics:** This is a resource from the National Center for Atmospheric Research and the National Science Foundation that explains the basics of weather and climate. This article is designed as background information for the teacher.
- **Earth and Sky: Grades K-4:** SciGuides are a collection of thematically aligned lesson plans, simulations, and web-based resources for teachers to use with their students centered on standards-aligned science concepts. "We all live under the same big sky." Since the beginning of time, humans have been intrigued by the objects in our sky and beyond. Take a voyage into space science where you will travel through the Internet to connect your classroom with content and activities designed to teach concepts related to these objects and changes in the sky over time.
- ***NGSS* Core Ideas: Earth's Systems:** The presenter was Jill Wertheim from National Geographic Society. The program featured strategies for teaching about Earth science concepts that answer questions such as "What regulates weather and climate?" and "What causes earthquakes and volcanoes?"
- Dr. Wertheim began the presentation by introducing a framework for thinking about content related to Earth systems. She then showed learning progressions for each concept within the Earth's Systems disciplinary core idea and shared resources and strategies for addressing student preconceptions. Dr. Wertheim also talked about changes in the way *NGSS* addresses these ideas compared to previous common approaches.

Technology Resources

- www.weather.com
- http://tinyurl.com/hhhg299
- www.abetterlesson.com
- www.brainpopjr.com
- https://mysteryscience.com/
- http://kids.nationalgeographic.com/

Accommodations & Modifications
for Spec. Ed., ELL, GT, & At Risk Students

- Allow oral responses
- Allow verbalization before writing
- Use audio materials when necessary
- Modify homework assignments
- Read tests aloud
- Provide math manipulatives as necessary
- Restate, reword, clarify directions
- Re-teach concepts using small groups
- Provide educational "breaks" as necessary
- Expanding time for free reading
- Chunking Content
- Calculator
- Use mnemonic devices
- Provide a cueing system
- Untimed and/or extended test taking time
- Shorten assignments to focus on mastery concept
- Leveled Reading Materials
- Acronyms
- Graphic Organizers
- Notes Provided
- Check agenda book for parent(s) communication
- Read directions aloud
- Assignment, Project, and Assessment Modification Based on Individual Student Needs
- Speech to Text/Text to Speech Features in Google Apps
- Technology assisted instruction
- Preferential seating utilized
- Redirect student(s) as necessary
- Student choice for project or approach to assignment
- Inquiry-Based Learning
- Genius Hour

Science- Kindergarten

Unit # 2	**Title:** Pushes and Pulls	**Pacing:** 15 days

Stage 1- Desired Results

Established Goals/NJSLS Standards

Next Generation Science Standards/NJSLS

PS2.A: Forces and Motion

- **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.** [Clarification Statement: Examples of pushes or pulls could include a string attached to an object being pulled, a person pushing an object, a person stopping a rolling ball, and two objects colliding and pushing on each other.] [Assessment Boundary: Assessment is limited to different relative strengths or different directions, but not both at the same time. Assessment does not include non-contact pushes or pulls such as those produced by magnets.] (K-PS2-1)

PS2.B: Types of Interactions

- **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.** [Clarification Statement: Examples of problems requiring a solution could include having a marble or other object move a certain distance, follow a particular path, and knock down other objects. Examples of solutions could include tools such as a ramp to increase the speed of the object and a structure that would cause an object such as a marble or ball to turn.] [Assessment Boundary: Assessment does not include friction as a mechanism for change in speed.] (K-PS2-2)

ETS1.A: Defining Engineering Problems

- **Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.** (K-2-ETS1-3)

English Language Arts Standards:

- With prompting and support, ask and answer questions about key details in a text. (K-PS2-2) RI.K.1
  Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-PS2-1) W.K.7
- Ask and answer questions in order to seek help, get information, or clarify something that is not understood. (K-PS2-2) SL.K.3

Mathematics Standards:

- Reason abstractly and quantitatively. (K-PS2-1), (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
- Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object. (K-PS2-1) K.MD.A.1
- 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-PS2-1) K.MD.A.2

Enduring Understandings ***Students will understand…***	**Essential Questions** ***Students will consider...***
PS2.A: Forces and Motion ● Pushes and pulls can have different strengths and directions. (K-PS2-1), (K-PS2-2) ● Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it. (K-PS2-1), (K-PS2-2) **PS2.B: Types of Interactions** ● When objects touch or collide, they push on one another and can change motion. (K-PS2-1) **PS3.C: Relationship Between Energy and Forces** ● A bigger push or pull makes things speed up or slow down more quickly. (secondary to K-PS2-1) **ETS1.A: Defining Engineering Problems** ● 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. (secondary to K-PS2-2)	● Why do scientists like to play soccer? ● How can you design a simple way to change the speed or direction of an object using a push or pull from another object?
Knowledge ***Students will know…***	**Academic Vocabulary**
● 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.	● **Force** ● **Motion** ● **Push** ● **Pull** ● **Strenth** ● **Direction** ● **Start** ● **Stop** ● **Object** ● **Change** ● **Compare** ● **Test** ● **Collide**

Skills

Students will be able to…

- With guidance, design simple tests to gather evidence to support or refute ideas about cause-and-effect relationships.
- Analyze data from tests of an object or tool to determine if it works as intended.
- Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.
- Analyze data to determine whether a design solution works as intended to change the speed or direction of an object with a push or a pull.
- Examples of problems requiring a solution could include having a marble or other object move a certain distance, follow a particular path, and knock down other objects.
- Examples of solutions could include tools such as a ramp to increase the speed of the object and a structure that would cause an object such as a marble or ball to turn. (Assessment does not include friction as a mechanism for change in speed.)

21ST Century/ Interdisciplinary Themes	21st Century Skills
Global Awareness Financial, Business, & Entrepreneurial Literacy Civic Literacy **Environmental Literacy** Health Literacy	**Creativity & Innovation** **Communication & Collaboration** **Media Literacy** **Critical Thinking & Problem Solving** **Information Literacy** **Information, Communication, & Technology** **Life & Career Skills**

Stage 2- Assessment Evidence
from the NJ DOE Model Curriculum

What happens if you push or pull an object harder?

During this unit of study, students apply an understanding of the effects of different strengths or different directions of pushes and pulls on the motion of an object to analyze a design solution. The crosscutting concept of cause and effect is called out as the organizing concept for this disciplinary core idea. Students are expected to demonstrate grade-appropriate proficiency in planning and carrying out investigations and analyzing and interpreting data. Students are also expected to use these practices to demonstrate understanding of the core ideas.

Summative Assessment 1:

- ***Standards:*** **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.** [Clarification Statement: Examples of pushes or pulls could include a string attached to an object being pulled, a person pushing an object, a person stopping a rolling ball, and two objects colliding and pushing on each other.] [Assessment Boundary: Assessment is limited to different relative strengths or different directions, but not both at the same time. Assessment does not include non-contact pushes or pulls such as those produced by magnets.] (K-PS2-1)
- ***Overview:*** Students will test items to see if they will stop a car at the bottom of a race track.
- ***Assessment:*** Will it Stop the Car Investigation Recording Sheet
- ***Resources:*** https://betterlesson.com/lesson/635423/stop-it-exploring-forces-on-moving-objects, pencil, matchbox cars, track, folded papers, cotton balls, books, sponges, and blocks

Stage 2- Assessment Evidence Continued

Summative Assessment 2:

- ***Standards:*** **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.** [Clarification Statement: Examples of problems requiring a solution could include having a marble or other object move a certain distance, follow a particular path, and knock down other objects. Examples of solutions could include tools such as a ramp to increase the speed of the object and a structure that would cause an object such as a marble or ball to turn.] [Assessment Boundary: Assessment does not include friction as a mechanism for change in speed.] (K-PS2-2)
- ***Overview:*** Students will work in groups to use classroom objects to fill paper boxes with classroom materials in order to get a ball to change its direction.
- ***Assessment:*** Students will test their boxes to see if it makes the ball change direction. Students will then explain why their ball changed direction or why it did not.
- ***Resources:*** https://betterlesson.com/lesson/635812/turn-turn-turn-a-simple-assessment, heavy ball, paper boxes, tape, classroom objects to go into the boxes

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Summative Assessment 3

- ***Standards:*** **Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.** (K-2-ETS1-3)
- ***Overview:*** Students will compare the strengths and weaknesses of how the milk cart or a plastic container performs to get the milk for the class from the cafeteria each day.
- ***Assessment:*** Students will analyze the data and discuss with partners.
- ***Resources:*** Milk cart, milk, plastic container, partner

Formative Assessments	*Student Self-Assessment*	*Common Assessments*
• Projects • Project and problem-based learning activities • Graphic organizers • Collaborative learning projects • Formative checks (whiteboards) • Center Activities • Class discussion and participation in activities • Teacher observation • Performance tasks • Probes	• Reflection activities (on the learning goal, on summative assessments, on collaborative work, on projects) • Responses to inquiry-based questions • Think-pair-share activities • Student revising knowledge throughout the unit	• Summative assessments

Stage 3- Learning Plan

Suggested Learning Activities

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.

Suggested Learning Activities Continued

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.

Resources/Instructional Materials

(articles, novels, websites, books, magazines, art, media)

- Rookie Read-About Science--Physical Science: Push and Pull by Patricia J. Murphy
- And Everyone Shouted, "Pull!" A First Look at Forces and Motion by Claire Liewellyn
- Motion Push and Pull, Fast and Slow by Darlene Stille
- Push Pull-Changing Direction: Students investigate the interactions between colliding objects using pushes and pulls. Students play a game of kickball and observe how the ball is pushed, pulled, started, stopped, or collided with other objects and how it changed position and speed. As a group, students will then brainstorm about other objects being pushed, pulled or colliding and then choose one of those objects to investigate.
- Marble Roll: This is an assessment probe from the book Uncovering Student Ideas in Primary Science Vol. 1 that is used to elicit children's descriptions of motion. The probe is designed to reveal how students describe the path of a moving object as it leaves a winding track.

Resources/Instructional Materials Continued

- **NSTA Web Seminar: Teaching NGSS in Elementary School—Kindergarten**
  The seminar was led by expert teachers Carla Zembal-Saul, Professor of Science Education, Penn State University; Mary Starr, Executive Director, Michigan Mathematics and Science Centers Network; and Kathy Renfrew, K-5 Science Coordinator, VT Agency of Education. Carla, Mary and Kathy engaged with participants to gauge their familiarity with *NGSS* for kindergarten, and provided a number of example activities and videos on how to implement it, e.g., different approaches to teaching weather and climate core ideas. The web seminar was then wrapped up by Ted Willard, who suggested a number of resources and events for participants to further develop their understanding of *NGSS* for kindergarten, as well as other grade levels.
- **NSTA Web Seminar: Teaching NGSS in K-5: Constructing Explanations from Evidence**-Carla Zembal-Saul, Mary Starr, and Kathy Renfrew, provided an overview of the *NGSS* for K-5th grade. The web seminar focused on the three dimensional learning of the *NGSS*, while introducing CLAIMS-EVIDENCE-REASONING (CER) as a framework for introducing explanations from evidence. The presenters highlighted and discussed the importance of engaging learners with phenomena, and included a demonstration on using a KLEWS chart to map the development of scientific explanations of those phenomena.
- **NSTA Web Seminar: Motion and Stability: Forces and Interactions**
  The presenters were Alicia Alonzo from Michigan State University and Alex Robinson, a teacher at Thornapple Kellogg High School in Middleville, Michigan. This was the fourth web seminar in a series focused on the disciplinary core ideas that are part of the *Next Generation Science Standards (NGSS)*. The program featured strategies for teaching about physical science concepts that answer questions such as "How can one explain and predict interactions between objects and within systems of objects?" Dr. Alonzo began the presentation by providing an overview of how disciplinary core ideas fit into the overall structure of *NGSS*. Then she and Mr. Robinson discussed common student preconceptions related to Motion and Stability: Forces and Interactions. They also showed how this disciplinary core idea progresses across grade bands. Participants had the opportunity to ask questions and discuss ideas for classroom application with other participating teachers.

Technology Resources

- www.abetterlesson.com
- www.brainpopjr.com
- https://mysteryscience.com/
- http://kids.nationalgeographic.com/
- http://www.learningliftoff.com/kindergarten-science-learning-game-push-pull/#.WYh_EFQrK70

Accommodations & Modifications
for Spec. Ed., ELL, GT, & At Risk Students

- Allow oral responses
- Allow verbalization before writing
- Use audio materials when necessary
- Modify homework assignments
- Read tests aloud
- Provide math manipulatives as necessary
- Restate, reword, clarify directions
- Re-teach concepts using small groups
- Provide educational “breaks” as necessary
- Expanding time for free reading
- Chunking Content
- Calculator
- Use mnemonic devices
- Provide a cueing system
- Untimed and/or extended test taking time
- Shorten assignments to focus on mastery concept
- Leveled Reading Materials
- Acronyms
- Graphic Organizers
- Notes Provided
- Check agenda book for parent(s) communication
- Read directions aloud
- Assignment, Project, and Assessment Modification Based on Individual Student Needs
- Speech to Text/Text to Speech Features in Google Apps
- Technology assisted instruction
- Preferential seating utilized
- Redirect student(s) as necessary
- Student choice for project or approach to assignment
- Inquiry-Based Learning
- Genius Hour

Adapted from: Wiggins, Grant and J. McTighe. (1998). *Understanding by Design*, Association for Supervision and Curriculum Development and 5E NGSS Lesson Plan from www.lewiscenter.org and NJ Science Model Curriculum athttp://www.nj.gov/education/modelcurriculum/sci/7.shtml

Science- Kindergarten

Unit # 3	**Title:** Effects of the Sun	**Pacing:** 15 days

Stage 1- Desired Results

Established Goals/NJSLS Standards

Next Generation Science Standards/NJSLS

PS3.B: Conservation of Energy and Energy Transfer

- **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)

ETS1.A: Defining and Delimiting Engineering Problems

- **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)

English Language Arts Standards:

- 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
- 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

Mathematics Standards:

- 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. (K-2-ETS1-1),(K-2-ETS1-3) 2.MD.D.10

Enduring Understandings ***Students will understand…***	**Essential Questions** ***Students will consider...***
PS3.B: Conservation of Energy and Energy Transfer ● Sunlight warms Earth's surface. (K-PS3-1),(K-PS3-2) **ETS1.A: Defining and Delimiting Engineering Problems** ● A situation that people want to change or create can be approached as a problem to be solved through engineering. (K-2-ETS1-1) ● 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)	● How does sunlight affect the playground? ● Imagine that we have been asked to design a new playground. How would we keep the sand, soil, rocks, and water found on the playground cool during the summer?
Knowledge ***Students will know…***	**Academic Vocabulary**
● Scientists use different ways to study the world. ● Events have causes that generate observable patterns. ● Sunlight warms Earth's surface. ● 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.	● Sunlight ● Warms ● Surface ● Earth ● Design ● Problem ● Solution ● Compare ● Test ● Shadow ● Star

Skills

Students will be able to…

- Observe patterns in events generated by cause-and-effect relationships.
- Make observations (firsthand or from media) to collect data that can be used to make comparisons.
- Make observations to determine the effect of sunlight on Earth's surface. (Assessment of temperature is limited to relative measures such as warmer/cooler.)
- Examples of Earth's surface could include:
    - Sand
    - Soil
    - Rocks
    - Water
- Observe patterns in events generated by cause-and-effect relationships.
- 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 (e.g., umbrellas, canopies, tents) that will reduce the warming effect of sunlight on an area.

21ST Century/ Interdisciplinary Themes	21st Century Skills
Global Awareness Financial, Business, & Entrepreneurial Literacy Civic Literacy **Environmental Literacy** Health Literacy	**Creativity & Innovation** **Communication & Collaboration** **Media Literacy** **Critical Thinking & Problem Solving** **Information Literacy** **Information, Communication, & Technology** **Life & Career Skills**

Stage 2- Assessment Evidence
from the NJ DOE Model Curriculum

How can we use science to keep a playground cool in the summertime?

During this unit of study, 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.

Summative Assessment 1:

- ***Standards:*** **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)
- ***Overview:*** Students will journal and record their observations regarding the effect of sunlight on Earth's surfaces (including sand, soil, rocks, and water.)
- ***Assessment:*** Completion using sticker system
- ***Resources:*** Notebook, pencil

Summative Assessment 2:

- ***Standards:*** **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)
- ***Overview:*** Students will create a structure to try and keep an ice cube from melting.
- ***Assessment:*** Students will test their structures and determine how they could have better created their structures.
- ***Resources:*** https://betterlesson.com/lesson/644795/a-place-in-the-shade-an-engineering-challenge, paper, pencil, black and white construction paper, popsicle sticks, tongue depressors, making tape, ice cubes

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Summative Assessment 3:

- ***Standards:*** **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)
- ***Overview:*** Students will evaluate their original structure to try and keep an ice cube from melting and work to improve their designs.
- ***Assessment:*** Students will test their structures and determine if they were successful and why.
- ***Resources:*** https://betterlesson.com/lesson/645370/still-looking-for-shade-a-design-and-engineering-challenge-continues, paper, pencil, black and white construction paper, popsicle sticks, tongue depressors, making tape, ice cubes

Summative Assessment 4:

- ***Standards:*** **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)
- ***Overview:*** Students will analyze their two structures to try and keep an ice cube from melting and determine how the shape of the structure helped it function to keep the ice cube from melting.
- ***Assessment:*** Completion using sticker system on the sketches of the students.
- ***Resources:*** paper, pencil, student created structures

Formative Assessments	***Student Self-Assessment***	***Common Assessments***
• Projects • Project and problem-based learning activities • Graphic organizers • Collaborative learning projects • Formative checks (whiteboards) • Center Activities • Class discussion and participation in activities • Teacher observation	• Reflection activities (on the learning goal, on summative assessments, on collaborative work, on projects) • Responses to inquiry-based questions • Think-pair-share activities • Student revising knowledge throughout the unit	• Summative assessments • Performance tasks • Probes • Teacher observation and documentation

Stage 3- Learning Plan

Suggested Learning Activities

From the NJ DOE Model Curriculum

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 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.

Suggested Learning Activities Continued

Group 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.

Resources/Instructional Materials

(articles, novels, websites, books, magazines, art, media)

- 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 or neighborhood, but it can be a simple walk around the classroom.
- A Big Star: This reading passage that explains what the sun is and that it provides heat to the Earth. This activity comes with comprehension and critical thinking questions.
- The Warmth of the Sun: This lesson helps students broaden their understanding of the sun, particularly its critical role in warming the land, air, and water around us.
- The Sun Lesson Plan: This lesson plan is adaptable to several grade band levels. The adjustments are included in the lesson plan along with suggestions for extension activities.
- 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, The lesson is linked to NASA's MESSENGER spacecraft in its voyage to and around Mercury. This lesson is designed to last 4 or more days. There are four different activities within the lesson. The teacher will need to gather some materials prior to beginning the lesson.
- Shadow Smile! - Part 6 | Sid the Science Kid: In this song, Miss Susie teaches the class about shadows and the necessary shade they provide for people and animals in the heat! Learn how shadows are a result of an object getting in the way of the path of the sun and that the shadow it casts over the ground provides shade.
- **Using the *NGSS* Practices in the Elementary Grades**: The presenters were Heidi Schweingruber from the National Research Council, Deborah Smith from Penn State University, and Jessica Jeffries from State College Area School District. In this seminar the presenters talked about applying the scientific and engineering practices described in A Framework for K–12 Science Education in elementary-level classrooms.
- **Teaching *NGSS* in K-5: Constructing Explanations from Evidence**: Carla Zembal-Saul, Mary Starr, and Kathy Renfrew, provided an overview of the NGSS for K-5th grade. The web seminar focused on the three dimensional learning of the NGSS, while introducing CLAIMS-EVIDENCE-REASONING (CER) as a framework for introducing explanations from evidence. The presenters highlighted and discussed the importance of engaging learners with phenomena, and included a demonstration on using a KLEWS chart to map the development of scientific explanations of those phenomena. View the resource collection.
- **Appendix I – Engineering Design in the *NGSS***: Appendix I provides important information about how engineering design plays a key role in science education. Providing students a foundation in engineering design allows them to better engage in and aspire to solve the major societal and environmental challenges they will face in the decades ahead. We anticipate that the insights gained and interests provoked from studying and engaging in the practices of science and engineering during their K-12 schooling should help students see how science and engineering are instrumental in addressing major challenges that confront society today, such as generating sufficient energy, preventing and treating diseases, maintaining supplies of clean water and food, and solving the problems of global environmental change (NRC 2012, p. 9).
- Mr. Sun Song
- The Sun our Nearest Star by Franklyn M. Branley
- What Makes a Shadow? by Clyde Robert Bulla

Resources/Instructional Materials Continued

- ***NGSS* Core Ideas: Energy**: The presenter was Jeff Nordine of the San Antonio Children's Museum. Ramon Lopez from the University of Texas at Arlington provided supporting remarks. The program featured strategies for teaching about physical science concepts that answer questions such as "How is energy transferred between objects or systems?" and "What is meant by conservation of energy?"
  Dr. Nordine began the presentation by talking about the role of disciplinary core ideas within NGSS and the importance of energy as a core idea as well as a crosscutting concept. He then shared physicist Richard Feynman's definition of energy and related it to strategies for teaching about energy. Dr. Nordine talked about the elements of the energy core idea and discussed common student preconceptions. Visit the resource collection.
- Energy from the Sun by Allan Fowler

Technology Resources

- www.abetterlesson.com
- www.brainpopjr.com
- https://mysteryscience.com/
- http://kids.nationalgeographic.com/

Accommodations & Modifications
for Spec. Ed., ELL, GT, & At Risk Students

- Allow oral responses
- Allow verbalization before writing
- Use audio materials when necessary
- Modify homework assignments
- Read tests aloud
- Provide math manipulatives as necessary
- Restate, reword, clarify directions
- Re-teach concepts using small groups
- Provide educational “breaks” as necessary
- Expanding time for free reading
- Chunking Content
- Calculator
- Use mnemonic devices
- Provide a cueing system
- Untimed and/or extended test taking time
- Shorten assignments to focus on mastery concept
- Leveled Reading Materials
- Acronyms
- Graphic Organizers
- Notes Provided
- Check agenda book for parent(s) communication
- Read directions aloud
- Assignment, Project, and Assessment Modification Based on Individual Student Needs
- Speech to Text/Text to Speech Features in Google Apps
- Technology assisted instruction
- Preferential seating utilized
- Redirect student(s) as necessary
- Student choice for project or approach to assignment
- Inquiry-Based Learning
- Genius Hour

Adapted from: Wiggins, Grant and J. McTighe. (1998). *Understanding by Design*, Association for Supervision and Curriculum Development and 5E NGSS Lesson Plan from www.lewiscenter.org and NJ Science Model Curriculum athttp://www.nj.gov/education/modelcurriculum/sci/7.shtml

Science- Kindergarten

Unit # 4	**Title:** Basic Needs of Living Things	**Pacing:** 20 days

Stage 1- Desired Results

Established Goals/NJSLS Standards

Next Generation Science Standards/NJSLS

LS1.C: Organization for Matter and Energy Flow in Organisms

- **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)

ESS3.A: Natural Resources

- **Use a model to represent the relationship between the needs of different plants and animals (including humans) and the places they live.** [Clarification Statement: Examples of relationships could include that deer eat buds and leaves, therefore, they usually live in forested areas; and, grasses need sunlight so they often grow in meadows. Plants, animals, and their surroundings make up a system.] (K-ESS3-1)

ESS2.E: Biogeology

- **Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.** [Clarification Statement: Examples of plants and animals changing their environment could include a squirrel digs in the ground to hide its food and tree roots can break concrete.] (K-ESS2-2)

English Language Arts Standards:

- 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

Mathematics Standards:

- 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

Enduring Understandings ***Students will understand…***	**Essential Questions** ***Students will consider...***
LS1.C: Organization for Matter and Energy Flow in Organisms ● All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow. (K-LS1-1) **ESS3.A: Natural Resources** ● Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do. (K-ESS3-1) **ESS2.E: Biogeology** ● Plants and animals can change their environment. (K-ESS2-2)	● What do animals need to survive? ● What do plants need to survive? ● How do plants and animals (including humans) interact with the environment to meet their needs?
Knowledge ***Students will know…***	**Academic Vocabulary**
● Animals need water and food in order to live and grow. They get their food from plants or animals. ● Plants need water and light to live and grow. ● Living things need water, air, and resources from the land. ● Animals, plants, and humans live in places that have the things they need. ● Humans use natural resources for everything they do. ● Asking questions, making observations, and gathering information are helpful in analyzing data and identifying the needs of different things. ● Plants and animals can change their environments to meet their needs.	● Animal ● Human ● Plant ● Live ● Survive ● Grow ● Living things ● Non-living things ● Air ● Resources ● Land ● Needs ● Environment ● Habitat
Skills ***Students will be able to…***	
● Use observations to describe what plants and animals need to survive. ● Observe patterns in events generated by cause-and-effect relationships. ● Understand that animals need to take in food and plants do not. ● Make observations (firsthand or from media) to collect data that can be used to make comparisons. ● Communicate solutions based on observations and information gathered to explain how plants and animals (including humans) can change their environments to meet their needs. ● Ask questions based on observations to find more information about the designed world.	

21ST Century/ Interdisciplinary Themes	21st Century Skills
Global Awareness Financial, Business, & Entrepreneurial Literacy Civic Literacy **Environmental Literacy** Health Literacy	**Creativity & Innovation** **Communication & Collaboration** **Media Literacy** **Critical Thinking & Problem Solving** **Information Literacy** **Information, Communication, & Technology** **Life & Career Skills**

Stage 2- Assessment Evidence
from the NJ DOE Model Curriculum

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

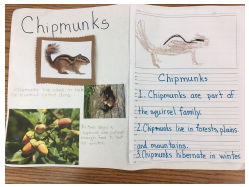
In this unit of study, students develop an understanding of what plants and animals need to survive and the relationship between their needs and where they live. Students compare and contrast what plants and animals need to survive and the relationship between the needs of living things and where they live. The crosscutting concepts of patterns and systems and system models are called out as organizing concepts for these disciplinary core ideas. Students are expected to demonstrate grade-appropriate proficiency in developing and using models, analyzing and interpreting data, and engaging in argument from evidence. Students are also expected to use these practices to demonstrate understanding of the core ideas.

Summative Assessment 1:

- ***Standard:*** **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)
- ***Overview***: With teacher support, students will create a Venn Diagram to describe patterns of what plants and animals need to survive.
- **Assessment**: Students will be able to identify what plants and animals need to survive.
- ***Resources***: Notebook, pencil

Summative Assessment 2:

- ***Standard:*** **Use a model to represent the relationship between the needs of different plants and animals (including humans) and the places they live.** [Clarification Statement: Examples of relationships could include that deer eat buds and leaves, therefore, they usually live in forested areas; and, grasses need sunlight so they often grow in meadows. Plants, animals, and their surroundings make up a system.] (K-ESS3-1)
- ***Overview:*** Students will create a research project at home about an animal that lives in Birch Grove Park.
- ***Assessment:*** Students will present their projects in front of the class. Completion using sticker system.
- ***Resources:*** directions, sample project sent home, construction paper, lined paper,



Summative Assessment 3:

- ***Standard:*** **Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.** [Clarification Statement: Examples of plants and animals changing their environment could include a squirrel digs in the ground to hide its food and tree roots can break concrete.] (K-ESS2-2)
- ***Overview:*** Students will read the book, Muncha! Muncha! Muncha! by Candace Fleming. In the book, the bunnies keep getting into Mr. McGreely's vegetable garden and eating his vegetables. Students will design and build something to prevent the bunnies from getting into the vegetable garden.
- ***Assessment:*** Teacher observation of designs and completion using sticker system.
- ***Resources:*** http://www.k12science.org/curriculum/engineering/garden.html, Muncha! Muncha! Muncha! by Candace Fleming, Construction paper, Scissors, glue, tape, crayons, markers, playdough, index cards, cardboard, popsicle sticks, tongue depressors, yarn, string, paper towel tubes, pipe cleaners, straws, plastic wrap, foil, small vegetable gardens – paper plates with lettuce and carrots, pop-up bunnies

Formative Assessments	***Student Self-Assessment***	***Common Assessments***
• Projects • Project and problem-based learning activities • Graphic organizers • Collaborative learning projects • Formative checks (whiteboards) • Center Activities • Class discussion and participation in activities • Teacher observation	• Reflection activities (on the learning goal, on summative assessments, on collaborative work, on projects) • Responses to inquiry-based questions • Think-pair-share activities • Student revising knowledge throughout the unit	• Summative assessments • Performance tasks • Probes • Teacher observation and documentation

Stage 3- Learning Plan

Suggested Learning Activities

Many students come to class with experience caring for living things such as family pets, houseplants, gardens, and even younger siblings. Teachers can begin IS1 with activities that allow students to share these experiences with one another. By the end of Unit 4, they should be able to relate these anecdotes to a few key principles about living organisms.

The DCIs for this unit are developmentally appropriate for kindergarten. Students learn that plants need water and light to live and grow and that animals need food. Animals obtain food from plants or other animals. Students also learn that organisms survive and thrive in places that have the resources they need. Simply knowing these core ideas is not sufficient for meeting the PE; K-LS1-1 requires that students identify patterns in the needs of different organisms. It is not possible to identify a pattern unless students observe and compare multiple observations of living things. The process of integrating multiple observations and looking for patterns constitutes analyzing data in the K–2 grade band.

Students can observe living things directly in the classroom, on the schoolyard, and through media. Media (including books, print articles, and digital resources) expose students to a wide variety of organisms. Classroom pets such as birds, rodents, reptiles, fish, or even ant farms allow students to notice consistent patterns over time (i.e., the fish needs to be fed every day or the rodent spends most of its waking time eating). (Note: With pets, teachers must be mindful of district policies and allergies.) Students can observe plants, insects, and other critters on their schoolyard. They can also grow their own seeds in cups or in an outdoor garden space.

Once students have identified patterns about what plants need to survive, they can test out their idea by taking several identical plants that have already sprouted and deprive them of water, light, both, or neither. Based on their model of what plants need, which do they predict will survive? Students will plan their own investigation of this question in grade two (2-LS2-1).

Suggested Learning Activities Continued

While all plants and all animals share common features, there are also important differences between types of organisms. Different plants require different amounts of water (such as a fern that requires lots of water versus a cactus that requires very little). Different animals prefer different types of foods. For example, some animals only eat plants while others only eat animals, and others eat both. Students can use their background knowledge and observations from media to match specific animals to the food sources that they eat. Teachers can then ask questions such as, "What will happen if a deer that eats only grass tries to live in a desert where cacti are the main plants?"

Students should begin to group plants and animals together based upon their similar environmental needs (water, sunlight) and the availability of their preferred food sources. For example, students might read a story about the grasslands of Africa where a gazelle eats grass and then a lion eats the gazelle. Students should be able to explain [SEP-6] why each animal lives in that particular spot in Africa. Their answers should identify a specific need that is met by that location (either an environmental condition such as, "the grass lives there because it gets the sunlight and water that it needs," or a food source such as, "the lion lives there because it eats the gazelles there."). Once students master the relationships of simple groups of organisms like the African grassland, teachers can focus on living things close to their school. What plants grow well in the weather in their city? What animals will eat those plants, and what animals will eat those animals?

Students will build on their model of the relationship between the needs of organisms and their environmental conditions in grade three when they explore what happens when the environment changes (3-LS4-4) and in grade five when they examine the specific flow of energy and matter (5-LS2-1).

Guiding Questions:

- How can you tell if something is alive?
- What do animals and plants need to survive?
- Where do organisms live and why do they live there?

<u>Example Instructional Sequence</u>

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 non-living things. Direct students to sort the pictures into two groups: living and non-living. 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 making 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.

Suggested Learning Activities Continued

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.

Students need opportunities make observations; then, with adult guidance, they can use their observations as evidence to support a claim about how living things can change its environment to meet its needs.

Resources/Instructional Materials

(articles, novels, websites, books, magazines, art, media)

- From Seed to Plant by Gail Gibbons
- Seed to Plant (National Geographic)
- Let's -Read-and-Find-Out Science: Sleep is for Everyone by Paul Showers
- Tell Me, Tree by Gail Gibbons
- Our Big Home: An Earth Poem by Linda Glaser
- My First Book of Living Things (Scholastic)
- Muncha! Muncha! Muncha! by Candace Fleming
- The Needs of Living Things: This lesson plan has one level for Grades K-2 and another level for Grades 3-5. Students will learn about what plants and animals need to survive and how habitats support those needs. They will also learn about how organisms can change their environment.
- Living Things and Their Needs: This is an excellent resource that provides a Teacher Guide, videos, reading resources, and student activity sheets. The objective of the lessons is for students to learn about living organisms and what they need to survive. These lessons can easily be taught as an interdisciplinary set of learning experiences.
- How do living things Interact: This unit plan is about unit plan about living things and environmental interactions.
- 5E Science Lesson Plan: This Prezi presentation describes lesson ideas that support students' understanding of living organisms. Lessons also provide an opportunity for students to identify patterns that help them determine similarities and differences between plants and animals.

Resources/Instructional Materials Continued

- Curious George: Paper Towel Plans: This video from Curious George shows students helping bean seeds sprout outside of soil by meeting their essential needs for moisture, temperature, air, and light. The children place the beans and a wet paper towel inside a zippered plastic bag and leave them undisturbed in a warm, well-lighted place. After two weeks, the students return and observe that the beans have sprouted and, like apple seeds, will one day grow to be fully developed plants.
- Think Garden: The Importance of Water: This video from KET's Think Garden collection explores why plants need water to survive, and how they tell us they're thirsty. Learn about the signs plants give when they've had too much or too little water and the part water plays in the process of photosynthesis. See a quick, easy-to-understand animation explaining the water cycle and transpiration process. Also find out how to improve water quality with rain gardens and how to conserve water with rain barrels. This video is available in both English and Spanish audio, along with corresponding closed captions.
- Journal Article: Assessing Students' Ideas About Plants: This article contains an interview protocol that will help you gather information about your elementary students' ideas related to plants. By implementing the protocol, you will be able to discover what kinds of organisms your students think are plants and identify what students consider important for plant growth. Reproducible pictures of organisms and items that plants need for growth are included.
- Journal Article: The Early Years: The Sun's Energy: Understanding the connection between the Sun's energy and sustaining life is difficult for preschoolers, but learning about these concepts through both long and short-term activities captures children's short attention spans. Activities such as growing plants in sunlight and without light, playing with light and shadow, and making "sun prints" explore light—in this case how the Sun's light is different from lamplight.

Technology Resources

- www.abetterlesson.com
- www.brainpopjr.com
- https://mysteryscience.com/
- http://kids.nationalgeographic.com/

Accommodations & Modifications
for Spec. Ed., ELL, GT, & At Risk Students

- Allow oral responses
- Allow verbalization before writing
- Use audio materials when necessary
- Modify homework assignments
- Read tests aloud
- Provide math manipulatives as necessary
- Restate, reword, clarify directions
- Re-teach concepts using small groups
- Provide educational "breaks" as necessary
- Expanding time for free reading
- Chunking Content
- Calculator
- Use mnemonic devices
- Provide a cueing system
- Untimed and/or extended test taking time
- Shorten assignments to focus on mastery concept
- Leveled Reading Materials
- Acronyms
- Graphic Organizers
- Notes Provided
- Check agenda book for parent(s) communication
- Read directions aloud
- Assignment, Project, and Assessment Modification Based on Individual Student Needs
- Speech to Text/Text to Speech Features in Google Apps
- Technology assisted instruction
- Preferential seating utilized
- Redirect student(s) as necessary
- Student choice for project or approach to assignment
- Inquiry-Based Learning
- Genius Hour

Adapted from: Wiggins, Grant and J. McTighe. (1998). *Understanding by Design*, Association for Supervision and Curriculum Development and 5E NGSS Lesson Plan from www.lewiscenter.org and NJ Science Model Curriculum athttp://www.nj.gov/education/modelcurriculum/sci/7.shtml

Science- Kindergarten

Unit # 5	**Title:** Basic Needs of Humans	**Pacing:** 15 days

Stage 1- Desired Results

Established Goals/NJSLS Standards

Next Generation Science Standards/NJSLS

ESS3.C: Human Impacts on Earth Systems

- Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.* [Clarification Statement: Examples of human impact on the land could include cutting trees to produce paper and using resources to produce bottles. Examples of solutions could include reusing paper and recycling cans and bottles.] (K-ESS3-3)

ETS1.A: Defining and Delimiting Engineering Problems

- 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)

English Language Arts Standards:

- 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-ESS3-3) W.K.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) W.2.6
- Recall information from experiences or gather information from provided sources to answer a question. (K-2-ETS1-1) W.2.8

Mathematics Standards:

- Reason abstractly and quantitatively. (K-2-ETS1-1) MP.2
- Model with mathematics. (K-2-ETS1-1) MP.4
- Use appropriate tools strategically. (K-2-ETS1-1) 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. (K-2-ETS1-1) 2.MD.D.10

Enduring Understandings ***Students will understand…***	**Essential Questions** ***Students will consider...***
ESS3.C: Human Impacts on Earth Systems ● Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things. (K-ESS3-3) **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.(secondary) (K-ESS3-3) **ETS1.A: Defining and Delimiting Engineering Problems** ● A situation that people want to change or create can be approached as a problem to be solved through engineering. (K-2-ETS1-1) ● 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)	● How can humans reduce their impact on the land, water, air, and other living things in the local environment?
Knowledge ***Students will know…***	**Academic Vocabulary**
● Events have causes 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.	● 5 R's: Reduce, Reuse, Recycle, Reject, React ● Impact ● Land ● Water ● Air ● Living things ● Non-living things ● Questions ● Observations ● Problem ● Solution ● Choices ● Environment
Skills ***Students will be 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.	

21ST Century/ Interdisciplinary Themes	21st Century Skills
Global Awareness Financial, Business, & Entrepreneurial Literacy Civic Literacy **Environmental Literacy** Health Literacy	**Creativity & Innovation** **Communication & Collaboration** **Media Literacy** **Critical Thinking & Problem Solving** **Information Literacy** **Information, Communication, & Technology** **Life & Career Skills**

Stage 2- Assessment Evidence
from the NJ DOE Model Curriculum

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

In this unit of study, students develop an understanding of what humans need to survive and the relationship between their needs and where they live. The crosscutting concept of cause and effect is called out as the organizing concept for the disciplinary core ideas. Students demonstrate grade-appropriate proficiency in asking questions and defining problems, and in obtaining, evaluating, and communicating information. Students are also expected to use these practices to demonstrate understanding of the core ideas.

Summative Assessment 1

- ***Standard:*** **Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.*** [Clarification Statement: Examples of human impact on the land could include cutting trees to produce paper and using resources to produce bottles. Examples of solutions could include reusing paper and recycling cans and bottles.] (K-ESS3-3)
- ***Overview:*** Students will draw pictures to show solutions that will reduce the impact of humans on the environment.
- ***Assessment:*** Completion using sticker system
- ***Resources:*** Paper, pencil, crayons

Summative Assessment 2:

- ***Standard:*** **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)
- ***Overview:*** Students will brainstorm ideas to reduce the amount of paper we use. Then we will reuse paper by making paper.
- ***Assessment:*** Students will make paper from paper.
- ***Resources:*** https://betterlesson.com/lesson/638906/paper-to-paper, clear bottle (3oz travel size), 2 sieves (screens), sponge, self-stick notes, newspaper, one-ply toilet tissue, clear basin (1lb deli container), waxed paper (cut into 6x6 pieces)

Formative Assessments	***Student Self-Assessment***	***Common Assessments***
• Projects • Project and problem-based learning activities • Graphic organizers • Collaborative learning projects • Formative checks (whiteboards) • Center Activities • Class discussion and participation in activities • Teacher observation	• Reflection activities (on the learning goal, on summative assessments, on collaborative work, on projects) • Responses to inquiry-based questions • Think-pair-share activities • Student revising knowledge throughout the unit	• Summative assessments • Performance tasks • Probes • Teacher observation and documentation

Stage 3- Learning Plan

Suggested Learning Activities

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 lifestyle. 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 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; or
    - 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, drawings, 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 humans 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.

Resources/Instructional Materials
(articles, novels, websites, books, magazines, art, media)

- 10 Things You Can Do To Reduce, Reuse, Recycle by Elizabeth Weitzman
- Why Should I Recycle? by Jen Green
- Humans on Earth: This is a 3.5 minute narrated video explaining the use of natural resources to supply the needs of humans, and solutions for preserving them.
- The Clean Water Book: Choices for Resource Water Protection: This book is available from the New Jersey Department of Environmental Protection.
- Recycling Manual for New Jersey Schools: This manual will guide school personnel through a step-by-step process of setting up a recycling program in the school. It provides all the necessary tools for designing and implementing a viable and comprehensive program in private, public and parochial institutions.
- Speakers Program: The New Jersey Department of Environmental Protection (DEP) fields requests for public speakers, classroom presentations and exhibitors regarding the various environmental topics, programs and services that are administered by the agency.
- Practice the 5 R's – Poster
- The USGS Water Science School: Welcome to the U.S. Geological Survey's (USGS) Water Science School. We offer information on many aspects of water, along with pictures, data, maps, and an interactive center where you can give opinions and test your water knowledge.
- *Framework for K-12 Science Education*, **Developing and Using Models**: This section of the Framework provides a deeper explanation of what it means for students to develop and use models. Modeling is especially important when concepts are too large or too small for students to have direct experience.
- **APPENDIX F: Science and Engineering Practices in the NGSS:** The Framework uses the term "practices," rather than "science processes" or "inquiry" skills for a specific reason: We use the term "practices" instead of a term such as "skills" to emphasize that engaging in scientific investigation requires not only skill but also knowledge that is specific to each practice. (NRC Framework, 2012, p. 30). Appendix F provides further clarification of each science and engineering practice as well as specific details about what each looks like in each grade band.
- ***NGSS* Crosscutting Concepts: Stability and Change:** The presenter was Brett Moulding, director of the Partnership for Effective Science Teaching and Learning. Mr. Moulding began the web seminar by defining stability and change and discussing the inclusion of this concept in previous standards documents such as the National Science Education Standards (NSES). Participants brainstormed examples of science phenomena that can be explained by using the concept of stability and change. Some of their ideas included Earth's orbit around the Sun, carrying capacity of ecosystems, and replication of DNA. Mr. Moulding then discussed the role of stability and change within NGSS. Participants again shared their ideas in the chat, providing their thoughts about classroom implementation of this crosscutting concept.

Technology Resources

- www.abetterlesson.com
- www.brainpopjr.com
- https://mysteryscience.com/
- http://kids.nationalgeographic.com/

Accommodations & Modifications
for Spec. Ed., ELL, GT, & At Risk Students

- Allow oral responses
- Allow verbalization before writing
- Use audio materials when necessary
- Modify homework assignments
- Read tests aloud
- Provide math manipulatives as necessary
- Restate, reword, clarify directions
- Re-teach concepts using small groups
- Provide educational "breaks" as necessary
- Expanding time for free reading
- Chunking Content
- Use mnemonic devices
- Provide a cueing system
- Untimed and/or extended test taking time
- Shorten assignments to focus on mastery concept
- Leveled Reading Materials
- Acronyms
- Graphic Organizers
- Notes Provided
- Check agenda book for parent(s) communication
- Read directions aloud
- Calculator
- Assignment, Project, and Assessment Modification Based on Individual Student Needs
- Speech to Text/Text to Speech Features in Google Apps
- Technology assisted instruction
- Preferential seating utilized
- Redirect student(s) as necessary
- Student choice for project or approach to assignment
- Inquiry-Based Learning
- Genius Hour