Audubon Public Schools

Grade Kindergarten: Science

Curriculum Guide

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Course Description

Grade Kindergarten: Science

Students in kindergarten through fifth grade begin to develop an understanding of the four disciplinary core ideas: physical sciences; life sciences; earth and space sciences; and engineering, technology, and applications of science. In the earlier grades, students begin by recognizing patterns and formulating answers to questions about the world around them. By the end of fifth grade, students are able to demonstrate grade-appropriate proficiency in gathering, describing, and using information about the natural and designed world(s). The performance expectations in elementary school grade bands develop ideas and skills that will allow students to explain more complex phenomena in the four disciplines as they progress to middle school and high school. While the performance expectations shown in kindergarten through fifth grade couple particular practices with specific disciplinary core ideas, instructional decisions should include use of many practices that lead to the performance expectations.

Overview / Progressions

Grade Kindergarten: Science

Overview		**Motion and Stability: Forces and Interactions**	**Energy**	**From Molecules to Organisms: Structures and Processes**	**Earth Systems**	**Earth and Human Activity**
Trimester 1	**Focus standards (Objectives)**		K-PS3-1 K-PS3-2		K-ESS2-1	K-ESS3-2 K-ESS3-3
Trimester 2	**Focus standards (Objectives)**	K-PS2-1 K-PS2-2				
Trimester 3	**Focus standards (Objectives)**			K-LS1-1	K-ESS2-2	K-ESS3-1

Earth Systems	Grade K	Unit 1	Trimester 1 &3

Earth Systems	
Students develop an understanding of patterns and variations in local weather over time. Students develop an understanding of what plants and animals need to survive and the relationship between their needs and where they live. 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.	
Overarching Essential Questions	**Overarching Enduring Understandings**

Trimester 1- K-ESS2-1 What is weather? How does weather affect our daily lives? How do weather patterns help predict the weather? Why do people observe and measure weather conditions? Trimester 3- K-ESS2-2 Why do animals engage in certain behaviors that affect the environment?	Trimester 1- K-ESS2-1 Weather is the combination of sunlight, wind, snow or rain and temperature in a particular time. Weather affects how we dress, what outside activities we can do, foods we eat (based on how crops grow). Patterns can be observed and used as evidence to predict future weather. People observe and measure weather conditions to describe and record the weather and to notice patterns over time. Trimester 3- K-ESS2-2 Some animals change the environment to create shelter, ex beavers build dams for shelter and change water flow in rivers.
Student Learning Objectives	
Use and share observations of local weather conditions to describe patterns over time.	K-ESS2-1
Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs	K-ESS2-2
Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.	K-2-ETS1-1

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

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations. ● Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (K-ESS2-1) **Engaging in Argument from Evidence** Engaging in argument from evidence in K–2 builds on prior experiences and progresses to comparing ideas and representations about the natural and designed world(s). ● Construct an argument with evidence to support a claim. (K-ESS2-2)	**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) **ESS2.E:Biogeology** ● Plants and animals can change their environment. (K-ESS2-2) **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. (secondary to K-ESS2-2)	**Patterns** ● Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (K-ESS2-1) **Systems and System Models** ● Systems in the natural and designed world have parts that work together. (K-ESS2-2) *Connections to Nature of Science* **Science Knowledge is Based on Empirical Evidence** ● Scientists look for patterns and order when making observations about the world. (K-ESS2-1)

Embedded English Language Arts/Literacy and Mathematics

ELA/Literacy

- **W.K.7** Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-LS-1)
- **RL.K.1** With prompting and support, ask and answer questions about key details in a text (e.g., who, what, where, when, why, how). (K-ESS2-2)
- **W.K.1** 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.2** 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.7** 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)

Mathematics

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

Three-Dimensional Teaching and Learning
Trimester 1- K-ESS2-1:

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.

In order to observe patterns in weather, kindergartners will learn that weather is the combination of sunlight, wind, precipitation, and temperature in a particular region at a particular time (See Appendix B, Weather Chart). By observing and recording daily weather events—such as sunny, cloudy, rainy, and windy— students can analyze both qualitative and quantitative data. Recording and analyzing data over time will reveal recognizable weather patterns that can be used to make predictions. Examples of weather patterns may include: Snow and colder temperatures generally occur in the winter. Clouds may bring rain or snow. Rain occurs more often in the spring. Warmer/hotter temperatures occur in the summer. It is generally cooler in the morning and warmer in the afternoon. At this grade level, it is developmentally appropriate to describe temperature in relative terms; therefore, vocabulary words such as hot, warm, cool, cold, and warmer/cooler can be used to describe temperature. Students may also record temperature in degrees Fahrenheit and relate the number of degrees with descriptors such as hot, warm, cold, cool, and warmer and cooler.

<u>Trimester 3- K-ESS2-2:</u>

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 focus 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.

Prior Learning	
Trimester 1- K-ESS2-1 - Types of local weather - The sun is hot - Shade is cool	Trimester 3- K-ESS2-2: - Living and nonliving things - Names of animals - Where animals live

Part A: How can someone predict what the weather will be tomorrow?	
Concepts	**Formative Assessment**
● 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.	*Students who understand the concepts are able to:* What patterns do you observe in our Weather Chart? a) Have we had more sunny days or cloudy days? What is your evidence? b) When was it warmest this week? What is your evidence? c) Is this week sunnier or cloudier than last week? What is your evidence? d) Has the weather gotten warmer or cooler over the past two weeks? What is your evidence? *(Assessment of quantitative observations limited to whole numbers and relative measures such as warmer/cooler.)*

Modifications: ***Teachers identify the modifications that they will use in the unit. The unneeded modifications can then be deleted from the list.(See NGSS Appendix D)***

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

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

Leveraging English Language Arts/Literacy and Mathematics
Trimester 1- K-ESS2-1

English Language Arts/Literacy

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

• With prompting and support, the students ask and answer questions about key details in the text and SciJinks videos.

• Students get information and help each other clarify their thinking as part of the activities. Students demonstrate their understandings of the texts and videos by being able to orally answer such questions as who, what, where, when, why, and how.

With guidance and support from adults and in collaboration with peers, students use digital tools to produce and publish writing about the patterns that they see in their weather observations. Throughout the school year, students recall information from experiences or gather information from provided sources to answer a question. (K-2-ETS1-1)

Mathematics

With adult support, students measure and record various types of weather (e.g., rainfall or snow amounts, relative temperature at different times of the day and over a period of time). They mathematically represent real-world information by organizing their data into simple weather charts and graphs. Kindergarteners attend to the meaning of various quantities using a variety of units of measure and use counting to analyze data and determine patterns in charts and graphs.

By using media resources, students explore how weather scientists represent real-world weather data with picture representations, charts, and graphs. They can use this information to think about how weather scientists use tools to collect and record weather data in order to determine patterns of change.

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

<u>Trimester 3- K-ESS2-2</u>

English Language Arts/Literacy

With adult support, students participate in shared research in order to find examples of ways that plants and animals can change the environment to meet their needs. With prompting and support, students will ask and answer questions about key details in a text. Students, with adult support and/or peer collaboration, can also use simple books and media resources to gather information and then use drawings, simple informative writing (or dictation), and visual displays to represent some of the ways that plants and animals can change the environment to meet their needs. With support from adults, students will recall information from experiences or gather

information provided from sources to answer a question. Students can clarify their ideas, thoughts, and feelings using simple informative writing.

Mathematics

N/A

Samples of Open Education Resources for this unit:

Watching Weather: Students will make their own weather station consisting of actual and simplified versions of real weather equipment. The weather station will consist of a thermometer and a student-made weather vane. They will use that equipment to make observations about the local weather.

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.

Mystery Science: Mystery Science provides ready-made science mysteries for elementary school students. Each lesson contains a central mystery, discussion questions, supplemental reading, and a hands-on activity.

Earth and Human Activity	Grade K	Unit 2	Trimester 1 & 3

Earth and Human Activity

Students extend their 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. Students also develop an understanding of the use of weather forecasting to prepare for and respond to severe weather. 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.

Overarching Essential Questions	Overarching Enduring Understandings
Trimester 3- K-ESS3-1 How are the needs of plants, animals, and humans different in the places they live? Trimester 1- K-ESS3-2; K-ESS3-3 Why is it important to forecast the weather? Why do scientists forecast the weather? What impact do animals and humans have on the environment? How can humans reduce the impact on the land, water and air?	Trimester 3- K-ESS3-1 Plants and animals get what they need to survive from the places they live. Trimester 1- K-ESS3-2; K-ESS3-3 Forecasting future weather helps people prepare for severe weather conditions. Weather Scientists forecast severe weather so that communities can prepare for and respond to these events Animals can effect the environment when building shelter or getting food. .Things that people do to live can affect the world around them. But they can make choices that reduce their

	impacts on the land, water, air, and other living things.
Student Learning Objectives	
Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.	K-ESS3-1
Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.	K-ESS3-2
Communicate solutions that will reduce the impact of climate change and humans on the land, water, air, and/or other living things in the local environment.	K-ESS3-3
Ask questions, make observations, and gather information about a situation people want to change (e.g., climate 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

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Asking Questions and Defining Problems Asking questions and defining problems in grades K–2 builds on prior experiences and progresses to simple descriptive questions that can be tested. ● Ask questions based on observations to find more information about the designed world. (K-ESS3-2)	**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) **ESS3.B: Natural Hazards** ● Some kinds of severe weather are more likely than others in a given	**Cause and Effect** ● Events have causes that generate observable patterns. (K-ESS3-2), (K-ESS3-3) **Systems and System Models** ● Systems in the natural and designed world have parts that work together. (K-ESS3-1) *Connections to Engineering, Technology, and Applications of Science* **Interdependence of Science, Engineering, and Technology** ● People encounter questions about

Developing and Using Models

Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, storyboard) that represent concrete events or design solutions.

- Use a model to represent relationships in the natural world. (K-ESS3-1)

Obtaining, Evaluating, and Communicating Information

Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information.

- Read grade-appropriate texts and/or use media to obtain scientific information to describe patterns in the natural world. (K-ESS3-2)
- Communicate solutions with others in oral and/or written forms using models and/or drawings that provide detail about scientific ideas. (K-ESS3-3)

region. Weather scientists forecast severe weather so that the communities can prepare for and respond to these events. (K-ESS3-2)

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.A: Defining and Delimiting an Engineering Problem

- Asking questions, making observations, and gathering information are helpful in thinking about problems. (secondary to K-ESS3-2)

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

the natural world every day. (K-ESS3-2)

Influence of Engineering, Technology, and Science on Society and the Natural World

- People depend on various technologies in their lives; human life would be very different without technology. (K-ESS3-2)

	people. (secondary to K-ESS3-3)	

Embedded English Language Arts/Literacy and Mathematics
ELA/Literacy • **W.K.7** Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-LS-1) • **RI.K.1** With prompting and support, ask and answer questions about key details in a text. (K-ESS3-2) • **W.K.2** 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) • **SL.K.3** Ask and answer questions in order to seek help, get information, or clarify something that is not understood. (K-ESS3-2) • **SL.K.5** Add drawings or other visual displays to descriptions as desired to provide additional detail. (K-ESS3- 1) **Mathematics** • **MP.2** - Reason abstractly and quantitatively. (K-ESS1-2) • **MP.4** - Model with mathematics. (K-ESS1-2) • **K.CC** Know number names and the count sequence. (K-ESS2-1)

Three-Dimensional Teaching and Learning
Trimester 3- K-ESS3-1

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**.**

<u>Trimester 1- K-ESS3-2;K-ESS3-3</u>

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

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- What kinds of severe weather events tend to occur in New Jersey (e.g., thunderstorms, hurricanes, flooding, snow storms)?

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- What do people do in response to these types of severe weather events?

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- 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?

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 **f**or drinking, washing clothes, showering, washing dishes, watering lawns, and cooking

.

- Gas and oil for cars and buses

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- Electricity to power the appliances in their homes

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- 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:

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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.

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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.

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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.

Prior Learning	
Trimester 3- K-ESS3-1	Trimester 1- K-ESS3-2; K-ESS3-3
- Types of local weather - The sun is hot	- Living and nonliving things - Names of animals

- Shade is cool	- Where animals live

Part A: How does weather forecasting help us to prepare for dangerous weather?	
Concepts	**Formative Assessment**
● 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.	Students who understand the concepts are able to: ● 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.

Part B: How can humans reduce their impact on the land, water, air, and other living things in the local environment?	
Concepts	**Formative Assessment**
● 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	Students who understand the concepts are able to: ● Observe patterns in events generated due to cause-and-effect relationships. ● Communicate solutions with others in oral and/or written forms using models and/or drawings that provide detail about scientific ideas.

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.	● 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.

Modifications: ***Teachers identify the modifications that they will use in the unit. The unneeded modifications can then be deleted from the list.(See NGSS Appendix D)***

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

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

Leveraging English Language Arts/Literacy and Mathematics
Trimester 1- K-ESS3-1 ***English Language Arts/Literacy***

After students observe plants and animals in a variety of settings (e.g., ant farms, fish in an aquarium, plants growing, insects in a jar), the teacher asks them to share their thoughts about what the plants and animals need using expressions like, "I think…" and "I agree with…." To help summarize patterns in the needs of plants and animals, teachers can list all of the "needs" the class has discussed on the board using words and pictures/symbols (e.g., sun, water, food). Students, individually or with a partner, draw a picture of a plant on one half of a piece of paper, and an animal on the other half. Then they draw and/or write the needs of the plant and of the animal next to each picture. Students can verbally complete the sentence frame, "Plants are different from animals because _____." This concept is important because scientists distinguish plants from animals based on what they need: animals need to consume food while plants do not, although plants do need nutrients. Students can represent this idea with a Venn diagram.

Mathematics

N/A

Trimester 1- K-ESS3-2; K-ESS3-3

English Language Arts

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

Mathematics

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

Samples of Open Education Resources for this unit:

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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.

Mystery Science: Mystery Science provides ready-made science mysteries for elementary school students. Each lesson contains a central mystery, discussion questions, supplemental reading, and a hands-on activity.

Energy	Grade K	Unit 3	Trimester 1

Energy 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.	
Overarching Essential Questions	**Overarching Enduring Understandings**
What does sunlight do to the Earth?	Sunlight warms Earth's surface. .
Student Learning Objectives	
Make observations to determine the effect of sunlight on Earth's surface.	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.	K-PS3-2
Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem	K-2ETS1-2

The Student Learning Objectives above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:		
Science and Engineering Practices	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Planning and Carrying Out Investigations Planning and carrying out investigations to answer questions or test solutions to problems in K-2 builds on prior experiences and progresse to simple investigations based on fair tests, which provide data to support explanations or design solutions. • Make observations (firsthand or from media) to collect data that can be used to make comparisons. (K-PS3-1) **Constructing Explanations and Designing Solutions** Constructing explanations and designing solutions in K-2 builds on	**PS3.B: Conservations of Energy and Energy Transfer** • Sunlight warms Earth's surface. (K-PS3-1), (K-PS3-2)	**Cause and Effect** • Events have causes that generate observable patterns. (K-PS3-1), (K-PS3-2) ***Connections to Nature of Science*** **Scientific Investigations Use a Variety of Methods** • Scientists use different ways to study the world. (K-PS3-1)

prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions. ● Use tools and materials provided to design and build a device that solves a specific problem or a solution to a specific problem. (K-PS3-2)		

Embedded English Language Arts/Literacy and Mathematics
ELA/Literacy ● **W.K.7** 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**)** **Mathematics** ● **K.MD.A.2**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)

Three-Dimensional Teaching and Learning

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. Groups should be given a predetermined amount of time to draw and build their designs.

- Groups share their designs with the class, using their drawings or diagrams, and then test their designs outside. (Groups can place their structures in a sunny area, then compare the relative temperature of the ground under the structure and the ground in direct sunlight.)
- Students make and use observations to determine if the designs worked as intended, then compare the strengths and weaknesses of how each design performed.

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

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

Prior Learning
- Types of local weather - The sun is hot - Shade is cool

Part A: How does sunlight affect the playground?	
Concepts	**Formative Assessment**
● Scientists use different ways to study the world. ● Events have causes that generate observable patterns. ● Sunlight warms Earth's surface.	Students who understand the concepts are 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

Part B: 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?	
Concepts	**Formative Assessment**
• 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	Students who understand the concepts are able to: ● 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.

Modifications: ***Teachers identify the modifications that they will use in the unit. The unneeded modifications can then be deleted from the list.(See NGSS Appendix D)***

- *(Note: Teachers identify the modifications that they will use in the unit. See NGSS Appendix D: All Standards, All Students/Case Studies for vignettes and explanations of the modifications.)*
- Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.
- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.
- Provide ELL students with multiple literacy strategies.
- Collaborate with after-school programs or clubs to extend learning opportunities.
- Restructure lesson using UDL principles (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA).

Leveraging English Language Arts/Literacy and Mathematics

English Language Arts

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

Mathematics

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

Samples of Open Education Resources for this unit:

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

Mystery Science: Mystery Science provides ready-made science mysteries for elementary school students. Each lesson contains a central mystery, discussion questions, supplemental reading, and a hands-on activity.

Motion and Stability:Forces and Interactions	Grade K	Unit 4	Trimester 2

Motions and Stability: Forces and Interactions

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.

Overarching Essential Questions	Overarching Enduring Understandings
Why does push or pull affect the motion of an object? How does speed affect the motion of an object? How can changes in force or speed be related? What is force? How can you describe the location of an object? How can you move an object further? What causes an object to change position? Can an object move without being touched? What are the possible effects of force being applied to an object? (start, stop, change in speed, change in direction) Are there patterns in how objects move?	Simple tests can be designed to gather evidence. Pushes and pulls can have different strengths and directions. Pushing or pulling on an object can 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. Force is a push or a pull. Force can cause an object to start or start moving. When you push or pull an object, force is applied to that object. There is a relationship between the distance an object moves and the force applied. Properties of an object affect its motion. Force can change the speed and direction of motion of an object. Some forces act by touching and other forces act without touching.
Student Learning Objectives	
Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.	K-PS2-1

Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.	K-PS2-2
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

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

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations Planning and carrying out investigations to answer questions or test solutions to problems in K-2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions. ● With guidance, plan and conduct and investigation in collaboration with peers. (K-PS2-1) **Analyzing and Interpreting Data** Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations. ● Analyze data from tests of an object or tool to determine if it words as intended (K-PS2-2)	**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)*	**Cause and Effect** ● Simple Tests can be designed to gather evidence to support or refute student ideas about causes. (K-PS2-1), (K-PS2-2) **Systems and System Models** ● Systems in the natural and designed world have parts that work together. (K-ESS2-2) *Connections to Nature of Science* **Scientific Investigations Use a Variety of Methods** ● Scientists use different ways to study the world. (K-PS2-1)

Embedded English Language Arts/Literacy and Mathematics
ELA/Literacy • **RI.K1** With prompting and support ask and answer questions about key details in text. (K-PS2-2) • **W.K.7** Participate in shared research and writing projects (e.g. explore a number of books by a favorite author and express opinions of them.) (K-PS2-2) • **SL.K3** Ask and answer questions in order to seek help, get information, or clarify something that is not understood. (K-PS2-2) **Mathematics** • **MP.2** Reason abstractly and quantitatively (K-PS2-1), (K-2-ETS1-1), (K-2-ETS1-3), • **K.MD.A.1** Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object. (K-PS2-1) • **K.MD.A.2** Directly compare two objects with a measurable attribute in common, to see which objects has" more of" / "less of" the attribute, and describe the difference. (K-PS2-1)

Three-Dimensional Teaching and Learning
In this unit of study, students plan and carry out investigations in order to understand the effects of different strengths and different directions of pushes and pulls on the motion of an object. Students will also engage in a portion of the engineering design process to determine whether a design solution works as intended to change the speed or direction of an object. Scientists often design simple tests in order to gather evidence that can be used to understand cause-and-effect relationships. In this unit's progression of learning, kindergarteners need adult guidance to collaboratively plan and conduct simple investigations to discover and compare the effects of pushes and pulls on the motion of an object. Students will need opportunities to push and pull a variety of objects, such as balls, toy cars, pull toys, cans, tops, and boxes. Students should push/pull these objects first with varying strengths, and then in a variety of directions. They should also explore the effects of pushing objects into one another, as well as into walls and other stationary objects. Students should record their observations using pictures and words, and should participate in class discussions on the effects of varying the strength or direction of a push or pull on an object. As students engage in these types of simple force and motion investigations, they will learn that:

- Pushes and pulls can have different strengths and directions.
- Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it.
- When objects touch or collide, the object's motion can be changed.
- The force of the push or pull will make things speed up or slow down more quickly

To enhance students' experiences, teachers can schedule time for students to investigate these force and motion concepts using playground equipment, such as swings, seesaws, and slides. Teachers can also use trade books and multimedia resources to enrich students' understanding. As students participate in discussions, they should be encouraged to ask questions, share observations, and describe cause-and-effect relationships between forces (pushes and pulls) and the motion of objects. As students come to understand the force and motion concepts outlined above, they should engage in the engineering design process as follows.

- Students are challenged to design a simple way to change the speed or direction of an object using a push or pull from another object.
- As a class, students determine what the design should be able to do (criteria). For example:

  *An object should move a second object a certain distance;

  *An object should move a second object so that the second object follows a particular path;

  * An object should change the direction of the motion of a second object; and/or

  * An object should knock down other specified objects.

Students determine the objects that will move/be moved (balls, ramps, blocks, poker chips) and the types of structures (ramps or barriers) and materials (rubber bands, paper tubes, cardboard, foam, wooden blocks) that can be used to meet this challenge.

- Groups of students then develop a simple drawing or diagram and use given materials to build their design. Groups should be given a predetermined amount of time to draw and build their designs.
- Groups share their designs with the class, using their drawings or diagrams, and then test their designs.
- Students make and use observations to determine which of the designs worked as intended, based on the criteria determined by the class.

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

In this unit of study, students learn that problem situations can be solved through engineering, and that because there is always more

than one possible solution to a problem, it is useful to compare and test designs. Students will use what they have learned about the effect of pushes and pulls of varying strength and direction on the motion of an object to determine whether a design solution works as intended. This process is outlined in greater detail in the previous section.

Prior Learning
- Use student knowledge of toys (cars, slides, trains, phone, dog with pull string) - How can you move objects?

Part A: Why do scientists like to play soccer?	
Concepts	**Formative Assessment**
● 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	Students who understand the concepts are able to: ● With guidance, design simple tests to gather evidence to support or refute ideas about cause-and-effect relationships. ● With guidance, plan and conduct an investigation in collaboration with peers. ● With guidance, collaboratively 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. (Assessment is limited to different relative strengths or different directions, but not both at the same time. Assessment does not include noncontact pushes or pulls such as those produced by magnets.) Some examples of pushes and pulls on the motion of an object could include: ● A string attached to an object being pulled. ● A person pushing an object. ● A person stopping a rolling ball. ● Two objects colliding and pushing on each other

Part B: : How can you design a simple way to change the speed or direction of an object using a push or pull from another object?	
Concepts	**Formative Assessment**
● 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.	Students who understand the concepts are 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.)

Modifications: ***Teachers identify the modifications that they will use in the unit. The unneeded modifications can then be deleted from the list.(See NGSS Appendix D)***

- *(Note: Teachers identify the modifications that they will use in the unit. See NGSS Appendix D: All Standards, All Students/Case Studies for vignettes and explanations of the modifications.)*
- Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.
- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.
- Provide ELL students with multiple literacy strategies.
- Collaborate with after-school programs or clubs to extend learning opportunities.
- Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA).

Leveraging English Language Arts/Literacy and Mathematics

English Language Arts

In order to integrate English Language Arts into this unit, students need the opportunity to participate in shared research that will enhance their understanding of the effect of forces (pushes and pulls) on objects. This could include exploring simple books and other media or digital resources. With prompting and support, students should ask and answer questions about key details in texts in order to seek help, get information, or clarify something that they do not understand. With support from adults, students will also recall

information from experiences to answer questions and clarify their thinking. With support and/or collaboration, they can use digital tools to produce and publish simple informative writing or to document their observations of the simple force and motion systems they design and build.

Mathematics

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

Samples of Open Education Resources for this unit:

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.

Roller Coaster: There are two parts to this lesson from the book More Picture Perfect Science Lessons. In the first part learners explore ways to change the speed and direction of a rolling object by building roller coasters out of pipe insulation after reading the book, Roller Coaster by Marla Frazee. In the second part students read I Fall Down by Vicki Cobb and then investigate the idea that gravity affects all objects equally by conducting dropping races with everyday items.

Ramps 2: Ramp Builder: This is a multi-day lesson plan that has students design, build, and test their own ramps. Students are introduced to a variety of materials and explore putting them together. Students engage in an inquiry-based learning experience to reinforce math, science, and technology. They create plans for ramps by evaluating a variety of materials provided to them.

Mystery Science: Mystery Science provides ready-made science mysteries for elementary school students. Each lesson contains a central mystery, discussion questions, supplemental reading, and a hands-on activity.

From Molecules to Organisms: Structures and Processes	Grade K	Unit 5	Trimester 3

From Molecules to Organisms: Structures and Processes

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

Overarching Essential Questions	Overarching Enduring Understandings
What do plants and animals need to survive? How are the needs of plants and animals alike or different?	Plants need water and light to live and grow. Living things need water, air, and resources from the land. All living things need food and shelter to live and grow.
Student Learning Objectives	
Use observations to describe patterns of what plants and animals (including humans) need to survive.	K-LS1-1
Ask questions, make observations, and gather information about a situation people want to change to define a simple	K-2-ETS1-1

problem that can be solved through the development of a new or improved object or tool.	

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

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations. ● Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (KLS1-1)	**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)	**Patterns** ● Patterns in the natural and human designed world can be observed and used as evidence. (K-LS1-1) ***Connections to Nature of Science*** **Scientific Knowledge is Based on Empirical Evidence** ● Scientists look for patterns and order when making observations about the world. (K-LS1-1)

Embedded English Language Arts/Literacy and Mathematics

ELA/Literacy

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

Mathematics

- **K.MD.A.2** 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-LS-1)

Three-Dimensional Teaching and Learning

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, 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).

Prior Learning
- Living and nonliving things - Names of animals - Where animals live

Modifications: ***Teachers identify the modifications that they will use in the unit. The unneeded modifications can then be deleted from the list.(See NGSS Appendix D)***

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

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

Leveraging English Language Arts/Literacy and Mathematics
English Language Arts N/A ***Mathematics***

Kindergarten students use attributes to sort objects (K.MD.3). For example, a large portion of IS1 involves sorting plants and animals based on patterns in their needs. Students can sort organisms based on whether they are a plant or an animal, whether they live on water or land, and whether an animal eats only plants, only animals, or both.

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

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

Math Standards: MP. 2, K.CC.1-3, K.MD.2-3 M

Samples of Open Education Resources for this unit:

Read-Aloud Lesson: Where Do Polar Bears Live? Students identify and recall characteristics that allow polar bears to survive in the extremely cold Arctic environment.

"Good Night" & Where Do Polar Bears Live? This is a Paired Text activity that uses the “Where Do Polar Bears Live” read aloud and the non-fiction text “Good Night” which addresses hibernation.

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

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: Plant Structure: This video from KET’s Think Garden collection examines plant structure by taking a closer look at the root and shoots systems. Learn about roots, stems, leaves, flowers, seeds, and fruit through engaging illustrations and animations.

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.

From Seed to Fruit | Everyday Learning: Seed to Fruit takes children through the different stages of growth in the life of a cherry tomato plant. Planting a seed in a cup and watching it grow over time is a wonderful way to introduce the life cycle to young children.

Mystery Science: Mystery Science provides ready-made science mysteries for elementary school students. Each lesson contains a central mystery, discussion questions, supplemental reading, and a hands-on activity.

Appendix

Kindergarten Unit 1: Weather and Climate

(20 Instructional Days) Rationale: Students will develop an understanding of patterns and variations in local weather and the purpose of weather forecasting to prepare for, and respond to, severe weather. Content Statement: Students will learn how to observe weather and describe patterns over time. Students will learn how to gain information about local weather (with an emphasis on local severe weather) and the purpose of weather forecasting to prepare for, and respond to, severe weather. Students will observe the effects of sunlight on the Earth's surfaces (sand, rock, soil, water). Students will design and build a structure to reduce the warming effect of sunlight (umbrellas, canopies, tents)

Overarching Essential Questions Overarching Enduring Understandings

How does weather affect our daily lives?

How do weather patterns help predict the weather?

Why is it important to forecast the weather?

Weather affects how we dress, what outside activities we can do, foods we eat (based on how crops grow).

Patterns can be observed and used as evidence to predict future weather.

Forecasting future weather helps people prepare for severe weather conditions.

Essential Questions Enduring Understandings

What is weather?

Why do people observe and measure weather conditions?

What does sunlight do to the Earth?

Why do scientists forecast the weather?

Weather is the combination of sunlight, wind, snow or rain and temperature in a particular time.

People observe and measure weather conditions to describe and record the weather and to notice patterns over time.

Sunlight warms Earth's surface

Weather Scientists forecast severe weather so that communities can prepare for and respond to these events.

Student Learning Experiences and Formative Assessments

Weather Walks: Weather walks engage students in relevant and real-time exploration of weather events such as sunny days, rainy days, hot days, etc. Students note the characteristics of weather events with related literature connections. http://www.uen.org/Lessonplan/preview?LPid=10665

K-ESS2-1

What's the Weather: Students keep daily records of temperature, precipitation, and wind. They plot their data and look for patterns of ups and downs without getting deeply into the nature of climate. http://sciencenetlinks.com/lessons/weather-1-weather-patterns/

K-ESS2-1

What's The Season?: Students identify the seasonal patterns in temperature and precipitation. http://sciencenetlinks.com/lessons/weather-1-weather-patterns/

K-ESS2-1

Students explore how the amount of sunlight and heat changes in areas that are shaded. There are 4 activities in this lesson. http://sciencenetlinks.com/lessons/cooler-in-the-shadows/

K-PS3-1

How do you prepare for severe weather? What supplies would you need? http://www.earthsciweek.org/classroom-activities/disaster- supplies-kit

K-ESS2-2

Why is it important to predict future weather? http://betterlesson.com/lesson/636219/exploring-weather-one-two-three-forecast

K-ESS2-2

What does a weather forecast do to help us survive? http://betterlesson.com/lesson/636325/what-weather-assessment

K-ESS2-2

Students will engage in the engineering and design process in this challenge in which they try to keep an ice cube from melting. http://betterlesson.com/lesson/644795/a-place-in-the-shade-an-engineering-challenge

K-PS3-2

Summative (Benchmark) Assessment

Investigations: Students will (oral or written) describe, with guidance. the purpose of the investigation; describe, with guidance, the evidence that will result from the investigation; collect and record data; state what is concluded from the investigation. Oral Assessment

Journals: Students will keep a journal to record (words and/or pictures) predictions and observations.

Oral/ Written Response: Students will recall facts learned about topics with oral and/or written responses.

Embedded English Language Arts/Literacy and Mathematics

Literacy Standards

RI.K.1 With prompting and support, ask and answer questions about key details in a text.

RI.K.10 Actively engage in group reading activities with purpose and understanding.

W.K.2 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.

W.K.7 Participate in shared research and writing projects

SL.K.2 Confirm understanding of a text read aloud or information presented orally or through other media by asking and answering questions about key details and requesting clarification if something is not understood.

SL.K.3 Ask and answer questions in order to seek help, get information, or clarify something that is not understood.

Math Standards

MA.K.K.CC.A Know number names and the count sequence.

MA.K.K.MD.A.1 Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object.

MA.K.K.MD.A.2 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.

MA.K.K.MD.B.3 Classify objects into given categories; count the numbers of objects in each category and sort the categories by count.

Three-Dimensional Teaching and Learning

Asking Questions and Defining Problems Asking questions and defining problems in grades K–2 builds on prior experiences and progresses to simple descriptive questions that can be tested.

• Ask questions based on observations to find more information about the designed world. (K- ESS3-2) Planning and Carrying Out Investigations Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.

• Make observations (firsthand or from media) to collect data that can be used to make comparisons. (K-PS3-1) Analyzing and Interpreting Data Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.

• Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (K-ESS2-1) Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.

• Use tools and materials provided to design and build a device that solves a specific problem or a solution to a specific problem. (K-PS3-2) Obtaining, Evaluating, and Communicating Information Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information.

• Read grade-appropriate texts and/or use media to obtain scientific information to describe patterns in the natural world. (K-ESS3-2)

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Connections to Nature of Science

PS3.B: Conservation of Energy and Energy Transfer

• Sunlight warms Earth's surface. (K-PS3-1),(K- PS3-2) 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

• Asking questions, making observations, and gathering information are helpful in thinking about problems. (secondary to K-ESS3-2)

Patterns

• Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (K-ESS2-1) Cause and Effect

• Events have causes that generate observable patterns. (K-PS3-1),(K-PS3-2),(K-ESS3-2)

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Connections to Engineering,Technology, a nd Applications of Science

Interdependence of Science, Engineering, and Technology

- **People encounter questions about the natural world every day. (K-ESS3-2) Influence of Engineering, Technology, and Science on Society and the Natural World**
- People depend on various technologies in their lives; human life would be very different without technology. (K-ESS3-2)

Scientific Investigations Use a Variety of Methods

• Scientists use different ways to study the world. (K-PS3-1) Science Knowledge is Based on Empirical Evidence

• Scientists look for patterns and order when making observations about the world. (K-ESS2- 1)

Prior Learning

Types of local weather

The sun is hot

Shade is cool

Modifications

Special Needs:

Students are engaged in small group work, where students of differing abilities and learning styles should be grouped together. Students act as peer coaches to support students with special needs.

ELL:

Allow English Language Learners to play a very active role in selecting their hotspots to study. Many students' families may have immigrated from countries or regions that feature hotspots. The process of sharing their own perspective or cultural ties to their native region's biodiversity in invaluable to the group's work.

Gifted Learners:

Offer scientific journal articles as sources for research to gifted students. The vocabulary and writing style is very advanced, but gifted students might be able to garner the needed information and data from these primary sources.

Mainstream Learners:

Throughout the unit during class time, plan and hold small learning sessions/work groups where students can selectively attend to learn more about a specific topic. Hold these sessions often, changing the topic every week. Topics can include, but not limited to using maps, planning an interview, interpreting scientific data, reading graphs and charts, etc. Allow students to select the sessions they would like to attend, based on their perceived need, and they should plan the sessions into their research schedule ahead of time.

Samples of Open Education Resources for this unit:

Websites:

Climate Kids can help educators build lesson plans that align with the Next Generation Science Standards. http://climatekids.nasa.gov/

National Science Teachers Association: http://ngss.nsta.org/DisplayStandard.aspx?view=topic&id=3

Lesson plans and activities: betterlesson.com

Lesson plans and activities: mysteryscience.com/

Lesson plans and activities: buggyandbuddy.com/ngss-science/

Kids can research types of weather: weatherwizkids.com

Short videos about science topics: brainpopjr.com

Appendix

Differentiation	
Enrichment	● Utilize collaborative media tools ● Provide differentiated feedback ● Opportunities for reflection ● Encourage student voice and input ● Model close reading ● Distinguish long term and short term goals

Intervention	● Utilize “skeleton notes” where some required information is already filled in for the student ● Provide access to a variety of tools for responses ● Provide opportunities to build familiarity and to practice with multiple media tools ● Leveled text and activities that adapt as students build skills ● Provide multiple means of action and expression ● Consider learning styles and interests ● Provide differentiated mentors ● Graphic organizers
ELLs	● Pre-teach new vocabulary and meaning of symbols ● Embed glossaries or definitions ● Provide translations ● Connect new vocabulary to background knowledge ● Provide flash cards ● Incorporate as many learning senses as possible ● Portray structure, relationships, and associations through concept webs ● Graphic organizers

21st Century Skills

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

Integrating Technology

- Chromebooks
- Internet research
- Online programs
- Virtual collaboration and projects
- Presentations using presentation hardware and software

Kindergarten Unit 2: Plants and Animals (20 Instructional Days) Rationale: Students will learn to formulate answers to questions such as, "Where do animals live and why do they live there?" Students are also expected to develop an understanding of what plants and animals (including humans) need to survive and the relationship between their needs and where they live. Content Statement: Students will use observations to describe patterns of what plants and animals (including humans) need to survive. They will construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs. They will use a model (drawing, diagram) to represent the relationship between the needs of different plants and animals (including humans) and the places they live. They will communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.

Overarching Essential Questions Overarching Enduring Understandings

How do living things use resources (food and shelter) to survive?

Why do animals engage in certain behaviors that affect the environment?

All living things need food and shelter to live and grow.

Some animals change the environment to create shelter, ex beavers build dams for shelter and change water flow in rivers.

Essential Questions Enduring Understandings

What do plants and animals need to survive?

What impact do animals and humans have on the environment?

How are the needs of plants and animals alike or different?

How can humans reduce the impact on the land, water and air?

How are the needs of plants, animals, and humans different in the places they live?

Plants need water and light to live and grow. Living things need water, air, and resources from the land

Things that people do to live can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things.

Animals can effect the environment when building shelter or getting food.

Plants and animals get what they need to survive from the places they live.

Student Learning Experiences and Formative Assessments

What do plants need to survive? Students will be able to draw conclusions about plant needs and begin to compare them to human needs after completing this simple investigation. https://betterlesson.com/lesson/640647/what-do-plants-need-part-i

K-LS1-1

K-ESS3-1

Why is it important for animals to have the right place to live? https://betterlesson.com/lesson/599355/survival-of-the-fittest- exploring-basic-needs

K-LS1-1

In this lesson, students observe different animal behaviors and work to discover a pattern: all animals seek food in order to survive. https://mysteryscience.com/secrets/mystery-1/survival-needs-food/115?r=5169560

K-LS1-1

In this lesson, students observe different animal behaviors and work to discover another pattern: all animals seek safety in order to survive. https://mysteryscience.com/secrets/mystery-2/survival-needs-safety/116?r=5169560

K-LS1-1

Students explore basic survival needs of humans and wildlife and draw their own homes (habitats) and neighborhoods. http://ngss.nsta.org/Resource.aspx?ResourceID=714

K-LS1-1

Students are introduced to the negative effects of oil spills on the environment. Students identify and discuss ways to prevent or minimize the negative impact of an oil spill and conduct an activity to explore and compare 3 different ways to remove oil from water.

http://ngss.nsta.org/Resource.aspx?ResourceID=113

K-ESS3-3

Students investigate ways plants and animals can change their environment. The unit culminates in a self-selected project through which students how their understanding.

K-ESS2-2

K-ESS3-1

Summative (Benchmark) Assessment

Investigations: Students will (oral or written) describe, with guidance. the purpose of the investigation; describe, with guidance, the evidence that will result from the investigation; collect and record data; state what is concluded from the investigation. Oral Assessment

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Connections to Nature of Science

PS3.B: Conservation of Energy and Energy Transfer

• Sunlight warms Earth's surface. (K-PS3-1),(K- PS3-2) 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

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• Asking questions, making observations, and gathering information are helpful in thinking about problems. (secondary to K-ESS3-2)

Patterns

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• Events have causes that generate observable patterns. (K-PS3-1),(K-PS3-2),(K-ESS3-2)

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- **People encounter questions about the natural world every day. (K-ESS3-2) Influence of Engineering, Technology, and Science on Society and the Natural World**
- People depend on various technologies in their lives; human life would be very different without technology. (K-ESS3-2)

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• Scientists use different ways to study the world. (K-PS3-1) Science Knowledge is Based on Empirical Evidence

• Scientists look for patterns and order when making observations about the world. (K-ESS2- 1)

Prior Learning

Living and non living things

Names of animals

Where animals live

Modifications

Special Needs:

Students are engaged in small group work, where students of differing abilities and learning styles should be grouped together. Students act as peer coaches to support students with special needs.

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Allow English Language Learners to play a very active role in selecting their hotspots to study. Many students' families may have immigrated from countries or regions that feature hotspots. The process of sharing their own perspective or cultural ties to their native region's biodiversity in invaluable to the group's work.

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Samples of Open Education Resources for this unit:

Websites:

PBS Kids Wild Kratts videos: http://pbskids.org/wildkratts/videos/

National Science Teachers Association: http://ngss.nsta.org/DisplayStandard.aspx?view=topic&id=3

Lesson plans and activities: betterlesson.com

Lesson plans and activities: mysteryscience.com/

Lesson plans and activities: buggyandbuddy.com/ngss-science/

Kids can research types of animals and needs: http://kids.nationalgeographic.com/

Short videos about science topics: brainpopjr.com

Appendix

Differentiation	
Enrichment	● Utilize collaborative media tools ● Provide differentiated feedback ● Opportunities for reflection ● Encourage student voice and input ● Model close reading ● Distinguish long term and short term goals

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21st Century Skills

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

Integrating Technology

- Chromebooks
- Internet research
- Online programs
- Virtual collaboration and projects
- Presentations using presentation hardware and software

Kindergarten Unit 3: Pushes and Pulls (20 Instructional Days) Rationale: Students will 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. Content Statement: Students will investigate to compare different strengths or different directions of pushes and pulls on the motion of an object. They will determine if a design works as intended to change the speed or direction of an object with a push or a pull.

Overarching Essential Questions Overarching Enduring Understandings

Why does push or pull affect the motion of an object?

How does speed affect the motion of an object?

How can changes in force or speed be related?

Simple tests can be designed to gather evidence.

Pushes and pulls can have different strengths and directions.

Pushing or pulling on an object can 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.

Essential Questions Enduring Understandings

What is force?

How can you describe the location of an object?

How can you move an object further?

What causes an object to change position?

Can an object move without being touched?

What are the possible effects of force being applied to an object? (start, stop, change in speed, change in direction)

Are there patterns in how objects move?

Force is a push or a pull.

Force can cause an object to start or start moving.

When you push or pull an object, force is applied to that object.

There is a relationship between the distance an object moves and the force applied.

Properties of an object affect its motion.

Force can change the speed and direction of motion of an object.

Some forces act by touching and other forces act without touching.

Student Learning Experiences and Formative Assessments

In the previous lesson, students had exposure to conducting a simple investigation. Now the students will take this investigation one step further by comparing the speeds of several vehicles.https://betterlesson.com/lesson/635348/which-one-is-the-fastest- a-continuing-investigation-of-speed

K-PS2-1

Pushing or pulling makes things move, even on the playground!https://betterlesson.com/lesson/638993/force-push-or-pull

K-PS2-1

Intro STEM unit focused on building a trap for the gingerbread man. http://ngss.nsta.org/Resource.aspx?ResourceID=529

K-PS2-1

Multi day lesson that has students plan, design, build and test their own ramps.

http://ngss.nsta.org/Resource.aspx?ResourceID=457

K-PS2-2

This unit has allowed the students to explore objects in motion. Now it's time to figure out how to make them stop!

https://betterlesson.com/lesson/635423/stop-it-exploring-forces-on-moving-objects

K-PS2-2

Students will play kickball and observe how the ball is pushes, pulled, started, stopped, collided with other objects and how it changed position or speed. Students will conduct an investigation. http://ngss.nsta.org/Resource.aspx?ResourceID=129

K-PS2-1

In this unit, students have been exploring speed and force. Now they get the opportunity to conduct an experiment to better

K-

PS2-2 understand how forces work.https://betterlesson.com/lesson/635429/a-change-of-direction-exploring-the-impact-of-forces

Summative (Benchmark) Assessment

Investigations: Students will (oral or written) describe, with guidance. the purpose of the investigation; describe, with guidance, the evidence that will result from the investigation; collect and record data; state what is concluded from the investigation. Oral Assessment

Journals: Students will keep a journal to record (words and/or pictures) predictions and observations.

Oral/ Written Response: Students will recall facts learned about topics with oral and/or written responses.

Embedded English Language Arts/Literacy and Mathematics

Literacy Standards

RI.K.1 With prompting and support, ask and answer questions about key details in a text.

RI.K.10 Actively engage in group reading activities with purpose and understanding.

W.K.2 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.

W.K.7 Participate in shared research and writing projects

SL.K.2 Confirm understanding of a text read aloud or information presented orally or through other media by asking and answering questions about key details and requesting clarification if something is not understood.

SL.K.3 Ask and answer questions in order to seek help, get information, or clarify something that is not understood.

Math Standards

MA.K.K.CC.A Know number names and the count sequence.

MA.K.K.MD.A.1 Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object.

MA.K.K.MD.A.2 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.

MA.K.K.MD.B.3 Classify objects into given categories; count the numbers of objects in each category and sort the categories by count.

Three-Dimensional Teaching and Learning

Asking Questions and Defining Problems Asking questions and defining problems in grades K–2 builds on prior experiences and progresses to simple descriptive questions that can be tested.

• Ask questions based on observations to find more information about the designed world. (K- ESS3-2) Planning and Carrying Out Investigations Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.

• Make observations (firsthand or from media) to collect data that can be used to make comparisons. (K-PS3-1) Analyzing and Interpreting Data Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.

• Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (K-ESS2-1) Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.

• Use tools and materials provided to design and build a device that solves a specific problem or a solution to a specific problem. (K-PS3-2) Obtaining, Evaluating, and Communicating Information Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information.

• Read grade-appropriate texts and/or use media to obtain scientific information to describe patterns in the natural world. (K-ESS3-2)

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Connections to Nature of Science

PS3.B: Conservation of Energy and Energy Transfer

• Sunlight warms Earth's surface. (K-PS3-1),(K- PS3-2) 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

• Asking questions, making observations, and gathering information are helpful in thinking about problems. (secondary to K-ESS3-2)

Patterns

• Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (K-ESS2-1) Cause and Effect

• Events have causes that generate observable patterns. (K-PS3-1),(K-PS3-2),(K-ESS3-2)

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Connections to Engineering,Technology, a nd Applications of Science

Interdependence of Science, Engineering, and Technology

- **People encounter questions about the natural world every day. (K-ESS3-2) Influence of Engineering, Technology, and Science on Society and the Natural World**
- People depend on various technologies in their lives; human life would be very different without technology. (K-ESS3-2)

Scientific Investigations Use a Variety of Methods

• Scientists use different ways to study the world. (K-PS3-1) Science Knowledge is Based on Empirical Evidence

• Scientists look for patterns and order when making observations about the world. (K-ESS2- 1)

Prior Learning

Use student knowledge of toys (cars, slides, trains, phone, dog with pull string)

How can you move objects

Modifications

Special Needs:

Students are engaged in small group work, where students of differing abilities and learning styles should be grouped together. Students act as peer coaches to support students with special needs.

ELL:

Allow English Language Learners to play a very active role in selecting their hotspots to study. Many students' families may have immigrated from countries or regions that feature hotspots. The process of sharing their own perspective or cultural ties to their native region's biodiversity in invaluable to the group's work.

Gifted Learners:

Offer scientific journal articles as sources for research to gifted students. The vocabulary and writing style is very advanced, but gifted students might be able to garner the needed information and data from these primary sources.

Mainstream Learners:

Throughout the unit during class time, plan and hold small learning sessions/work groups where students can selectively attend to learn more about a specific topic. Hold these sessions often, changing the topic every week. Topics can include, but not limited to using maps, planning an interview, interpreting scientific data, reading graphs and charts, etc. Allow students to select the sessions they would like to attend, based on their perceived need, and they should plan the sessions into their research schedule ahead of time.

Samples of Open Education Resources for this unit:

Websites:

National Science Teachers Association: http://ngss.nsta.org/DisplayStandard.aspx?view=topic&id=3

Lesson plans and activities: betterlesson.com

Lesson plans and activities: mysteryscience.com/

Lesson plans and activities: buggyandbuddy.com/ngss-science/

Short videos about science topics: brainpopjr.com

Teachertube: short videos http://www.teachertube.com/video/push-and-pull-play-145137

Simple Physics experiments for kids: https://www.weareteachers.com/simple-physics-experiments-for-kids-pushing-and-pulling/

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