Eastampton Community School

Grade K Science Curriculum

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Unit 1: Weather Instructional Days: 10 to start and then *ongoing*

In this unit of study, students develop an understanding of patterns and variations in local weather and the use of weather forecasting to prepare for and respond to severe weather. The crosscutting concepts of *patterns*; *cause and effect*; *interdependence of science, engineering, and technology*; and *the influence of engineering, technology, and science on society and the natural world* are called out as organizing concepts for the disciplinary core ideas. Students are expected to demonstrate grade-appropriate proficiency in *asking questions*, *analyzing and interpreting data*, and *obtaining, evaluating, and communicating information*. Students are also expected to use these practices to demonstrate understanding of the core ideas.

This unit is based on K-ESS2-1, K-ESS3-2, and K-2-ETS1-1.

Unit 2: Pushes and Pulls Instructional Days: 15

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.

This unit is based on K-PS2-1, K-PS2-2, and K-2: ETS1-3.

Unit 3: Effects of the Sun Instructional Days: 15

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.

This unit is based on K-PS3-1, K-PS3-2, K-2 ETS1-1, K-2-ETS1-2, and K-2-ETS1-3.

Unit 4: Basic Needs of Living Things **Instructional Days: 20**

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.

This unit is based on K-LS1-1, K-ESS3-1, and K-ESS2-2.

Unit 5: Basic Needs of Humans **Instructional Days: 15**

In this unit of study, students develop an understanding of what humans need to survive and the relationship between their needs and where they live. The crosscutting concept of *cause and effect* is called out as the organizing concept for the disciplinary core ideas. Students demonstrate grade-appropriate proficiency in *asking questions* and *defining problems,* and *in obtaining, evaluating, and communicating information*. Students are also expected to use these practices to demonstrate understanding of the core ideas. This unit is based on K-ESS3-3 and K-2 ETS1-1.

Note: *The number of instructional days is an estimate based on the information available at this time. 1 day equals approximately 42*

minutes of seat time. Teachers are strongly encouraged to review the entire unit of study carefully and collaboratively to determine whether adjustments to this estimate need to be made.

Recommended Instructional Time: 10 Days to start and ongoing throughout the year

Grade K Science Unit 1: Weather

NGSS:

Students who demonstrate understanding can:

K-ESS2-1. Use and share observations of local weather conditions to describe patterns over time. [Clarification Statement: Examples of qualitative observations could include descriptions of the weather (such as sunny, cloudy, rainy, and warm); examples of quantitative observations could include numbers of sunny, windy, and rainy days in a month. Examples of patterns could include that it is usually cooler in the morning than in the afternoon and the number of sunny days versus cloudy days in different months.] [*Assessment Boundary: Assessment of quantitative observations limited to whole numbers and relative measures such as warmer/cooler.*]

K-ESS3-2. Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.* [Clarification Statement: Emphasis is on local forms of severe weather.]

K-2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

Unit Summary

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

In this unit of study, students develop an understanding of patterns and variations in local weather and the use of weather forecasting to prepare for and respond to severe weather. The crosscutting concepts of *patterns*; *cause and effect*; *interdependence of science, engineering, and technology*; and *the influence of engineering, technology, and science on society and the natural world* are called out as organizing concepts for the disciplinary core ideas. Students are expected to demonstrate grade-appropriate proficiency in *asking questions*, *analyzing and interpreting data*, and *obtaining, evaluating, and communicating information*. Students are also expected to use these practices to demonstrate understanding of the core ideas.

Note: Unlike other science units, the Weather unit is intended to become a part of the classroom routine throughout the year. Some weather patterns are not obvious unless the students collect data over long periods of time. For example, in some locations it is sunnier during some parts of a year than others. The temperature outside will change from fall, winter, spring, to summer. Also, during some periods, the weather data should be recorded in the morning and then again in the afternoon. Students will be able to observe patterns in temperature through the course of the day.

This unit is based on K-ESS2-1, K-ESS3-2, and K-2-ETS1-1.

Student Learning Objectives

Use and share observations of local weather conditions to describe patterns over time. *[Clarification Statement: Examples of qualitative observations could include descriptions of the weather (such as sunny, cloudy, rainy, and warm); examples of quantitative observations could include numbers of sunny, windy, and rainy days in a month. Examples of patterns could include that it is usually cooler in the morning than in the afternoon and the number of sunny days versus cloudy days in different months.]* [Assessment Boundary: Assessment of quantitative observations limited to whole numbers and relative measures such as warmer/cooler.*]* **(K-ESS2-1)**

Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.* *[Clarification Statement: Emphasis is on local forms of severe weather.]* **(K-ESS3-2)**

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)

Unit Sequence	
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.)*

Unit Sequence
Part B: *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	*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.)

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.	• 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.

What It Looks Like in the Classroom
Phenomena: Read the local weather forecast from an online or print resource. Make a list of the words that they use to describe weather (cloudy, sunny, partly cloudy, temperature, and wind). As a class, create symbols that the students can use to record the weather each day. Examples can be found at http://tinyurl.com/hhhg299. In this ongoing study, students are expected to develop an understanding of patterns and variations in local weather and how

they respond to the weather.

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

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

Students learn that we can help people to be safe from hazardous weather (thunderstorms, hurricanes, and nor-Easters,)

through engineering. Students begin by comparing and contrasting hazardous weather events. With the support of the teacher, they ask scientific questions about how each type of weather is hazardous, gather information that will help them understand the types of problems they might face when severe weather conditions exist, and in and around their homes, schools, and communities, and work together to design ways to keep people safe during hazardous weather events.

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

Examples of weather patterns may include:

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

At this grade level, it is developmentally appropriate to describe temperature in relative terms; therefore, vocabulary words such as hot, warm, cool, cold, and warmer/cooler can be used to describe temperature. Students may also record temperature in degrees Fahrenheit and relate the number of degrees with descriptors such as hot, warm, cold, cool, and warmer/colder.

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

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

- ✔ What kinds of severe weather events tend to occur in New Jersey (e.g., thunderstorms, hurricanes, flooding, snow storms)?
- ✔ What do people do in response to these types of severe weather events?
- ✔ What kinds of tools can people use to solve problems caused by severe weather conditions (e.g., umbrellas, sandbags, salt, gravel, shovels, snow blowers)?
- ✔ What other solutions might people use for problems caused by severe weather (e.g., closing schools and businesses; sending out emergency workers to restore utilities; sending out early warnings; stockpiling food, water, and other supplies; having a portable generator)?
- ✔ What kinds of problems would we face if we had a lot of rain in a short period of time?
- ✔ What problems might we have if our community experienced flooding?

- ✔ What kinds of problems might occur if strong winds caused damage (e.g., knocked over trees, damaged power lines, damaged homes and businesses)?
- ✔ What kinds of precautions do people take during a hurricane? A tornado? A Nor’easter? Why?

Connecting with English Language Arts/literacy and Mathematics

English Language Arts

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 a 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) **W.2.8**

Mathematics

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

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

Modifications

(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).

Research on Student Learning

N/A

Future Learning

Grade 2 Unit 5: Changes to Earth's Land

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

Grade 3 Unit 1: Weather and Climate

Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next.

- Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years. A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts.

Grade 4 Unit 1: Weathering and Erosion

Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around.

Grade 4 Unit 2: Earth Processes

A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts.

Connections to Other Units

N/A

Sample of Open Education Resources

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.

About the Weather: This lesson is about using local weather to make observations, measure, collect, and record data to describe patterns over time. Students will count types of outdoor clothing worn by classmates and use the data to look for patterns in weather over months and seasons.

Teacher Professional Learning Resources

Connections Between Practices in *NGSS*, Common Core Math, and Common Core ELA: The presenter was Sarah Michaels from Clark University. In this seminar Dr. Michaels talked about connecting the scientific and engineering practices described in A Framework for K–12 Science Education with the Common Core State Standards in Mathematics and English Language Arts.

Weather and Climate Basics: This is a resource from the National Center for Atmospheric Research and the National Science Foundation that explains the basics of weather and climate. This article is designed as background information for the teacher.

Earth and Sky: Grades K-4: SciGuides are a collection of thematically aligned lesson plans, simulations, and web-based resources for teachers to use with their students centered on standards-aligned science concepts. "We all live under the same big sky." Since the beginning of time, humans have been intrigued by the objects in our sky and beyond. Take a voyage into space science where you will travel through the Internet to connect your classroom with content and activities designed to teach concepts related to these objects and changes in the sky over time.

***NGSS* Core Ideas: Earth's Systems:** The presenter was Jill Wertheim from National Geographic Society. The program featured strategies for teaching about Earth science concepts that answer questions such as "What regulates weather and climate?" and "What causes earthquakes and volcanoes?"

Dr. Wertheim began the presentation by introducing a framework for thinking about content related to Earth systems. She then showed learning progressions for each concept within the Earth's Systems disciplinary core idea and shared resources and strategies for addressing student preconceptions. Dr. Wertheim also talked about changes in the way *NGSS* addresses these ideas compared to previous common approaches.

Continue the discussion in the community forums.

Appendix A: NGSS and Foundations for the Unit

Use and share observations of local weather conditions to describe patterns over time. *[Clarification Statement: Examples of qualitative observations could include descriptions of the weather (such as sunny, cloudy, rainy, and warm); examples of quantitative observations could include numbers of sunny, windy, and rainy days in a month. Examples of*

*patterns could include that it is usually cooler in the morning than in the afternoon and the number of sunny days versus cloudy days in different months.] [*Assessment Boundary: Assessment of quantitative observations limited to whole numbers and relative measures such as warmer/cooler.*]* **(K-ESS2-1)**
Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.* *[Clarification Statement: Emphasis is on local forms of severe weather.]* **(K-ESS3-2)**
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 performance expectations 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

Use observations (firsthand or from media) to describe patterns in the natural world in order to answer

scientific questions. (K-ESS2-1)

Asking Questions and Defining Problems

Ask questions based on observations to find more information about the designed world. (K-ESS3-2)

Ask questions based on observations to find more information about the natural and/or designed world(s).

Define a simple problem that can

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)

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-ESS3-2)

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Connections to Nature of Science

Science Knowledge is Based on Empirical Evidence

· Scientists look for patterns and order

be solved through the development of a new or	ETS1.A: Defining and Delimiting an	

improved object or tool. (K-2-	

ETS1-1) **Obtaining, Evaluating, and Communicating Information** · Read grade-appropriate texts and/or use media to obtain scientific information to describe patterns in the natural world. (K-ESS3-2)	**Engineering Problem** · A situation that people want to change or create can be approached as a problem to be solved through engineering. (K-2-ETS1-1) · Asking questions, making observations, and gathering information are helpful in thinking about problems. (K-2-ETS1-1) · Before beginning to design a solution, it is important to clearly understand the problem. (K-2-ETS1- 1)	when making observations about the world. (K-ESS2-1) - ***Connections to Engineering, Technology, and 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-2-ETS1-1)

English Language Arts	Mathematics
Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-ESS2-1) **W.K.7** With prompting and support, ask and answer questions about key details in a text. (K-ESS3-2) **RI.K.1** Ask and answer questions in order to seek help, get information, or clarify something that is not understood. (K ESS3-2) **SL.K.3** Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text. (K-2-ETS1-1) **RI.2.1** With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers. (K-2-ETS1-1) **W.2.6** Recall information from experiences or gather	Reason abstractly and quantitatively. (K-ESS2-1),(K-2-ETS1- 1) **MP.2** Model with mathematics. (K-ESS2-1),(K-ESS3-2),(K-2-ETS1- 1) **MP.4** Use appropriate tools strategically. (K-2-ETS1-1) **MP.5** Counting and Cardinality (K-ESS3-2) **K.CC** Know number names and the count sequence. (K-ESS2-1) **K.CC.A** Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object. (K-ESS2-1) **K.MD.A.1** Classify objects into given categories; count the number of objects in each category and sort the categories by count. (K ESS2-1) **K.MD.B.3** Draw a picture graph and a bar graph (with single-unit

information from provided sources to answer a question.

(K-2-ETS1-1) **W.2.8**

scale) to represent a data set with up to four categories.

Solve simple put-together, take-apart, and compare problems using information presented in a bar graph.
(K-2-ETS1-1) **2.MD.D.10**

Appendix B

Our Weather

What do we	**Monday Date**	**Tuesday Date**	**Wednesday Date**	**Thursday Date**	**Friday Date**	**Saturday Date**	**Sunday Date**
see? What time is it?							
What is the temperature							
Is the sky ? sunny or							
Is it windy cloudy? or calm?							
Is it raining or							

snowing?

What do we	Monday Date	Tuesday Date	Wednesday Date	Thursday Date	Friday Date	Saturday Date	Sunday Date
see? What time is it?							
What is the temperature							
Is the sky ? sunny or							
Is it windy cloudy? or calm? Is it raining or							

snowing?

Recommended Instructional Days: 15

Grade K Science Unit 2: Pushes and Pulls

NGSS:

Students who demonstrate understanding can:

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

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

K-2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

K-2-ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

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

Unit Summary

What happens if you push or pull an object harder?

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

This unit is based on K-PS2-1, K-PS2-2, and K-2 ETS1-3.

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

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

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)

Unit Sequence

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.

Unit Sequence
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.)*

What It Looks Like in the Classroom

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.

Connecting with 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.

Modifications

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

· Structure lessons around questions that are authentic, relate to students’ interests, social/family background and knowledge of their community.

· Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques

auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).

· Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).

· Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).

· Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.

· Use project-based science learning to connect science with observable phenomena.

· Structure the learning around explaining or solving a social or community-based issue.

· Provide ELL students with multiple literacy strategies.

· Collaborate with after-school programs or clubs to extend learning opportunities.

· Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA).

Research on Student Learning

Students tend to think of force as a property of an object ("an object has force," or "force is within an object") rather than as a relation between objects. In addition, students tend to distinguish between active objects and those objects that support or block or otherwise act passively. Students tend to call the active actions "force" but do not consider passive actions as "forces" (NSDL, 2015).

Future Learning

Grade 3 Unit 2: Forces and Motion

· Each force acts on one particular object and has both strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object's speed or direction of motion. *(Boundary: Qualitative and conceptual, but not quantitative addition of forces are used at this level.)*

· The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it. (Boundary: Technical terms, such as magnitude, velocity, momentum, and vector quantity, are not introduced at this level, but the concept that some quantities need both size and direction to be described is developed.)

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- The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it. (Boundary: Technical terms, such as magnitude, velocity, momentum, and vector quantity, are not introduced at this level, but the concept that some quantities need both size and direction to be described is developed.)
- Objects in contact exert forces on each other.
- Electric and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other.

Grade 4 Unit 5: Transfer of Energy

- Energy can be moved from place to place by moving objects or through sound, light, or electric currents.

Connections to Other Units

N/A

Sample of Open Education Resources

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.

Teacher Professional Learning Resources

NSTA Web Seminar: Teaching NGSS in Elementary School—Kindergarten

The seminar was led by expert teachers Carla Zembal-Saul, Professor of Science Education, Penn State University; Mary Starr, Executive Director, Michigan Mathematics and Science Centers Network; and Kathy Renfrew, K-5 Science Coordinator, VT Agency of Education. Carla, Mary and Kathy engaged with participants to gauge their familiarity with *NGSS* for kindergarten, and provided a number of example activities and videos on how to implement it, e.g., different approaches to teaching weather and climate core ideas. The web seminar was then wrapped up by Ted Willard, who suggested a number of resources and events for participants to further develop their understanding of *NGSS* for kindergarten, as well as other grade levels.

View the resource collection.

Continue discussing this topic in the community forums.

NSTA Web Seminar: Teaching NGSS in K-5: Constructing Explanations from Evidence

Carla Zembal-Saul, Mary Starr, and Kathy Renfrew, provided an overview of the *NGSS* for K-5th grade. The web seminar focused on the three dimensional learning of the *NGSS*, while introducing CLAIMS-EVIDENCE-REASONING (CER) as a framework for introducing explanations from evidence. The presenters highlighted and discussed the importance of engaging learners with phenomena, and included a demonstration on using a KLEWS chart to map the development of scientific explanations of those phenomena.

To view related resources, visit the resource collection.

Continue discussing this topic in the community forums.

NSTA Web Seminar: Motion and Stability: Forces and Interactions

The presenters were Alicia Alonzo from Michigan State University and Alex Robinson, a teacher at Thornapple Kellogg High School in Middleville, Michigan. This was the fourth web seminar in a series focused on the disciplinary core ideas that are part of the *Next Generation Science Standards (NGSS)*. The program featured strategies for teaching about physical science concepts that answer questions such as "How can one explain and predict interactions between objects and within systems of objects?"

Dr. Alonzo began the presentation by providing an overview of how disciplinary core ideas fit into the overall structure of *NGSS*. Then she and Mr. Robinson discussed common student preconceptions related to Motion and Stability: Forces and Interactions. They also showed how this disciplinary core idea progresses across grade bands. Participants had the opportunity to ask questions and discuss ideas for classroom application with other participating teachers.

View the resource collection.

Continue discussing this topic in the community forums.

Appendix A: NGSS and Foundations for the Unit

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

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

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 performance expectations 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

- With guidance, plan and conduct an investigation in collaboration with peers. (K-PS2-1)

Analyzing and Interpreting Data

- Analyze data from tests of an object or tool to determine if it works as intended. (K-PS2-2)

Asking Questions and Defining Problems

- Ask questions based on observations to find more information about the natural and/or designed world(s). (K 2-ETS1-1)
- Define a simple problem that can be solved through the development

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)

Structure and Function

- The shape and stability of structures of natural and designed objects are related to their function(s). (K-2-ETS1-1)

- -

Connections to the Nature of Science

Scientific Investigations Use a Variety of Methods

- Scientists use different ways to study the world. (K-PS2-1)

of a new or improved object or tool. (K-2- ETS1-1) **Developing and Using Models** • Develop a simple model based on	**ETS1.A: Defining Engineering Problems** • A situation that people want to change or create can be approached	

evidence to represent a proposed object or tool. (K-2-ETS1-2)	as a problem to be solved through engineering. Such problems may have many acceptable solutions. *(secondary to K-PS2-2)* **ETS1.A: Defining and Delimiting Engineering Problems** • A situation that people want to change or create can be approached as a problem to be solved through engineering. (K-2-ETS1-1) • Asking questions, making observations, and gathering information are helpful in thinking about problems. (K-2-ETS1-1) • Before beginning to design a solution, it is important to clearly understand the problem. (K-2-ETS1- 1)	

English Language Arts **Mathematics**	

With prompting and support, ask and answer questions about key details in a text. (K-PS2-2) **RI.K.1** Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-PS2-1) **W.K.7** Ask and answer questions in order to seek help, get information, or clarify something that is not understood. (K	Reason abstractly and quantitatively. (K-PS2-1), (K-2-ETS1- 1),(K-2-ETS1-3) **MP.2** Model with mathematics. (K-2-ETS1-1), (K-2-ETS1-3) **MP.4** Use appropriate tools strategically. (K-2-ETS1-1), (K-2-ETS1- 3) **MP.5** Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single
PS2-2) **SL.K.3** object. (K-PS2-1) **K.MD.A.1**	Directly compare two objects with a measurable attribute in common, to see which object has “more of”/”less of” the attribute, and describe the difference. (K-PS2-1) **K.MD.A.2**

Recommended Instructional Days: 15

Grade K Science Unit 3: Effects of the Sun

NGSS:

Students who demonstrate understanding can:

K-PS3-1. Make observations to determine the effect of sunlight on Earth's surface. [Clarification Statement: Examples of Earth's surface could include sand, soil, rocks, and water.] [*Assessment Boundary: Assessment of temperature is limited to relative measures such as warmer/cooler.*]

K-PS3-2. Use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area.*[Clarification Statement: Examples of structures could include umbrellas, canopies, and tents that minimize the warming effect of the sun.]

K-2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

K-2-ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

K-PS3-1. Make observations to determine the effect of sunlight on Earth's surface. [Clarification Statement: Examples of Earth's surface could include sand, soil, rocks, and water.] [*Assessment Boundary: Assessment of temperature is limited to relative measures such as warmer/cooler.*]

Unit Summary

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

During this unit of study, students apply an understanding of the effects of the sun on the Earth's surface. The crosscutting concepts of *cause and effect* and *structure and function* are called out as organizing concepts for this disciplinary core idea. Students are expected to demonstrate grade-appropriate proficiency in *developing and using models*; *planning and carrying out investigations*; *analyzing and interpreting data*; and *designing solutions*. Students are also expected to use these practices to demonstrate understanding of the core ideas.

This unit is based on K-PS3-1, K-PS3-2, K-2-ETS1-1, K-2-ETS1-2, and K-2-ETS1-3.

Student Learning Objectives

Make observations to determine the effect of sunlight on Earth's surface. *[Clarification Statement: Examples of Earth's surface could include sand, soil, rocks, and water.]* [Assessment Boundary: Assessment of temperature is limited to relative measures such as warmer/cooler.*]* **(K-PS3-1)**

Use tools and materials provided to design and build a structure that will reduce the warming effect of sunlight on Earth's surface.* *[Clarification Statement: Examples of structures could include umbrellas, canopies, and tents that minimize the warming effect of the sun.]* **(K-PS3-2)**

Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool. (K-2-ETS1-1)

Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. (K-2-ETS1-2)

Unit Sequence

Part A: *How does sunlight affect the playground?*

Concepts Formative Assessment

- Scientists use different ways to study the world. *Students who understand the concepts are able to:*

• Events have causes that generate observable patterns. • Sunlight warms Earth's surface.	· 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

Unit Sequence	
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	*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

communicating ideas for a problem's solutions to other people. • Because there is always more than one possible solution	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.

to a problem, it is useful to compare and test designs. • Sunlight warms Earth's surface.	• 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. • Develop a simple model based on evidence to represent a proposed object or tool. • 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. • 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

What It Looks Like in the Classroom

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.

Connecting with 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.

Modifications

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

· Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.

· Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).

· Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).

· Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).

· Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and

multiple ways to demonstrate their understandings.

· Use project-based science learning to connect science with observable phenomena. · Structure the learning around explaining or solving a social or community-based issue. · Provide ELL students with multiple literacy strategies. · Collaborate with after-school programs or clubs to extend learning opportunities. · Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA).

Research on Student Learning
N/A

Future Learning

Grade 1 Unit 4: Light and Sound

· Objects can be seen if light is available to illuminate them or if they give off their own light.

· Some materials allow light to pass through them, others allow only some light through and others block all the light and create a dark shadow on any surface beyond them, where the light cannot reach. Mirrors can be used to redirect a light beam.

Grade 3 Unit 1: Weather and Climate

· Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next.

· Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years. **Grade 4 Unit 7: Using Engineering Design with Force and Motion Systems**

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

Connections to Other Units

In Unit 1, Weather; Unit 2, Pushes and Pulls, and Unit 5, Humans; students will use the following engineering principles:

· 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.

· 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.

Sample of Open Education Resources
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.

Teacher Professional Learning Resources

Using the *NGSS* Practices in the Elementary Grades

The presenters were Heidi Schweingruber from the National Research Council, Deborah Smith from Penn State University, and Jessica Jeffries from State College Area School District. In this seminar the presenters talked about applying the scientific and engineering practices described in A Framework for K–12 Science Education in elementary-level classrooms.

Continue the discussion in the community forums.

Teaching *NGSS* in K-5: Constructing Explanations from Evidence

Carla Zembal-Saul, Mary Starr, and Kathy Renfrew, provided an overview of the NGSS for K-5th grade. The web seminar focused on the three dimensional learning of the NGSS, while introducing CLAIMS-EVIDENCE-REASONING (CER) as a framework for introducing explanations from evidence. The presenters highlighted and discussed the importance of engaging learners with phenomena, and included a demonstration on using a KLEWS chart to map the development of scientific explanations of those phenomena.

View the resource collection.

Continue discussing this topic in the community forums.

Appendix I – Engineering Design in the *NGSS*

Appendix I provides important information about how engineering design plays a key role in science education. Providing students a foundation in engineering design allows them to better engage in and aspire to solve the major societal and environmental challenges they will face in the decades ahead. We anticipate that the insights gained and interests provoked

from studying and engaging in the practices of science and engineering during their K-12 schooling should help students see how science and engineering are instrumental in addressing major challenges that confront society today, such as generating sufficient energy, preventing and treating diseases, maintaining supplies of clean water and food, and solving the problems of global environmental change (NRC 2012, p. 9).

NGSS Core Ideas: Energy

The presenter was Jeff Nordine of the San Antonio Children's Museum. Ramon Lopez from the University of Texas at Arlington provided supporting remarks. The program featured strategies for teaching about physical science concepts that answer questions such as "How is energy transferred between objects or systems?" and "What is meant by conservation of energy?"

Dr. Nordine began the presentation by talking about the role of disciplinary core ideas within *NGSS* and the importance of energy as a core idea as well as a crosscutting concept. He then shared physicist Richard Feynman's definition of energy and related it to strategies for teaching about energy. Dr. Nordine talked about the elements of the energy core idea and discussed common student preconceptions.

Visit the resource collection.

Continue discussing this topic in the community forums.

Appendix A: NGSS and Foundations for the Unit
Make observations to determine the effect of sunlight on Earth's surface. *[Clarification Statement: Examples of Earth's surface could include sand, soil, rocks, and water.]* [Assessment Boundary: Assessment of temperature is limited to relative measures such as warmer/cooler.*]* **(K-PS3-1)**
Use tools and materials provided to design and build a structure that will reduce the warming effect of sunlight on Earth's surface.* *[Clarification Statement: Examples of structures could include umbrellas, canopies, and tents that minimize the warming effect of the sun.]* **(K-PS3-2)**
Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool. (K-2-ETS1-1)
Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as

needed to solve a given problem. (K-2-ETS1-2)	
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 performance expectations 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

Make observations (firsthand or from media) to collect data that can be used to make comparisons. (K-PS3- 1)

Constructing Explanations 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)

Asking Questions and Defining Problems

Ask questions based on observations to find more information about the natural

PS3.B: Conservation of Energy and Energy Transfer

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

ETS1.A: Defining and Delimiting Engineering Problems

· A situation that people want to change or create can be approached as a problem to be solved through engineering. (K-2-ETS1-1)

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

Cause and Effect

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

Structure and Function

The shape and stability of structures of natural and designed objects are related to their function(s). (K-2-ETS1-2)

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Connections to Nature of Science

Scientific Investigations Use a Variety of Methods

Scientists use different ways to study the world. (K-PS3-1)

and/or designed world(s). (K 2-ETS1-1) Define a simple problem that can be solved through the development of a new or	· Before beginning to design a solution, it is important to clearly understand the problem. (K-2-ETS1-1)	

improved object or tool. (K-2-ETS1-1) **Developing and Using Models** Develop a simple model based on evidence to represent a proposed object or tool. (K-2-ETS1-2) **Analyzing and Interpreting Data** Analyze data from tests of an object or tool to determine if it works as intended. (K-2-ETS1-3) **Solutions**	**ETS1.B: Developing Possible** · Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (K-2-ETS1-2) **ETS1.C: Optimizing the Design Solution** · Because there is always more than one possible solution to a problem, it is useful to compare and test designs. (K-2-ETS1-3)	

English Language Arts	**Mathematics**

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

W.K.7

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

K.MD.A.2

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

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

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

K.MD.A.2

Reason abstractly and quantitatively.

(K-2-ETS1-1),(K-2- ETS1-3) **MP.2**

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

Use appropriate tools strategically.

(K-2-ETS1-1),(K-2-ETS1- 3) MP.5

Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph.

(K-2-ETS1-1),(K-2-

Recall information from experiences or gather information

from provided sources to answer a question. (K-2-ETS1-1),(K 2-ETS1-3) **W.2.8**

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

ETS1-3) **2.MD.D.10**

Recommended Instructional Days: 20

Grade K Science Unit 3: Basic Needs of Living Things

NGSS:

Students who demonstrate understanding can:

K-LS1-1. Use observations to describe patterns of what plants and animals (including humans) need to survive. [Clarification Statement: Examples of patterns could include that animals need to take in food but plants do not; the different kinds of food needed by different types of animals; the requirement of plants to have light; and, that all living things need water.]

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

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

Unit Summary

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

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

This unit is based on K-LS1-1, K-ESS3-1, and K-ESS2-2.

Student Learning Objectives

Use observations to describe patterns of what plants and animals need to survive. *[Clarification Statement: Examples of patterns could include that animals need to take in food but plants do not; the different kinds of food needed by different types of animals; the requirement of plants to have light; and, that all living things need water.]* **(K-LS1-1)**
Use a model to represent the relationship between the needs of different plants and animals (including humans) and the places they live. *[Clarification Statement: Examples of relationships could include that deer eat buds and leaves, therefore, they usually live in forested areas; and, grasses need sunlight so they often grow in meadows. Plants, animals, and their surroundings make up a system.]* **(K-ESS3-1)**
Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs. *[Clarification Statement: Examples of plants and animals changing their environment could include a squirrel digs in the ground to hide its food and tree roots can break concrete.]* **(K-ESS2-2)**

What It Looks Like in the Classroom

Many students come to class with experience caring for living things such as family pets, houseplants, gardens, and even younger siblings. Teachers can begin IS1 with activities that allow students to share these experiences with one another. By the end of Unit 4, they should be able to relate these anecdotes to a few key principles about living organisms. The DCIs for this unit are developmentally appropriate for kindergarten. Students learn that plants need water and light to live and grow and that animals need food. Animals obtain food from plants or other animals. Students also learn that organisms survive and thrive in places that have the resources they need. Simply knowing these core ideas is not sufficient for meeting the PE; K-LS1-1 requires that students identify patterns in the needs of different organisms. It is not possible to identify a pattern unless students observe and compare multiple observations of living things. The process of integrating multiple observations and looking for patterns constitutes analyzing data in the K–2 grade band.

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

in cups or in an outdoor garden space.

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

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

Students should begin to group plants and animals together based upon their similar environmental needs (water, sunlight) and the availability of their preferred food sources. For example, students might read a story about the grasslands of Africa where a gazelle eats grass and then a lion eats the gazelle. Students should be able to explain [SEP-6] why each animal lives in that particular spot in Africa. Their answers should identify a specific need that is met by that location (either an environmental condition such as, “the grass lives there because it gets the sunlight and water that it needs,” or a food source

such as, “the lion lives there because it eats the gazelles there.”). Once students master the relationships of simple groups of organisms like the African grassland, teachers can focus on living things close to their school. What plants grow well in the

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

Guiding Questions:

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

Example Instructional Sequence

The unit should begin with observable phenomena. The purpose of presenting phenomena to students is to start them thinking and wondering about what they observe. After students have observed the event, they can work individually, with

partners, or in a small group to develop questions about what they saw. The questions will lead them into investigational opportunities throughout the unit that will help them answer their questions.

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

· Prior to starting the unit, display pictures of living and non-living things. Direct students to sort the pictures into two groups: living and non-living. Ask students to explain how they decided which pictures represented living things and which represented non-living things.

· Watch the PBS video "Is It Alive?" Stop after each picture and ask students if it's alive or not. Ask them to explain how they can tell. (This activity will also provide an opportunity to pre-assess students' understandings and/or misconceptions. It will also provide an opportunity for students to think about what having life means.)

· Watch the TeacherTube video "Living or Non-Living?" (This activity provides similar experiences for students as the PBS video. The difference is that after each picture and question, the narrator provides the answer with reasoning.) In this unit's progression of learning, students first learn that scientists look for patterns and order when making observations about the world and those patterns in the natural world can be observed and used as evidence. Students conduct firsthand and media-based observations of a variety living things and use their observations as evidence to support the concepts

✔ Plants do not need to take in food, but do need water and light to live and grow.

✔ All animals need food in order to live and grow, that they obtain their food from plants or from other animals, that different kinds of food are needed by different kinds of animals, and that all animals need water.

After determining what plants need to survive, kindergarteners learn that plants are systems, with parts, or structures, that work together, enabling plants to meet their needs in a variety of environments. The vast majority of plants have similar structures, such as roots, stems, and leaves, but the structures may look different depending on the type or variety of plant. Although there are many varieties of plants, their structures function in similar ways, allowing the plants to obtain

the water and light they need to survive. In other words, each variety of plant has structures that are well-suited to the environment in which it lives. As students learn about different types of plants and the environments in which they live, they use models, such as diagrams, drawings, physical replicas, or dioramas, to represent the relationships between the needs of plants and the places they live in the natural world. For example, grasses need sunlight, so they often grow in meadows. Cacti, which live in places subject to drought, have thick, wide stems and modified leaves (spines) that keep water within the plant during long periods without rain.

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

The final portion of the learning progression focuses on the understanding that plants and animals are system with parts,

or

structures, that work together. Students use what they have learned about plants and animals to make further observations to determine ways in which plants and animals change their environment to meet their needs. For example:

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

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

Connecting with English Language Arts/literacy and Mathematics

English Language Arts

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.

ELA/Literacy Standards: W.K.2, 8; SL.K.1, 4, 5; L.K.5c

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 measurements to describe various
attributes of animals. Kindergarteners can use simple, nonstandard units to measure such attributes as height, length, or weight. They can also count numbers of appendages or other body parts. They might use Unifix cubes to measure height or length and wooden blocks to measure weight. Students should work in groups to measure and record their data.

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

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

Modifications

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

· Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.

· Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).

· Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).

· Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).

· Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.

· Use project-based science learning to connect science with observable phenomena.

· Structure the learning around explaining or solving a social or community-based issue.

· Provide ELL students with multiple literacy strategies.

· Collaborate with after-school programs or clubs to extend learning opportunities.

· Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA).

Research on Student Learning

N/A

Future Learning

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

Connections to Other Units

Teachers and students can decorate the four corners of their classrooms to look like the landscape of regional environments. They can read stories (fictional and informational) set in those environments. They can modify the decorations as the seasons change (connecting to IS3).

Sample of Open Education Resources
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

5E Science Lesson Plan: This Prezi presentation describes lesson ideas that support students’ understanding of living organisms. Lessons also provide an opportunity for students to identify patterns that help them determine similarities and differences between plants and animals.

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.

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. This resource is part of the KET Everyday Science for Preschoolers collection. This video is available in both English and Spanish audio, along with corresponding closed captions.

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.

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.

Teacher Professional Learning Resources

Webinar: Teaching *NGSS* in K-5: Making Meaning through Discourse

The presenters were Carla Zembal-Saul, (Penn State University), Mary Starr, (Michigan Mathematics and Science Centers Network), and Kathy Renfrew (Vermont Agency of Education). After a brief introduction about the Next Generation Science Standards (*NGSS*), Zembal-Saul, Starr, and Renfrew gave context to the *NGSS* specifically for K-5 teachers, discussing three dimensional learning, performance expectations, and background information on the *NGSS* framework for K-5. The presenters also gave a number of examples and tips on how to approach *NGSS* with students, and took participants' questions. The web seminar ended with the presentation of a number of recommended NSTA resources for participants to explore. View the resource collection.

Continue discussing this topic in the community forums.

Webinar: Evaluating Resources for *NGSS*: The EQuIP Rubric

The presenters were Brian J. Reiser, Professor of Learning Sciences in the School of Education and Social Policy at Northwestern University, and Joe Krajcik, Director of the CREATE for STEM Institute.

After a brief overview of the *NGSS,* Brian Reiser, Professor of Learning Sciences, School of Education at Northwestern University and Joe Krajcik, Director of CREATE for STEM Institute of Michigan State University introduced the Educators Evaluating Quality Instructional Products (EQuIP) Rubric. The web seminar focused on how explaining how the EQuIP rubric can be used to evaluate curriculum materials, including individual lessons, to determine alignment of the lesson and/or materials with the NGSS. Three-dimensional learning was defined, highlighted and discussed in relation to the rubric and the NGSS. An emphasis was placed on how to achieve the conceptual shifts expectations of NGSS and three-dimensional learning using the rubric as a guide. Links to the lesson plans presented and hard copies of materials discussed, including the EQuIP rubric, were provided to participants. The web seminar concluded with an overview of NSTA resources on the NGSS

available to teachers by Ted, and a Q & A with Brian Reiser and Joe Krajcik. View the resource collection. Continue discussing this topic in the community forums

Webinar: *NGSS* Crosscutting Concepts: Systems and System Models

The presenter was Ramon Lopez from the University of Texas at Arlington. Dr. Lopez began the presentation by discussing the importance of systems and system models as a crosscutting concept. He talked about the key features of a system: boundaries, components, and flows and interactions. Dr. Lopez also described different types of system models, including conceptual, mathematical, physical, and computational models. Participants discussed their current classroom applications of systems and system models and brainstormed ways to address challenges associated with teaching this crosscutting concept.

Journal Article: Assessing Students' Ideas About Plants: This article contains an interview protocol that will help you gather information about your elementary students' ideas related to plants. By implementing the protocol, you will be able to discover what kinds of organisms your students think are plants and identify what students consider important for plant growth. Reproducible pictures of organisms and items that plants need for growth are included.

Journal Article: The Early Years: The Sun's Energy: Understanding the connection between the Sun's energy and sustaining life is difficult for preschoolers, but learning about these concepts through both long and short-term activities captures children's short attention spans. Activities such as growing plants in sunlight and without light, playing with light and shadow, and making "sun prints" explore light—in this case how the Sun's light is different from lamplight.

Appendix A: NJSLS-S and Foundations for the Unit

Use observations to describe patterns of what plants and animals (including humans) need to survive. *[Clarification Statement: Examples of patterns could include that animals need to take in food but plants do not; the different kinds of food needed by different types of animals; the requirement of plants to have light; and, that all living things need water.]* **(K-LS1-1)**

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

Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs. *[Clarification Statement: Examples of plants and animals changing their environment could include a squirrel digs in the ground to hide its food and tree roots can break concrete.]* (K-ESS2-2)		
The performance expectations 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 · Make observations (firsthand or from media) to collect data that can be used to make comparisons. (K-PS3- 1) **Analyzing and Interpreting Data** · Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (K-LS1-1) **Developing and Using Models**	**LS1.C: Organization for Matter and Energy Flow in Organisms** · All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow. (K-LS1-1) **ESS3.A: Natural Resources** · Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural	**Patterns** · Patterns in the natural and human designed world can be observed and used as evidence. (K-LS1-1) **Systems and System Models** · Systems in the natural and designed world have parts that work together. (K-ESS3-1), (K-ESS2-2) - ***Connections to Nature of Science***

· Use a model to represent	resources for everything they do. (K-ESS3-1)	

relationships in the natural world. (K ESS3-1) **Engaging in Argument from Evidence** · Construct an argument with evidence to support a claim. (K-ESS2-2)	**ESS2.E: Biogeology** · Plants and animals can change their environment. (K-ESS2-2)	**Scientific Knowledge is Based on Empirical Evidence** · Scientists look for patterns and order when making observations about the world. (K-LS1-1)

English Language Arts Mathematics

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

W.K.1

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

W.K.2

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

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

SL.K.5

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

Directly compare two objects with a measurable attribute in common, to see which object has “more of”/”less of” the attribute, and describe the difference. (K-LS1-1)

K.MD.A.2

Reason abstractly and quantitatively. (K-ESS3-1) **MP.2** Model with mathematics. (K-ESS3-1) **MP.4**

Counting and Cardinality (K-ESS3-1) **K.CC**

Recommended Instructional Days: 15

Grade K Science Unit 5: Basic Needs of Humans

NGSS:

Students who demonstrate understanding can:

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

K-2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

Unit Summary

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

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

This unit is based on K-ESS3-3 and K-2 ETS1-1.

Student Learning Objectives

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

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)

Unit Sequence	
Part A: *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 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	*Students who understand the concepts are able to:* • Observe patterns in events generated due to cause-and effect relationships. • Communicate solutions with others in oral and/or written forms using models and/or drawings that provide detail about scientific ideas. • Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment. • Ask questions based on observations to find more information about the natural and/or designed world. • Define a simple problem that can be solved through the

information are helpful in thinking about problems.

- Before beginning to design a solution, it is important to clearly understand the problem.

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.

What It Looks Like in the Classroom

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

To help students recognize the impact that humans have on the living and nonliving components of the local environment, they need opportunities to observe and think about the things that people do to live comfortably. Over a period of a few days,

students can observe their families in their day-to-day lives, paying attention to what they eat, what they throw away, when and how they use water, how they warm or cool their home, what types of appliances and gadgets they use, how they maintain their home and yard, what resources are used to make the clothes they wear, how they travel from place to place, and how they communicate with others. During whole-group discussions, students can share their observations and then discuss the concept of comfortable lifestyle. This list could include:

- Plants and animals for food
- Trees, rocks, sand, and other materials for building homes and schools
- Local reserves of water for drinking, washing clothes, showering, washing dishes, watering lawns, and cooking
- Gas and oil for cars and buses

- Electricity to power the appliances in their homes
- Land for homes, schools, parks, parking lots, and landfills

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

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

✔ As a class or in groups, students participate in shared research to find examples of ways that people solve some of the problems created by humans' use of resources from the environment. For example, people in the community might choose to:

- Recycle plastic, glass, paper, and other materials in order to reduce the amount of trash in landfills; o Plant trees in areas where trees have been cut down for lumber to renew regional habitats for local wildlife; or
- Set up rainwater collection systems so that rainwater can be used to maintain landscaping instead of using water from local reserves.

✔ Groups of students then develop a simple sketch, drawing, diagram, or physical model to illustrate how the solution reduces the impact of humans on land, water, air and/or other living things in the local environment.

✔ Groups need the opportunity to communicate their solutions with the class in oral and/or written form, using their sketches, drawings, diagrams, or models to help explain how the solution reduces the human impact on the environment.

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

Connecting with English Language Arts/literacy and Mathematics

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. Student 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.

Modifications

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

· Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.

· Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).

· Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).

· Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).

· Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.

· Use project-based science learning to connect science with observable phenomena.

· Structure the learning around explaining or solving a social or community-based issue.

· Provide ELL students with multiple literacy strategies.

· Collaborate with after-school programs or clubs to extend learning opportunities.

· Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA).

Research on Student Learning

N/A

Future Learning

Grade 4 Unit 5: Transfer of Energy

· Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not.

Grade 5 Unit 4: Water on Earth

· Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments.

Connections to Other Units

In **Unit 4, Basic Needs of Plants,** students learned that plants need sunlight and water in order to live and grow. In **Unit 5**, **Basic Needs of Living Things**, student learned that all animals need food in order to live and grow. They obtain their food from plants or from other animals.

Sample of Open Education Resources

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.

Teacher Professional Learning Resources

The New Jersey Department of Environmental Protection offers several **professional development opportunities** for classroom teachers as well as diverse enrichment programs for adults, students, environmental educators, families and other individuals. This section provides links to several training opportunities that are either administered by DEP or through one of DEP's formal partnerships or sponsorships.

Framework for K-12 Science Education, **Developing and Using Models**: This section of the Framework provides a deeper explanation of what it means for students to develop and use models. Modeling is especially important when concepts are too large or too small for students to have direct experience.

APPENDIX F: Science and Engineering Practices in the NGSS: The Framework uses the term "practices," rather than "science processes" or "inquiry" skills for a specific reason: We use the term "practices" instead of a term such as "skills" to emphasize that engaging in scientific investigation requires not only skill but also knowledge that is specific to each practice. (NRC Framework, 2012, p. 30). Appendix F provides further clarification of each science and engineering practice as well as specific details about what each looks like in each grade band.

***NGSS* Crosscutting Concepts: Stability and Change:** The presenter was Brett Moulding, director of the Partnership for Effective Science Teaching and Learning. Mr. Moulding began the web seminar by defining stability and change and discussing the inclusion of this concept in previous standards documents such as the National Science Education Standards (NSES). Participants brainstormed examples of science phenomena that can be explained by using the concept of stability and change. Some of their ideas included Earth's orbit around the Sun, carrying capacity of ecosystems, and replication of DNA. Mr. Moulding then discussed the role of stability and change within NGSS. Participants again shared their ideas in the chat, providing their thoughts about classroom implementation of this crosscutting concept.

Appendix A: NGSS and Foundations for the Unit

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

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 performance expectations 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 · Make observations (firsthand or from media) to collect data that can be used to make comparisons. (K-PS3- 1) **Obtaining, Evaluating, and Communicating Information** · Communicate solutions with others in oral and/or written forms using models and/or drawings that provide detail about scientific ideas. (K ESS3-3) **Asking Questions and**	**ESS3.C: Human Impacts on Earth Systems** · Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things. (K-ESS3-3) **ETS1.B: Developing Possible Solutions** · Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other	**Cause and Effect** · Events have causes that generate observable patterns. (K-ESS3-3) **Structure and Function** · The shape and stability of structures of natural and designed objects are related to their function(s). (K-2-ETS1-2)

Defining Problems · Ask questions based on observations to find more information about the natural and/or designed world(s). (K 2-ETS1-1) · Define a simple problem that can be solved through the development of a new or improved object or tool. (K-2- ETS1-1)	people.*(secondary)* (K-ESS3-3) **ETS1.A: Defining and Delimiting Engineering Problems** · A situation that people want to change or create can be approached as a problem to be solved through engineering. (K-2-ETS1-1) · Asking questions, making observations, and gathering information are helpful in thinking about problems.	

(K-2-ETS1-1)	

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

Cross Curricular Standards

English Language Arts

Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic. (K-ESS3-3)

W.K.2

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

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

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

Mathematics

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

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

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

Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph. (K-2-ETS1-1) **2.MD.D.10**

W.2.8Technology

8.1.2.A.2
8.1.2.A.4
8.1.2.A.5

21st Century Life and Careers

9.2.4.A.1
CRP1
CRP2
CRP4

Modifications for SpEd/ESL/students at Risk/Gifted

Supports, Accommodations, and Modifications must be provided as stated in IEP,504 Plan, or I-Team Intervention Plan , and may include (but not limited to) the following**:**

Presentation accommodations:

- Listen to audio recordings instead of reading text
- Learn content from audio books, movies, videos and digital media instead of reading print versions
- Use alternate texts at lower readability level
- Work with fewer items per page or line and/or materials in a larger print size
- Use magnification device, screen reader, or Braille/Nemeth Code
- Use audio amplification device (e.g., hearing aid (s) , auditory trainer, sound-field system (which may require teacher use of microphone)
- Be given a written list of instructions
- Record a lesson, instead of taking notes
- Have another student share class notes with him
- Be given an outline of a lesson
- Be given a copy of teachers' lecture notes
- Be given a study guide to assist in preparing for assessments
- Use visual presentations of verbal material, such as word webs and visual organizers
- Use manipulatives to teach or demonstrate concepts
- Have curriculum materials translated into native language

Response accommodations:

- Use sign language, a communication device, Braille, other technology, or native language other than English
- Dictate answers to scribe
- Capture responses on an audio recorder
- Use a spelling dictionary or electronic spell-checker
- Use a word processor to type notes or give responses in class
- Use a calculator or table of “math facts”
- Respond directly in the test booklet rather than on an answer sheet.

Setting accommodations:

- Work or take a test in a different setting, such as a quiet room with few distractions
- Sit where he learns best (for example, near the teacher, away from distractions)
- Use special lighting or acoustics
- Take a test in a small group setting
- Use sensory tools such as an exercise band that can be looped around a chair’s legs (so fidgety kids can kick it and quietly get their energy out)
- Use noise buffers such as headphones, earphones, or earplugs

Timing accommodations:

- Take more time to complete a task or a test
- Have extra time to process oral information and directions
- Take frequent breaks, such as after completing task

Scheduling accommodations:

- Take more time to complete a project

· Take a test in several timed sessions or over several days
· Take sections of a test in a different order
· Take a test at a specific time of day

Organization skills accommodations:

· Use an alarm to help with time management
· Mark texts with a highlighter
· Have help coordination assignments in a book or planner
· Receive study skills instruction

Assignment modifications:

· Complete fewer or different homework problems than peers
· Write shorter papers
· Answer fewer or different test questions
· Create alternate projects or assignments

Curriculum modifications:

· Learn different material (such as continuing to work on multiplication while classmates move on to fractions, or moving ahead to an extension concept/skill while classmates continue to work on a core skill)