MOUNT HOLLY TOWNSHIP SCHOOL DISTRICT
KINDERGARTEN SCIENCE CURRICULUM

Revised to meet the June 2020 Science NJSLS-S
Board Approval: November, 2022

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2020 New Jersey Student Learning Standards for Science (K-5)

2020 New Jersey Student Learning Standards for Science (6-8)

Intent and Spirit

The New Jersey Student Learning Standards for Science (NJSLS-S) describe the expectations for what students should know and be able to do as well as promote three-dimensional science instruction across the three science domains (i.e., physical sciences, life science, Earth and space sciences). From the earliest grades, the expectation is that students will engage in learning experiences that enable them to investigate phenomena, design solutions to problems, make sense of evidence to construct arguments, and critique and discuss those arguments (in appropriate ways relative to their grade level).

The foundation of the NJSLS-S reflects three dimensions — science and engineering practices, disciplinary core ideas, and crosscutting concepts. The performance expectations are derived from the interplay of these three dimensions. It is essential that these three components are integrated into all learning experiences. Within each standard document, the three dimensions are intentionally presented as integrated components to foster sensemaking and designing solutions to problems. Because the NJSLS-S is built on the notions of coherence and contextuality, each of the science and engineering practices and crosscutting concepts appear multiple times across topics and at every grade level. Additionally, the three dimensions should be an integral part of every curriculum unit and should not be taught in isolation.

Mission

All students will possess an understanding of scientific concepts and processes required for personal decision-making, participation in civic life, and preparation for careers in STEM fields (for those that chose).

Vision

Prepare students to become scientifically literate individuals who can effectively:

- Apply scientific thinking, skills, and understanding to real-world phenomena and problems;

- Engage in systems thinking and modeling to explain phenomena and to give a context for the ideas to be learned;
- Conduct investigations, solve problems, and engage in discussions;
- Discuss open-ended questions that focus on the strength of the evidence used to generate claims;
- Read and evaluate multiple sources, including science-related magazine and journal articles and web-based resources to gain knowledge about current and past science problems and solutions and develop well-reasoned claims; and
- Communicate ideas through journal articles, reports, posters, and media presentations that explain and argue.

Three Dimensions of NJSLS-S

The performance expectations reflect the three dimensions and describe what students should know and be able to do. In layman's terms, they are "the standards." They are written as statements that can be used to guide assessment and allow for flexibility in the way that students are able to demonstrate proficiency.

The example below is provided to illustrate the interconnected nature of the NJSLS-S components.

Disciplinary Core Ideas and Performance Expectations

Disciplinary Core Idea	Performance Expectation
Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models.	Develop and use a model of the Earth-sun moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.

Science and Engineering Practices

Developing and Using Models	Develop and use a model to describe phenomena

Crosscutting Concepts

Scale, Proportion, and Quantity	Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.

Becoming familiar with the science practices and crosscutting concepts is a critically important first step in designing learning experiences reflective of the three dimensions. A description of each of the science and engineering practices and the cross-cutting concepts can be found in the next sections.

Further, for students to develop proficiency of the NJSLS-S, they will need to engage in learning experiences that are meaningful, cumulative, and progressive. Learning experiences designed to be meaningful, go beyond reading about science concepts and provide opportunities for students to be active learners and make sense of ideas. Cumulative learning experiences provide opportunities for students to use and build on ideas that they have learned in previous units. Progressive learning experiences provide multiple occasions for students to engage in ways that enable them to improve their construction of explanations and solutions over time by iteratively assessing them, elaborating on them, and holding them up to critique and evidence.

Scientific and Engineering Practices

Asking Questions and Defining Problems

A practice of science is to ask and refine questions that lead to descriptions and explanations of how the natural and designed world works and which can be empirically tested. Engineering questions clarify problems to determine criteria for successful solutions and identify constraints to solve problems about the designed world. Both scientists and engineers also ask questions to clarify the ideas of others.

Planning and Carrying Out Investigations

Scientists and engineers plan and carry out investigations in the field or laboratory, working collaboratively as well as individually. Their investigations are systematic and require clarifying what counts as data and identifying variables or parameters. Engineering investigations identify the effectiveness, efficiency, and durability of designs under different conditions.

Analyzing and Interpreting Data

Scientific investigations produce data that must be analyzed in order to derive meaning. Because data patterns and trends are not always obvious, scientists use a range of tools—including tabulation, graphical interpretation, visualization, and statistical analysis—to identify the significant features and patterns in the data. Scientists identify sources of error in the investigations and calculate the degree of certainty in the results. Modern technology makes the collection of large data sets much easier, providing secondary sources for analysis. Engineering investigations include analysis of data collected in the tests of designs. This allows comparison of different solutions and determines how well each meets specific design criteria—that is, which design best solves the problem within given constraints. Like scientists, engineers require a range of tools to identify patterns within data and interpret the results. Advances in science make analysis of proposed solutions more efficient and effective.

Developing and Using Models

A practice of both science and engineering is to use and construct models as helpful tools for representing ideas and explanations. These tools include diagrams, drawings, physical replicas, mathematical representations, analogies, and computer simulations. Modeling tools are used to develop questions, predictions and explanations; analyze and identify flaws in systems; and communicate ideas. Models are used to build and revise scientific explanations and proposed engineered systems. Measurements and observations are used to revise models and designs.

Constructing Explanations and Designing Solutions

The products of science are explanations and the products of engineering are solutions. The goal of science is the construction of theories that provide explanatory accounts of the world. A theory becomes accepted when it has multiple lines of empirical evidence and greater explanatory power of phenomena than previous theories. The goal of engineering design is to find a systematic solution to problems that is based on scientific knowledge and models of the material world. Each proposed solution results from a process of balancing competing criteria of desired functions, technical feasibility, cost, safety, aesthetics, and compliance with legal requirements. The optimal choice depends on how well the proposed solutions meet criteria and constraints.

Engaging in Argument from Evidence

Argumentation is the process by which explanations and solutions are reached. In science and engineering, reasoning and argument based on evidence are essential to identifying the best explanation for a natural phenomenon or the best solution to a design problem. Scientists and engineers use argumentation to listen to, compare, and evaluate competing ideas and methods based on merits.

Scientists and engineers engage in argumentation when investigating a phenomenon, testing a design solution, resolving questions about measurements, building data models, and using evidence to identify strengths and weaknesses of claims.

Using Mathematics and Computational Thinking

In both science and engineering, mathematics and computation are fundamental tools for representing physical variables and their relationships. They are used for a range of tasks such as constructing simulations; statistically analyzing data; and recognizing, expressing, and applying quantitative relationships. Mathematical and computational approaches enable scientists and engineers to predict the behavior of systems and test the validity of such predictions. Statistical methods are frequently used to identify significant patterns and establish correlational relationships.

Obtaining, Evaluating, and Communicating Information

Scientists and engineers must be able to communicate clearly and persuasively the ideas and methods they generate. Critiquing and communicating ideas individually and in groups is a critical professional activity. Communicating information and ideas can be done in multiple ways: using tables, diagrams, graphs, models, and equations as well as orally, in writing, and through extended discussions. Scientists and engineers employ multiple sources to acquire information that is used to evaluate the merit and validity of claims, methods, and design.

{NJDOE NJSLS-S January 2022}

New Jersey Technology Standards

2020 New Jersery Student Learning Standards: Computer Science and Design Thinking

New Jersey Career Readiness, Life Literacies, and Key Skills Standards

2020 New Jersey Student Learning Standards: Career Readiness, Life Literacies & Key Skills

New Jersey Climate Change Standards

2020 New Jersey Student Learning Standards: Climate Change

Pacing Guide

Topic	Unit #	Unit Length
Earth Systems	I	15 days
Motion and Stability: Forces and Interactions	II	15 days
Earth and Human Activity	III	15 days
Energy	IV	20 days
From Molecules to Organisms: Structures and Processes	V	15 days
Engineering and Design	VI	10 days

Science Curriculum Kindergarten	
Career Readiness, Life Literacies, and Key Skills (NJSLS 9)	9.1.2.CR.1: Recognize ways to volunteer in the classroom, school and community. 9.1.2.CR.2: List ways to give back, including making donations, volunteering, and starting a business.
Computer Science and Design Thinking (Technology)	8.1 Educational Technology All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and create and communicate knowledge. 8.2 Technology Education, Engineering, Design and Computational Thinking - Programming All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

Diversity, Equity, and Inclusion	Texts, presentations, and lesson materials are strategically chosen with equity in mind. Students will recognize a variety of identities, cultures, and abilities in the characters used to display and explain scientific concepts.
Climate Change	● K-ESS2-1: Use and share observations of local weather conditions to describe patterns over time. ● K-PS3-1: Make observations to determine the effect of sunlight on Earth's surface. ● K-PS3-2: Use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area. ● K-ESS2-2: Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs. ● K-ESS3-1: Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live. ● K-ESS3-3: Communicate solutions that will reduce the impact of climate change and humans on the land, water, air, and/or other living things in the local environment. ● K-2-ETS1-1: Ask questions, make observations, and gather information about a situation people want to change (e.g., climate change) to define a simple problem that can be solved through the development of a new or improved object or tool. ● K-2-ETS1-2: 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. ● K-LS1-1: Use observations to describe patterns of what plants and animals (including humans) need to survive.
Core/Supplemental Class Resources	Generation Genius BrainpopJr. Seesaw Mystery Science Peekaboo Kidz Science Lessons (YouTube)
District/School Formative Assessment Plan	● Teacher Observation ● Presentations ● Quizzes/Test

	● Portfolios ● Group Projects/Discussions ● Performance Tasks ● Summative Assessment

Kindergarten Next Generation Science Standards Overview

Science Content:

- Observe, describe, and predict patterns of movement of objects in the sky
- Develop understanding of how plants and animals use their external parts to help them survive, grow, and meet their needs
- Develop understanding of how behaviors of parents and offspring help the offspring survive
- Determine that young plants and animals are like, but not exactly the same as their parents
- Develop understanding of the relationship between sound and vibrating materials
- Develop understanding between the availability of light and ability to see objects
- Determine the effect of placing objects made with different materials in a path of light

Science Concepts:

- Patterns
- Cause and effect
- Structure and function
- Influence of engineering, technology, and science on society and the natural world

Science Skills:

- Planning and carrying out investigations
- Analyzing and interpreting data
- Constructing explanations and designing solutions
- Obtaining, evaluating, and communicated information

Interdisciplinary Standards	
Science Discipline	***Connection to other Disciplines***
Unit 1: **Earth Systems**	*Connections to NJSLS – English Language Arts* • **RL.K.1** With prompting and support, ask and answer questions about key details in a text (e.g., who, what, where, when, why, how). (K-ESS2-2) • **W.K.1** Use a combination of drawing, dictating, and writing to compose opinion pieces in which they tell a reader the topic or the name of the book they are writing about and state an opinion or preference about the topic or book. (K-ESS2-2) • **W.K.2** Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic. (K-ESS2- 2) • **W.K.7** Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-ESS2-1) *Connections to NJSLS – Mathematics* • **MP.2** Reason abstractly and quantitatively. (K-ESS2-1) • **MP.4** Model with mathematics. (K-ESS2-1) • **K.CC.A** Know number names and the count sequence. (K-ESS2-1) • **K.MD.A.1** Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object. (K-ESS2-1) • **K.MD.B.3** Classify objects into given categories; count the number of objects in

	each category and sort the categories by count. (K-ESS2-1)
Unit Two: **Motion and Stability: Forces and Interactions**	*Connections to NJSLS – English Language Arts* • **RI.K.1** With prompting and support, ask and answer questions about key details in a text. (K-PS2-2) • **W.K.7** Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-PS2-1) • **SL.K.3** Ask and answer questions in order to seek help, get information, or clarify something that is not understood. (K-PS2-2) *Connections to NJSLS – Mathematics* • **MP.2** Reason abstractly and quantitatively. (K-PS2-1) • **K.MD.A.1** Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object. (K-PS2-1) • **K.MD.A.2** Directly compare two objects with a measurable attribute in common, to see which object has "more of/less of" the attribute, and describe the difference. (K-PS2-1)
Unit 3: **Earth and Human Activity**	*Connections to NJSLS – English Language Arts* ● **RI.K.1** With prompting and support, ask and answer questions about key details in a text. (K-ESS3-2)

	• **W.K.2** Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic. (K-ESS3- 3) • **SL.K.3** Ask and answer questions in order to seek help, get information, or clarify something that is not understood. (K-ESS3-2) • **SL.K.5** Add drawings or other visual displays to descriptions as desired to provide additional detail. (K-ESS3- 1 ***Mathematics –****Connections to NJSLS – Mathematics* • **MP.2** Reason abstractly and quantitatively. (K-ESS3-1) • **MP.4** Model with mathematics. (K-ESS3-1) • **K.CC** Know number names and the count sequence. (K-ESS3-1)
Unit Four: Energy	*Connections to NJSLS – English Language Arts* • **W.K.7** Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-PS3-1), (K-PS3-2) *Connections to NJSLS – Mathematics*

	• **K.MD.A.2** Directly compare two objects with a measurable attribute in common, to see which object has "more of/less of" the attribute, and describe the difference. (K-PS3-1), (K-PS3-2)
Unit Five: From Molecules to Organisms: Structures and Processes	*Connections to NJSLS – English Language Arts* • **W.K.7** Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-LS-1) *Connections to NJSLS – Mathematics* • **K.MD.A.2** Directly compare two objects with a measurable attribute in common, to see which object has "more of/less of" the attribute, and describe the difference. (K-LS-1)
Unit Six:Engineering Design	*Connections to NJSLS - English Language Arts* • **RI.2.1** 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) • **W.2.6** 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.2.8** Recall information from experiences or gather information from

	provided sources to answer a question. (K-2-ETS1-1), (K-2-ETS1-3) • **SL.2.5** 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) *Connections to NJSLS - Mathematics* • **MP.2** Reason abstractly and quantitatively. (K-2-ETS1-1), (K-2-ETS1-3) • **MP.4** Model with mathematics. (K-2-ETS1-1), (K-2-ETS1-3) • **MP.5** Use appropriate tools strategically. (K-2-ETS1-1), (K-2-ETS1-3) • **2.MD.D.10** Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph. (K-2-ETS1-1), (K-2-ETS1-3)

Unit One: Earth Systems	
NJ Student Learning Standards: Science Grade K **K-ESS2-1 Use and share observations of local weather conditions to describe patterns over time.** [Clarification Statement: Examples of qualitative observations could	**15 days** **NJDOE Science Curricular Framework** NJ Science Frameworks **21st Century Student Outcomes** http://www.battelleforkids.org/networks/p21

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-ESS2-2 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.]

Learning and Innovation Skills
highlight appropriate indicators for unit/domain
Think Creatively
Work Creatively with Others
Implement Innovations
Reason effectively
Use Systems Thinking
Make Judgments and Decisions
Solve Problems
Communicate Clearly
Collaborate with Others

Life and Career Skills
highlight appropriate indicators for unit/domain
Adapt to Change
Be Flexible
Manage Goals and Time
Work Independently
Be Self-directed Learners
Interact Effectively with Others
Work Effectively in Diverse Teams

Unit Focus and Targets:

"Act like Scientists" (Science and Engineering Practices)	**"Think like Scientists" (Disciplinary Core Ideas/Content)**	**"See the World like Scientists" (Crosscutting Concepts)**
Analyzing and Interpreting Data Analyzing data in K–2 builds on prior	**ESS2.D: Weather and Climate** ▪ Weather is the combination of sunlight,	**Patterns** ▪ Patterns in the natural world can be

experiences and progresses to collecting, recording, and sharing observations. ▪ Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (K ESS2-1) **Engaging in Argument from Evidence** Engaging in argument from evidence in K–2 builds on prior experiences and progresses to comparing ideas and representations about the natural and designed world(s). ▪ Construct an argument with evidence to support a claim. (K ESS2-2)	wind, snow or rain, and temperature in a particular region at a particular time. People measure these conditions to describe and record the weather and to notice patterns over time. (K-ESS2-1) **ESS2.E: Biogeology** ▪ Plants and animals can change their environment. (K-ESS2-2) **ESS3.C: Human Impacts on Earth Systems** ▪ Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things. *(secondary to K ESS2-2)*	observed, used to describe phenomena, and used as evidence. (K-ESS2-1) **Systems and System Models** ▪ Systems in the natural and designed world have parts that work together. (K-ESS2-2) ***Connections to Nature of Science*** **Science Knowledge is Based on Empirical Evidence** ▪ Scientists look for patterns and order when making observations about the world. (K-ESS2-1)

In the Classroom: Unit 1, Part A

Part A Guiding Question:

- What types of patterns can be observed in local weather conditions?

Part A Teaching Points:

- Scientists looks for patterns and order when making observations about the world
- Weather is the combination of what is in the sky (sun, wind, snow, clouds, rain) and the 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

Part A Assessment Objectives:

- Observe and use patterns in the natural world as evidence and to describe weather
- Use and share observations of local weather conditions to describe patterns over time

Unit 1, Part A, Lesson 1: Introduction to Weather

Materials:

- Weather pictures (https://drive.google.com/open?id=0B5e_0qncfnkBWWpjSndGbDFOZ1E)
- White drawing paper

Engage:

1. Activate prior knowledge and expand on weather discussions that your class has during calendar
2. Ask questions and discuss
    a. What is weather?
    b. What are different types of weather?
3. Document answers to generate a list of different weather words

Explore:

1. Students will be broken up into five groups
2. Give each group a weather picture
3. Prompt groups to discuss what type of weather they see in their picture and talk about the pictures for a bit
4. Give each student a sheet of white paper
5. Pose a make believe situation to the class: “If you were standing in the middle of this picture, what would you do?”
6. Students will draw a picture of what they would do if they were in this situation
7. Prompt students to think about and draw more than one solution

Explain:

1. Gather whole group on the carpet
2. Allow students to share their drawing and explain what they are doing in their picture

3. Emphasize when students share ideas of protecting themselves in a dangerous scenario
    a. Hiding in a tornado
    b. Putting lots of clothes on to protect from a blizzard
    c. Wearing sunscreen and hat on sunny days
4. Ask students why they would do such things - prompt to be safe

Elaborate:

1. Teacher will explain that all of these pictures show different types of weather that happen in the real world
2. Explain that some types of weather can be severe or dangerous; therefore, it's important for us to protect ourselves during these times
3. Teachers will then refer to the "take shelter" drill we practice at school
4. Ask "Why do we practice this drill" - prompting to stay safe in severe weather
5. Take this time to review the severe weather drill, go over the drill procedures (going into the hallway and kneeling), act out the drill procedure

Evaluate:

1. Students should be able to explain the need to stay safe in severe weather and various ways to do so

Unit 1, Part A, Lesson 3: Forecasting and Observing Patterns

Materials:

- Objects to use as microphones for weather reports
- Weather journal (https://drive.google.com/open?id=0B5e_0qncfnkBQ2hwb3BqUlY3MFk)

Engage:

1. Watch the following video: https://www.youtube.com/watch?v=7-zWxzRr6OU
2. Discuss what this clip is of - a weather forecast, a weatherman
3. Ask students to explain why this job is important - to keep us safe from weather
4. Explain to students that
5. Explain to students that weather reports in different places are different than ours because weather is different depending on where you live
    a. Emphasize that this is why we do not typically have tornados and tsunamis in Mt. Holly

Explore:

1. Pair students up
2. Explain that during this lesson, students will practice giving a weather forecast for today's weather
3. Allow students to observe the weather and think about what is important to say in a forecast
4. Have one partner in each pair give their weather forecast
5. Switch and allow the other partner to give their weather forecast

Explain:

1. Explain to students that another job of the weather forecast is to find patterns in the weather
2. Discuss what a pattern is and how a weather pattern works the same - similar weather repeats itself over and over again

Elaborate:

1. Distribute and create weather journals for each student to track the weather patterns of the next 5 days
2. Allow students time each day to complete their weather journal, to make predictions of tomorrow's weather, and look for patterns

Evaluate:

1. Students should complete their weather journals
2. Compare severe weather to our regional weather
3. Explain why forecasts are important - to keep us safe

Unit 1, Part A, Lesson 4: Living Things Change Their Environment

Materials:

- Foil baking pan
- Foil bread pan
- Pitcher of water
- Handful of sticks
- Handful of leaves
- Handful of rocks
- Container of chocolate frosting

- Plastic Spoon
- Pencil
- Books

Engage:

1. What kinds of natural animal homes have you seen before?
2. What do birds build before they have babies? How do they do it?
3. Why do animals need homes?
4. How do plants change their environment?
5. What are some ways an animal changes their environment?
6. What are some ways that people chance the environment?

Explore:

1. Show students the following video: https://www.generationgenius.com/videolessons/living-things-change-their-environment-video-for-kids/
2. How does a prairie dog change its environment
3. How are prairie dog burrows good for the environment?
4. How does a beaver change its environment?
5. What are some good ways that people can change their environment?
6. What are some bad ways that people change their environment?

Explain:

1. WHAT IS AN ENVIRONMENT? An environment is the place where living things live. Many living things change their environments by building homes, digging in the ground and moving things around. To better understand how living things change their environment…
2. Animals build their homes in their environment. Prairie dogs dig tunnels to create burrows. Burrows are shelters under the ground. When prairie dogs build tunnels, they change the shape of the land.
3. Beavers can flood areas of land. Beavers build dams using trees, sticks, mud and rocks. The whole beaver family works together to build the dam. The flooding causes huge changes to their environment.
4. Animals make changes to the environment by eating. When a macaw eats seeds, it will fly somewhere else and then eventually poop the seeds out. This helps plants grow in new places and changes their environment.
5. Plants can also change their environment. Sometimes the roots of plants can grow into cracks in rock or concrete. The roots can make the cracks get bigger. You may have seen sidewalk cracks made bigger by plants.

6. People can change their environment in good and bad ways. People can help their environment by cleaning up trash and recycling. People sometimes hurt their environment when they cut down too many trees down or litter.

Elaborate:

1. Use the pencil to poke 2 holes in one end of the bread pan.
2. Stack 2 books next to the larger baking pan.
3. Place the bread pan on the books and hang half of it over the baking pan.
4. Take some chocolate frosting and coat the middle of the bread pan.
5. Place some sticks and leaves on the frosted area.
6. Place some rocks on top of the leaves and sticks to hold them down.
7. Add more frosting to hold everything in place.
8. Now test the dam by pouring water into the back part of the baking pan.
9. Tips:Your design may not work the first time. You can try putting the rocks on the bottom or using different materials. It may take a few tries.

Evaluate:

1. GeniusChallenge Quiz

Unit 1 Modifications:

SPED: Provide visuals for students throughout the lesson on promethean board and the focus wall; allow extra time for activities to be completed; dictated responses in lieu of written work; hands on activities instead of pencil and paper

ESL/ELL: Describing pictures or classroom objects; Providing information in graphic organizers; Identifying real life objects based on descriptive oral phrases or short sentences;

504 Students: Provide a checklist of the steps needed to complete the problem; Provide lots of white-space to make it less busy; If still struggling, reteach and retest

At-Risk Students: Reduce the number of problems given; Give extra time

Gifted and Talented: Added detail to written work; find connecting stories from classroom library and compare to the lessons

Unit Two: Motion and Stability: Forces and Interactions	
NJ Student Learning Standards: Science Grade K **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.]	**15 days** **NJDOE Science Curricular Framework** NJ Science Frameworks **21st Century Student Outcomes** http://www.battelleforkids.org/networks/p21 **Learning and Innovation Skills** **highlight appropriate indicators for unit/domain** Think Creatively Work Creatively with Others Implement Innovations Reason effectively Use Systems Thinking Make Judgments and Decisions Solve Problems Communicate Clearly Collaborate with Others **Life and Career Skills** **highlight appropriate indicators for unit/domain** Adapt to Change Be Flexible Manage Goals and Time

	Work Independently Be Self-directed Learners Interact Effectively with Others Work Effectively in Diverse Teams

Unit Focus and Targets:

"Act like Scientists" (Science and Engineering Practices)	**"Think like Scientists" (Disciplinary Core Ideas/Content)**	**"See the World like Scientists" (Crosscutting Concepts)**
Planning and Carrying Out Investigations Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions. ▪ With guidance, plan and conduct an investigation in collaboration with peers. (K-PS2-1) **Analyzing and Interpreting Data** Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations. ▪ Analyze data from tests of an object or tool to determine if it works as intended. (K-PS2-2)	**PS2.A: Forces and Motion** - ▪ Pushes and pulls can have different strengths and directions. (K-PS2- 1), (K-PS2-2) - ▪ Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it. (K PS2-1), (K-PS2-2) **PS2.B: Types of Interactions** - ▪ When objects touch or collide, they push on one another and can change motion. (K-PS2-1) **PS3.C: Relationship Between Energy and Forces** - ▪ A bigger push or pull makes things speed up or slow down more - quickly. *(secondary to K-PS2-1)* - **ETS1.A: Defining Engineering Problems**	**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) ***Connections to Nature of Science*** **Scientific Investigations Use a Variety of Methods** ▪ Scientists use different ways to study the world. (K-PS2-1)

	▪ A situation that people want to change or create can be approached as a problem to be solved through engineering. Such problems may have many acceptable solutions. *(secondary to K-PS2-2)*	

In the Classroom: Unit 2, Part A

Part A Guiding Question:

- How does science relate to physical activity and sports?

Part A Teaching Points:

- Pushes and pulls can have different strengths and directions
- Pushing and pulling on an object can change the speed or direction of its motion
- Pushing or pulling on an object 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

Part A Assessment Objectives:

- With guidance, design a simple test to gather evidence to support or refute ideas about cause and effect relationships
- With guidance, plan and conduct an investigation with peers
- With guidance, plan and conduct an investigation to compare the effects of different strengths and directions of pushes and pulls on an object

Unit 2, Part A, Lesson 1: Pulling

Materials:

- Marble and string
- Cardboard Mazes

- Book
- Pencil
- Soccer Ball
- Chair
- *Move it! Motion, Forces, and You* Read Aloud

Engage:

1. Ask students to demonstrate pulls
2. Students will be asked to explain what a push and pull can do
3. Students will list and brainstorm examples of how we use pushes and pulls

Explore:

1. Students will move marbles attached to string through the cardboard mazes
2. Challenge students to find out what needs to be done to move the marble quicker and slower through the maze

Explain:

1. Ask and discuss:
    a. What was different about how we moved the marble last week and how you moved the marble today?
    b. What was the hardest part of the maze to move the marble through? Why?
    c. What did you need to do to pull the marble through that area? (pull faster, pull harder, pull slower, etc)
2. Emphasize that we can push and pull things in different ways to create different speeds of pushes and pulls

Elaborate:

1. Students will experiment with different types of pushes and pulls to change the speed of materials
    a. Soccer ball
    b. Chair
    c. Book
    d. Pencil
2. Read aloud *Move it!*

Evaluate:

1. Students will take turns demonstrating and explaining how the types of pushes and pulls change the speed of the object

In the Classroom: Unit 2, Part B

Part B Guiding Question:

- How can you design a simple way to change the speed or direction of an object using a push or pull from another object?

Part B Teaching Points:

- A situation that people want to change or create can be approached as a problem to be solved through engineering
- Problems may have many acceptable solutions
- It is useful to compare and test designs

Part B Assessment Objectives:

- 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 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 pull

Unit 2, Part B, Lesson 1: Changing Directions
End of 1st science cycle

Materials:

- Ping pong balls (borrow from Cicchino)
- Straws
- Pipe Cleaners
- Plastic Spoons
- String
- Tape

Engage:

1. How can you design a simple way to change the speed or direction of an object using a push or pull from another object?

2. Present students with the materials above
3. Explain to students that today they will be choosing materials to help them move their ping pong ball from point A to point B
    a. Mark point A and point B on desks/floor
4. Each student or pair gets one ping pong ball and two other items

Explore:

1. Give students time to manipulate their materials. Examples of how students can use one object to push or pull another include:
    a. Pulling with piece of tape
    b. Pushing with pipe cleaner
    c. Pushing with spoon
    d. Pulling with string
2. Set up a "track" in the classroom where students can race their creations
3. Choose students to race their ping pong balls to the finish line using the materials they selected to help pull or push the ball towards the finish line

Explain:

1. Discuss after each race what happened to the ping pong balls
2. What materials did students use to move their balls?
3. Were there any problems with certain materials?
4. Did the balls move at the same speed and direction?
5. Did they collide?
6. Was the ball pushed or pulled to the finish line?

Elaborate:

1. Reflect on the previous day's races:
    a. What materials did you use to make your ball move?
    b. What materials would you choose today if you were given another chance to win the race?
2. Explain to students that based on what they learned and observed, they are going to have a second chance to race their ping pong balls
3. This time, students will be able to choose from the same materials, but make changes if they choose
4. Repeat the racing process

Evaluate:

1. Compare the strengths and weaknesses of each material
2. Analyze observed data in which materials worked best and why

Unit 2, Part B, Lesson 3: Changing Speed

Materials:

- Pinwheels borrowed from Cicchino

Engage:

1. Revisit the concepts of push and pull to activate students' prior knowledge
2. Explain to students that over the next two science classes, they will get to practice using force to move objects in different ways

Explore:

1. Give each group a pinwheel to test
2. Ask students to figure out how what type of force is being used to make the pinwheel move - your breathe is a push
3. Prompt groups to take turns making the pinwheel move as fast as it possible can - give each student 5-10 seconds, then pass to neighbor
4. Challenge students then to now take turns making the pinwheel move as slow as possible without stopping it

Explain:

1. Discuss and question
    a. Was the same type of force (push) used each time?
    b. What was different about the push that moved the pinwheel fast and moved the pinwheel slower? - one was much harder than the other
    c. Does this apply in other cases? Are there other times where you push or pull harder and a different speed is created? - running, pushing a baseball bat harder to hit farther
2. Emphasize that by using different types of pushes or pulls, you are able to move objects at different speeds

Elaborate:

1. Take students outside and stand next to the swings
2. Demonstrate for students how to make the swing move by first pulling it backwards, then letting it go, swinging forward

3. Ask students to identify what type of force you used to move the swing (pull)
4. Allow students to take turns pulling on the swing and challenge them to make the swing higher or lower by pulling back further

Evaluate:

1. Prompt students again to compare and demonstrate how different types of forces change the speed of an object

Unit 2 Modifications:

SPED: Provide visuals for students throughout the lesson on promethean board and the focus wall; allow extra time for activities to be completed; dictated responses in lieu of written work; hands on activities instead of pencil and paper

ESL/ELL: Describing pictures or classroom objects; Providing information in graphic organizers; Identifying real life objects based on descriptive oral phrases or short sentences; When introducing vocabulary, provide a vocabulary word that is both english and spanish, with a labeled picture for the children to reference
-Worksheets can be translated into native language so that parents can help children at home (if needed)

504 Students: Provide a checklist of the steps needed to complete the problem; Provide lots of white-space to make it less busy; If still struggling, reteach and retest

At-Risk Students: Reduce the number of problems given; Give extra time

Gifted and Talented: Added detail to written work; find connecting stories from classroom library and compare to the lessons

Unit Three:-Earth and Human Activity	
NJ Student Learning Standards: Science Grade K	**20 days**
	NJDOE Science Curricular Framework

• **K-ESS3-1** Use a model to represent the relationship between the needs of different plants or 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-ESS3-2** 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-ESS3-3** Communicate solutions that will reduce the impact of climate change and humans on the land, water, air, and/or other living things in the local environment. [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.]	NJ Science Frameworks **21st Century Student Outcomes** http://www.battelleforkids.org/networks/p21 **Learning and Innovation Skills** **highlight appropriate indicators for unit/domain** Think Creatively Work Creatively with Others Implement Innovations Reason effectively Use Systems Thinking Make Judgments and Decisions Solve Problems Communicate Clearly Collaborate with Others **Life and Career Skills** **highlight appropriate indicators for unit/domain** Adapt to Change Be Flexible Manage Goals and Time Work Independently Be Self-directed Learners Interact Effectively with Others Work Effectively in Diverse Teams

Unit Focus and Targets:

“Act like Scientists” (Science and	**“Think like Scientists”**	**“See the World like Scientists”**

Engineering Practices)	(Disciplinary Core Ideas/Content)	(Crosscutting Concepts)

Asking Questions and Defining Problems

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

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

Developing and Using Models

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

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

Obtaining, Evaluating, and Communicating Information

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

ESS3.A: Natural Resources

- Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do. (K-ESS3-1)

ESS3.B: Natural Hazards

- Some kinds of severe weather are more likely than others in a given region. Weather scientists forecast severe weather so that the communities can prepare for and respond to these events. (K-ESS3- 2)

ESS3.C: Human Impacts on Earth Systems

- Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things. (K-ESS3-3)

ETS1.A: Defining and Delimiting an Engineering Problem

- Asking questions, making observations, and gathering information are helpful in thinking about

Cause and Effect

- Events have causes that generate observable patterns. (K-ESS3-2), (K-ESS3-3)

Systems and System Models

- Systems in the natural and designed world have parts that work together. (K-ESS3-1)

Connections to Engineering, Technology, and Applications of Science

Interdependence of Science, Engineering, and Technology

- People encounter questions about the natural world every day. (K ESS3-2)

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

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

▪ Read grade-appropriate texts and/or use media to obtain scientific information to describe patterns in the natural world. (K ESS3-2) ▪ Communicate solutions with others in oral and/or written forms using models and/or drawings that provide detail about scientific ideas. (K-ESS3-3)	problems. *(secondary to K ESS3-2)* **ETS1.B: Developing Possible Solutions** ▪ Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. *(secondary to K-ESS3-3)*	

In the Classroom: Unit 3, Part A

Part A Guiding Question:

- What is the relationship between what plants and animals need and where they live?

Part A Teaching Points:

- Systems in the natural world and human world have parts that work together
- Living things live in places where they can get the things they need to survive

Part A Assessment Objectives:

- Use a model to represent relationships between the needs of living things and where they live
- Use observations to describe patterns in what living things need and where they live

Unit 3, Part A, Lesson 1: Animals Need Food

Materials:

1. Bag of bird seed

2. Plastic spoon
3. Bottle of honey
4. Plastic container
5. Toilet paper tube
6. Pair of scissors
7. Piece of string (2ft)

Engage:

1. What kinds of things do you eat?
2. Where does your food come from?
3. What happens if you don't get food for a long time?
4. Besides food, what are some things that you need to survive?
5. Where do wild animals get their food?
6. What would happen to an animal if it couldn't find any food?

Explore:

1. Watch the Animals Need Food video https://www.generationgenius.com/videolessons/animals-need-food-video-for-kids/
2. After the video, discuss and emphasize the following questions:
3. Why do animals need food?
4. What kinds of things does a porcupine like to eat?
5. How does a Savannah monitor find its food?
6. How does a monkey get a nut out of its shell?
7. What does a wolf eat?
8. How does a wolf catch its food?

Explain:

1. Do a few simple demonstrations of these vibrations: Put a rubber band between two fingers and pluck - what do you observe? pull the rubber band tighter - what happened? What did you hear? Let a few students try this and see what they feel when you pluck the rubber band
2. Blow up a balloon but do not tie it shut. Pinch the top of the balloon with two fingers on each side and stretch the top of the balloon out as you release the air. What do you hear? What do you feel?
3. Put your hand on your throat. Talk or make noise at different volumes. What do you feel? Put your lips together and hum. What do you feel?

Elaborate:

1. Use reading material: Read About How Animals Need Food
2. WHAT DO ANIMALS NEED? All animals need food and water to survive. Different animals eat different kinds of foods. Animals get their food from their environment. To better understand why animals need food…
3. Some animals like a porcupine eat plants. A porcupine eats plants or things that grow on plants. They often eat leaves and bark from a tree. Sometimes they eat berries that grow on plants.
4. Animals have features that help them find food. The porcupine has different features that help it get food. The porcupine has sharp claws to help it climb trees, and sharp teeth to help it eat bark from a tree.
5. Animals use their senses to help them find food. The Savannah monitor uses its sense of smell to f ind food. It has a tongue that can smell insects which it eats to survive. Many animals, such as frogs, mainly eat bugs.
6. Some animals like a wolf eat other animals. A wolf is a meat eater and eats other animals to survive. Wolves eat rabbits, deer and sometimes sheep. Wolves hunt in packs, which makes catching their food easier.
7. People need to eat food to live and grow, too. Most people eat food three times a day. We call those times breakfast, lunch and dinner. People eat fruits, nuts, leaves, chicken and many other things made from plants and animals.
8. Complete Bird Feeder DIY activity

Evaluate:

1. Generation Genius Challenge

In the Classroom: Unit 3, Part B

Part A Guiding Question:

- How can humans reduce their impact on the land, water, air, and other living things in the local environment?

Part A Teaching Points:

- Things that people do to live comfortably can affect the world around them
- People can make choices that reduce their impact on the land, water, air, and other living things
- Designs can be conveyed in sketches, drawings, and models and are helpful in communicating ideas

Part A Assessment Objectives:

- 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 other living things

  Ask questions, make observations, and gather information about a situation that people want to change and design solutions to fix it

Unit 3, Part B, Lesson 1: Importance of Natural Resources

Materials:

- *The Lorax*
- Large container or cloth
- 5 types of items
- Harvest Flipchart

(https://drive.google.com/open?id=0B5e_0qncfnkBaHYyN1MxN1NjV0E)

- Importance of Resource drawing page (https://drive.google.com/open?id=1Z0Ko5uGm0DMj_Nhg4z-lQ6TaUzS1B5akuQgo6QSqCJo)

Engage:

1. Read aloud or listen to *The Lorax* by Dr. Seuss
2. Ask students to compare different aspects in *The Lorax* with our world

Explore:

1. Place a large container or cloth on the floor somewhere in the classroom
2. Fill the container with 5 different, yet similar items (more if more than 5 groups). Examples:
    a. 5 different colors of skittles

b. 5 different types of noodles
c. 5 different types of beans
d. 5 different colors of math counters

3. Explain to students that this container is a Truffula Tree forest
4. Split students into 5 or more groups
5. Give each group a different type of tree to harvest (a different item to collect)
6. Have one student from each group come to the container and harvest their tree (collect their group's item) for 30 seconds
7. After each round, record how many trees were harvested to create a Flipchart of data

Explain:

1. Ask students: Describe what the forest looked like before the first harvest.
2. Describe what happened to the forest each time you harvested trees
3. Have students explain the data that was collected in the chart and prompt for them to draw the conclusion that the trees kept getting harvested until there were none left

Elaborate:

1. Have students complete the "Importance of Resource" drawing page by completing the sentence and drawing which natural resource is most important to them

Evaluate:

1. Students should be able to give examples of natural resources and explain why they are important to us

Unit 3, Part B, Lesson 2: Protecting Natural Resources/Pollution

Materials:

- Polluted water from previous lesson
- Gloves
- Litter/Recyclables

- *What If Everybody Did That?*

Engage:

1. Students will be given back sample cups of the polluted water they created last week
2. Ask and discuss: “Is this water clean?”; “Can we use this water to drink, clean ourselves, or brush our teeth?”
3. Pose the question to students and brainstorm a list of ideas: “How can we try to solve this problem?”
4. Create a list of the brainstormed ideas

Explore:

1. Students will be asked to solve their “pollution problem”
2. Allow students time to discuss with their group and then act on their plan
3. Once students believe they have completed the task, ask: “Is this water clean now?”
    a. Prompt for it is cleaner but still not clean enough for us to use
4. Ask: What did you do with the trash that was inside of the water?

Explain:

1. Emphasize that pollution in our environment is a problem that we need to work together to solve
2. Teacher will explain that recycling or throwing trash in the trash can is a better solution than throwing it on our land or water
3. Analyze, read, and discuss cover of *What if Everybody Did That?;* pages 8-9

Elaborate:

1. Ahead of time, gather litter/recycled items that are safe for students to pick up
2. Scatter items outside in a specific area
3. Distribute gloves and discuss safety
4. Take students to the littered location and ask: “What problem do you see?”; “Why is this a problem?”; “How could this hurt our natural resources?”; “How can it hurt us?”
5. Emphasize that we can take part in saving our natural resources by putting trash and litter where it belongs
6. All students to participate in collecting and cleaning up the items

Evaluate:

1. Once this activity is completed ask: “How did you help protect our natural resources today?”

2. Students should be able to explain that it is our job to take care of the Earth and natural resources

Unit 3, Part B, Lesson 3: Reduce

Materials:

- *Stuff! Reduce, Reuse, Recycle*
- Reducing Recording Sheet (https://drive.google.com/open?id=0B5e_0qncfnkBRlZVM1Y0Zm81bm8)
- Reducing Recording Sheet on chart paper

Engage:

1. Review with students the connection between survival needs and natural resources by asking and discussing: "What do humans need to survive?"; "Where do we get these things we need to survive from?"; "What happens if our Earth gets polluted?"
2. Look at pictures of polluted environments and ask: "Who is responsible for making sure our Earth is treated well and not polluted?"
3. Explain to students that over the next few science classes they are going to learn about the 3 R's of keeping our Earth safe and this week will be about "Reducing"

Explore:

1. Watch from the beginning until 2:20 on BrainPopJr.: https://jr.brainpop.com/science/conservation/reducereuserecycle/
2. Ask students to use their own words to explain the words: waste, landfill, and reduce
3. Look at photographs on Google Images of a landfill and ask students to think about how the trash gets to the landfill
4. Read aloud: *Stuff! Reduce, Reuse, Recycle*

Explain:

1. Emphasize in the story how Pinch is reducing the amount of stuff he owns.
2. Ask students to think about what would have happened to all of Pinch's stuff if he didn't take it to the tag sale (throw it in the trash and take up space in the landfill or pollute the town as a giant mess around his house)
3. Discuss with students the connection between Pinch being a pack rat and the need to reduce in our lives
4. Prompt students to use the vocabulary word "reduce" as they talk about the story and answer questions

Elaborate:

1. Over the next three days, either in class or as homework, provide students with the Reducing Recording Sheet
2. Students will count how many times they do the following:
    a. Shower/bathe
    b. Wash hands
    c. Throw away leftover food
    d. Transportation home from school

Evaluate:

1. Teacher will create a chart similar to the student's Reducing Recording Sheet on chart paper
2. For each time students recorded information in their chart in a specific category, give them a sticker to place on the class chart in the same specific category
3. After students have placed their stickers and the graph reflects the entire class' usage of natural resources, ask: "What task did we do the most often?"; "What did we do the least?"; "What natural resource did we use when we _____?"
4. Continue to fill the chart each day that you track natural resource usage

Unit 3, Part B, Lesson 4: Reuse

Materials:

- Sample reusable items
- Building materials for display
- Planning sheet (https://drive.google.com/open?id=14H6ltx0ZapEMYhdYNCwkepL-tUixKkHdnrKnw9VzXs0)

Engage:

1. Review with students that reducing means using less of a natural resource
2. Introduce that this week, we will be learning about the 2nd R of protecting our Earth - reusing
3. Have students turn and talk to discuss what they think reusing is and means
4. Explain that reuse means using something over and over again instead of throwing it away

Explore:

1. Watch BrainPopJr from 2;20-3:35 and focus students in on the difference between disposable and reusable

2. Have students brainstorm different examples of disposable and reusable items
3. Create a chart to compare these items. Some examples:
    a. Plastic water bottle vs. reusable water bottle
    b. Plastic grocery bags vs.. cloth bags
    c. New pieces of paper vs. using both sides of paper
    d. Paper bag for lunch vs.. using a lunchbox
4. If you feel that students will need help with this, bring in an example of the disposable version for students to see, then ask students to think of the reusable alternative

Explain:

1. Discuss with students how while many reusable options exist, there is still tons of trash that is not being reused
2. Tell students that they will be acting as engineers to design and then build their own invention from reusable materials

Elaborate:

1. View the following website with students for invention ideas: http://handsonaswegrow.com/34-recyclables-to-upcycle-for-the-kids/
2. Put students in groups and distribute planning sheet
3. Assign each group one of the building materials and explain that this will be the materials they get to build with during that week
4. Groups should then draw and plan their invention made from reusable materials

Evaluate:

1. After building, groups can present their invention made from reusable materials to the class

Unit 3, Part B, Lesson 5: Reuse

Materials:

- Common trash items (cardboard tubes, plastic bags, soda cans, plastic bottles)
- 3 rubber bands
- Scotch tape
- 6 buttons
- 2 pipe cleaners

- 2 pieces of scrap paper

Engage:

1. Teacher will display materials to the students
2. Explain and discuss what the materials are
3. Distribute the planning sheets used in science class with grade level teacher

Explore:

1. Groups will spend 10 minutes manipulating the building materials
2. Encourage students to test objects and plan out their invention

Explain:

1. Explain to students that the only help you can give them is to help with tape
2. Discuss with students how engineers do not always succeed the first, second, third, etc time and that failure is okay in building

Elaborate:

1. Groups will spend the rest of the class period building their invention made from reusable materials

Evaluate:

1. Teacher will circulate the room and prompt students to think about engineering techniques
2. Students will be asked questions about why reusing is important and how their invention helps reuse

In the Classroom: Unit 3, Part C

Part C Guiding Question:

- How can we communicate over long distances using light and/or sound?

Part C Teaching Points:

- People depend on various technologies in our lives to communicate
- Engineers can apply science to develop new devices and ideas about communication
- Designs can be conveyed through sketches, drawings, and models

Part C Assessment Objectives:

- Describe how the parts of their device impact the function of the device
- Define a simple problem that can be solved through the development of a new tool
- Develop a simple model to represent a new tool
- Use tools and materials provided to design and build a device

Unit 3 Modifications:

SPED: Provide visuals for students throughout the lesson on promethean board and the focus wall; allow extra time for activities to be completed; dictated responses in lieu of written work; hands on activities instead of pencil and paper

ESL/ELL: Describing pictures or classroom objects; Providing information in graphic organizers; Identifying real life objects based on descriptive oral phrases or short sentences;

504 Students: Provide a checklist of the steps needed to complete the problem; Provide lots of white-space to make it less busy; If still struggling, reteach and retest

At-Risk Students: Reduce the number of problems given; Give extra time

Gifted and Talented: Added detail to written work; find connecting stories from classroom library and compare to the lessons;

Unit Four: Energy	
NJ Student Learning Standards: Science Grade K **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.]	**15 days** **NJDOE Science Curricular Framework** NJ Science Frameworks **21st Century Student Outcomes** http://www.battelleforkids.org/networks/p21 **Learning and Innovation Skills** **highlight appropriate indicators for unit/domain** Think Creatively Work Creatively with Others Implement Innovations Reason effectively Use Systems Thinking Make Judgments and Decisions Solve Problems Communicate Clearly Collaborate with Others **Life and Career Skills** **highlight appropriate indicators for unit/domain** Adapt to Change Be Flexible Manage Goals and Time Work Independently Be Self-directed Learners

	Interact Effectively with Others Work Effectively in Diverse Teams

Unit Focus and Targets:

"Act like Scientists" (Science and Engineering Practices)	**"Think like Scientists" (Disciplinary Core Ideas/Content)**	**"See the World like Scientists" (Crosscutting Concepts)**
Planning and Carrying Out Investigations Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions. ▪ Make observations (firsthand or from media) to collect data that can be used to make comparisons. (K PS3-1) **Constructing Explanations and Designing Solutions** Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions. ▪ Use tools and materials provided to	**PS3.B: Conservation of Energy and Energy Transfer** ▪ Sunlight warms Earth's surface. (K-PS3-1), (K-PS3-2)	**Cause and Effect** ▪ Events have causes that generate observable patterns. (K-PS3-1), (K-PS3-2) ***Connections to Nature of Science*** **Scientific Investigations Use a Variety of Methods** ▪ Scientists use different ways to study the world. (K-PS3-1)

design and build a device that solves a specific problem or a solution to a specific problem. (K-PS3-2)		

In the Classroom: Unit 4, Part A

Part A Guiding Question:

- How does sunlight affect the Earth's surface?

Part A Teaching Points:

- Sunlight warms the Earth's surface

Part A Assessment Objectives:

- Make observations to collect data that can be used to make comparisons
- Make observations to determine the effect of sunlight on Earth's surface

Unit 4, Part A, Lesson 1: Investigation of Sun and Surfaces

Materials:

- Samples of sand, dirt, water, and rocks in containers
- Two plastic cups with water
- Cling wrap

Engage:

1. Start with this question: How does the sun change the Earth's surface or the ground?
2. Take students outside on a sunny day and have them feel the surface of the ground outside
3. Come back in and compare it to the surfaces in the building or surfaces in the shade

4. Ask: “What did you notice about the different surfaces?”; “How did it feel?”; “What was different?”; “Why do you think it was different?”
5. Record student answers on a chart
    a. Focus on using the words cooler and warmer
    b. Focus on temperature, not on the texture of the surface

Explore:

1. Explain to students that now that they know that heat from the sun makes the surface warmer, we are going to use what we know to figure out which surface would keep our playground the coolest on hot sunny days
2. Students are going to pretend they are in charge of picking out the surface for their next playground
3. Right now, they have mulch on the surface on the playground
4. Discuss: Do you think that this is the best surface? What other surfaces could we use that might keep it cooler?
5. List student ideas on a chart (rocks, sand, dirt, water)
6. Have students go outside and explore the different surfaces outside of the school (sidewalk, bike rack, mulch, grass, walls, black top)
7. Remind students to figure out which surface is the warmest and which is the coolest

Explain:

1. Debrief about what they observed while feeling the different surfaces outside
2. Have students explain which surfaces they picked as warmest and coolest

Elaborate:

1. Put samples of sand, water, dirt, and rocks in separate containers in the classroom
2. Ensure that they are out of the sunlight
3. Have students feel all of these samples to compare what they feel like out of the sun
4. Extension: Place 2 cups of water on the window sill in the sun
5. One cup should be uncovered and one cup should have a piece of cling wrap over it
6. Students should observe the cup of water each day to see the water disappear in the uncovered cup and evaporation cause water droplets on the cling wrapped cup. Mark the water level each day to track.
7. Tie this into the sun’s effect on Earth and effects water differently

Evaluate:

1. Teacher will walk around classroom as students are exploring the samples

2. Ask: Why do you think the temperature of these surfaces are different in the classroom vs.. outside
    a. Prompt for the connection that the sun warmed up the surfaces outside and that there was no sun inside to warm the surfaces

In the Classroom: Unit 4, Part B

Part B Guiding Question:

- How can we keep the Earth's surface cool in the sunlight?

Part B Teaching Points:

- The shape and stability of structures of natural and man-made objects are related to their function
- Designs can be conveyed through sketches, drawings, and models and are helpful in sharing ideas
- It is useful to test and compare designs

Part B Assessment Objectives:

- Describe how the shape and stability of structures are related to their function
- Use tools and materials to design and build a shade device

Unit 4, Part B, Lesson 1: Creating the Ultimate Shade Structure

Materials:

- Building materials
- Lab sheet (https://drive.google.com/open?id=1_hK3pSVhYOl2HNUJJXrJx5NDehJDBkRdZt1Ai1fy9lI)

Engage:

1. Explain to students that wewill be bringing special animal toys that only like to live in the dark
2. Explain that the toy is affected by the temperature of its habitat
3. Discuss: If the animal likes to live in the dark, what type of temperature do you predict it will like?

Explore:

1. Explain that our job is to build habitats for our animals so that they can go outside during the summertime, but not be affected by the sun

2. With students, look at pictures of shade structures: umbrellas, hats, canopies, desk overhangs, tents, etc
3. Discuss these structures and think about what should be included in the habitat for their animal
4. Break students into their building teams and provide each group with a set of building materials
5. Allow students time to manipulate the building materials without tape in order to test out the materials before planning

Explain:
Discuss with students what they learned while testing the building materials
Prompt students to make connections between how to use the materials and the need to create a habitat for the animal

Elaborate:
1. In their building teams, give each student a lab sheet
2. Allow teams time to complete their lab sheet and plan out the structure that they will build
3. Encourage students to label materials and be specific in their plan

Evaluate:
1. Have building teams share their plans with the class
2. Students should be able to explain that the structure will need a roof of some kind to create shade for the animal

Unit Five: From Molecules to Organisms: Structures and Processes	
NJ Student Learning Standards: Science Grade K **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	**15 days** **NJDOE Science Curricular Framework** NJ Science Frameworks **21st Century Student Outcomes** http://www.battelleforkids.org/networks/p21

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.]	**Learning and Innovation Skills** **highlight appropriate indicators for unit/domain** Think Creatively Work Creatively with Others Implement Innovations Reason effectively Use Systems Thinking Make Judgments and Decisions Solve Problems Communicate Clearly Collaborate with Others **Life and Career Skills** **highlight appropriate indicators for unit/domain** Adapt to Change Be Flexible Manage Goals and Time Work Independently Be Self-directed Learners Interact Effectively with Others Work Effectively in Diverse Teams

Unit Focus and Targets:

"Act like Scientists" (Science and Engineering Practices)	**"Think like Scientists" (Disciplinary Core Ideas/Content)**	**"See the World like Scientists" (Crosscutting Concepts)**
Analyzing and Interpreting Data Analyzing data in K–2 builds on prior	**LS1.C: Organization for Matter and Energy Flow in Organisms**	**Patterns**

experiences and progresses to collecting, recording, and sharing observations. ▪ Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (K LS1-1)	▪ All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow. (K-LS1-1)	▪ Patterns in the natural and human designed world can be observed and used as evidence. (K-LS1-1) ***Connections to Nature of Science*** **Scientific Knowledge is Based on Empirical Evidence** ▪ Scientists look for patterns and order when making observations about the world. (K-LS1-1)

In the Classroom: Unit 5, Part A

Part A Guiding Question:

- What do plants and animals need to live and grow?

Part A Teaching Points:

- Scientists looks for patterns and order when making observations about the world
- Plants need water and light to live and grow
- Animals and humans need to obtain food, water, and resources from the land to live and grow

Part A Assessment Objectives:

- Observe and use patterns in the natural world as evidence
- Use observations to describe patterns in what plants and animals need to survive

Unit 5, Part A, Lesson 1: Plants Need Water and Light

Materials:

- Generation Genius Plants Need Water and Light Lesson https://www.generationgenius.com/activities/plants-need-water-and-light-activity-for-kids/
- Pack of cress seeds (a fast-growing, edible herb)
- Small jar or cup
- Pack of cotton balls
- Spray bottle with water
- Pack of markers, googly eyes, etc.

Engage:

1. What kinds of plants have you seen before?
2. What do most plants have in common?
3. Why do we need plants?
4. Where do plants grow?
5. How do you take care of a plant?
6. What happens if a plant does not get any water and light?

Explore:

1. Watch Generation Genius video
2. After video, ask following questions:
3. What do all plants need to grow?
4. How can a plant grow without soil?
5. Why would it not be okay to keep a plant in a dark place?
6. Can a plant grow if it has sunlight, but no water?
7. Do plants grow fast or slow?
8. What happens if a plant receives too much water?

Explain:

1. Use Reading Material: Read About What Plants Need

Elaborate:

1. Do DIY activity: Grow Plants in a Jar
2. All plants need water and light to grow. Cress seeds came from a cress plants and when we added water and light, they grew into new plants. Most plants grow best in soil where their roots can get additional nutrients from the ground, but as you can see in this DIY, many plants can grow without soil. We grew cress seeds because they are easy to grow and they grow fast.

Evaluate:

1. Generation Genius Challenge

Unit Six: Engineering Design	
NJ Student Learning Standards: Science Grade K **K-2-ETS1-1** Ask questions, make observations, and gather information about a situation people want to change (e.g., climate change) to define a simple problem that can be solved through the development of a new or improved object or tool. **K-2-ETS1-2** 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.	**10 days** **NJDOE Science Curricular Framework** NJ Science Frameworks **21st Century Student Outcomes** http://www.battelleforkids.org/networks/p21 **Learning and Innovation Skills** **highlight appropriate indicators for unit/domain** Think Creatively Work Creatively with Others Implement Innovations Reason effectively Use Systems Thinking Make Judgments and Decisions Solve Problems

	Communicate Clearly Collaborate with Others **Life and Career Skills** **highlight appropriate indicators for unit/domain** Adapt to Change Be Flexible Manage Goals and Time Work Independently Be Self-directed Learners Interact Effectively with Others Work Effectively in Diverse Teams

Unit Focus and Targets:

"Act like Scientists" (Science and Engineering Practices)	**"Think like Scientists" (Disciplinary Core Ideas/Content)**	**"See the World like Scientists" (Crosscutting Concepts)**
Asking Questions and Defining Problems Asking questions and defining problems in K–2 builds on prior experiences and progresses to simple descriptive questions. ▪ Ask questions based on observations to find more information about the natural and/or designed world(s). (K-2-ETS1-1)	**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) ▪ Ask questions, make observations, and gather information about a situation people want to change (e.g., climate change) to define a simple problem that can be solved	**Structure and Function** ▪ The shape and stability of structures of natural and designed objects are related to their function(s). (K-2-ETS1-2

▪ Define a simple problem that can be solved through the development of a new or improved object or tool. (K-2-ETS1-1) **Developing and Using Models** Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions. ▪ Develop a simple model based on evidence to represent a proposed object or tool. (K-2-ETS1-2) **Analyzing and Interpreting Data** Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations. ▪ Analyze data from tests of an object or tool to determine if it works as intended. (K-2-ETS1-3)	through the development of a new or improved object or tool. (K-2- ETS1-1) ▪ Before beginning to design a solution, it is important to clearly understand the problem. (K-2-ETS1-1) **ETS1.B: Developing Possible Solutions** ▪ Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions, such as climate change, 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)	

In the Classroom: Unit 6, Part A

Part A Guiding Question:

- What do you think an engineer does?

Part A Teaching Points:

- An engineer uses math and science to solve problems
- Drawing a solution first can help you figure out what materials you will need and how you will build it
- Engineers make changes and try again if the solution doesn't work

Part A Assessment Objectives:

- Engineers work on solving problems by creating things. Some examples include inventing a light bulb and then improving the design.
- By testing things, engineers can figure out how to improve their design.

Unit 6, Part A, Lesson 1: What is Engineering?

Materials:

- Generation Genius What is Engineering Lesson
- https://www.generationgenius.com/activities/what-is-engineering-activity-for-kids/
- Toothpicks
- Bag of gummy bears
- Hard cover book

Engage:

1. What do you think an engineer does?
2. Did you ever need to solve a problem by creating something new?
3. Why is it important for an engineer to draw a solution before building it?
4. What can you do if a solution to a problem doesn't work the first time?
5. What is the coolest invention you have ever seen?
6. If you could be an engineer, what kinds of projects would you like to work on?

Explore:

1. Watch Generation Genius video

2. After video, ask following questions:
3. What kinds of things does an engineer do?
4. Why is it important for an engineer to test things they create?
5. Why is it important for engineers to have a good imagination?
6. What are some steps that engineers go through when solving problems?
7. What are some examples of problems different types of engineers have solved?
8. Why don't engineers get upset when their solution doesn't work?

Explain:

1. Use Reading Material: Read About Engineering?

Elaborate:

1. Do DIY activity: Engineering with Candy DIY
2. Some shapes have more strength than others. Triangles give more support than squares when building structures. Triangles are used a lot in construction of things like bridges. An engineer can test many different solutions and each time they redesign it, the solution can get better.

Evaluate:

1. Generation Genius Challenge

Unit 6, Part A, Lesson 2: Simple Machines

Materials:

- Generation Genius Simple Machines Lesson
- https://www.generationgenius.com/videolessons/simple-machines-video-for-kids/
- Popsicle Stick Catapult DIY
- Large popsicle sticks
- Small rubber bands
- Plastic spoon
- Mini marshmallows

Engage:

1. Describe a time when you needed to push something heavy
2. How can you make lifting something easier?
3. What kinds of things do you use that have wheels?
4. When have you had to pull something?
5. What kinds of things are difficult to pull?
6. When have you had to move something heavy from down low to high up?

Explore:

1. Watch Generation Genius Video
2. After video, ask following questions:
3. Describe a simple machine
4. Why are simple machines important?
5. How does a pulley help lift things up?
6. How does a level help move heavy objects?
7. How does the wheel and axle make it easier to move heavy objects?
8. What are some examples of using a wedge?

Explain:

1. Use Reading Material: Read About Simples Machines

Elaborate:

1. Do DIY Activity: Popsicle Stick Catapult DIY
2. A catapult works like a lever, which is a simple machine. When you push down on one end of the lever and then let go, it changes the direction of the force and pushes the marshmallow in the opposite direction. Levers are used all around us. For example, a seesaw is a lever and so is a pair of scissors!

Evaluate:

1. Generation Genius Challenge