Science Grade 2

Length of Course: Term
Elective/Required: Required
Schools: Elementary
Eligibility: Grade 2
Credit Value: N/A
Date Approved: August 24, 2015
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statement of Purpose</td>
<td>3</td>
</tr>
<tr>
<td>Curriculum Overview</td>
<td>5</td>
</tr>
<tr>
<td>Scope &amp; Sequence</td>
<td>6</td>
</tr>
<tr>
<td>Unit 1</td>
<td>8</td>
</tr>
<tr>
<td>Unit 2</td>
<td>16</td>
</tr>
<tr>
<td>Unit 3</td>
<td>24</td>
</tr>
<tr>
<td>Unit 4</td>
<td>32</td>
</tr>
</tbody>
</table>
STATEMENT OF PURPOSE

In July 2011, the National Research Council (NRC) of the National Academy of Sciences developed *A Framework for K-12 Science Education*. This guidance provides a sound, evidence-based foundation for standards by drawing on current scientific research - including research on the methods in which students learn science effectively - and identifies the science all students in grade K-12 should know.

This Framework was composed based on a set of core principles that:

- Reaffirm children are born investigators;
- Recognize understanding builds over time;
- Assert science & engineering require both knowledge and practice;
- Acknowledge a connection to students’ interests and experiences is essential;
- Focus on core ideas and practices; and
- Promote equity.

The NRC’s Framework describes a vision of what it means to be proficient in science; it rests on a view of science as both a body of knowledge and an evidence-based, model and theory building enterprise that continually extends, refines, and revises understanding. It presents three dimensions that will be combined to form each standard:

**Dimension 1: Practices**

Practices describe behaviors that scientists engage in as they investigate and build models and theories about the natural world. They also include the key set of engineering practices that engineers use as they design and build models and systems. The NRC uses the term “practices” instead of a term like “skills” to emphasize that engaging in scientific investigation requires not only skill but also knowledge that is specific to each practice. Part of the NRC’s intent is to better explain and extend what is meant by “inquiry” in science and the range of cognitive, social, and physical practices that it requires.

Although engineering design is similar to scientific inquiry, there are significant differences. For example, scientific inquiry involves the formulation of a question that can be answered through an investigation, while engineering design involves the formulation of a problem that can be solved through design. Emphasizing the engineering aspects of the Next Generation Science Standards will clarify for students the relevance of science, technology, engineering, and mathematics to everyday life.

**Dimension 2: CrossCutting Concepts**

The CrossCutting Concepts have application across all domains of science and, as such, are a way of linking different domains together. They include:

- Patterns, similarity, and diversity;
- Cause and effect;
- Scale, proportion, and quantity;
- Systems and system models;
- Energy and matter;
- Structure and function; and
- Stability and change.

The Framework emphasizes that these concepts need to be made explicit for students because they provide an organizational schema for inter-relating knowledge from various science fields into a coherent and scientifically-based view of the world.
Dimension 3: Disciplinary Core Ideas

Disciplinary Core Ideas have the power to focus K-12 science curriculum, instruction, and assessment on the most important aspects of science. To be considered core, the ideas meet at least two of the following criteria (and, ideally, all four):

- Have broad importance across multiple sciences or engineering disciplines, or be a key organizing concept of a single discipline;
- Provide a key tool for understanding or investigating more complex ideas and solving problems;
- Relate to the interests and life experiences of students or be connected to societal or personal concerns that require scientific or technological knowledge; and/or
- Be teachable and learnable over multiple grades at increasing levels of depth and sophistication.

Disciplinary Core Ideas are grouped in four domains: the physical sciences, the life sciences, the earth and space sciences; and engineering, technology, and applications of science.

The NRC’s Framework serves as the foundation of the Next Generation Science Standards (NGSS), a set of internationally-benchmarked science learning outcomes published in April 2013. NGSS proposes shifts in the teaching and learning of science to augment student engagement and strengthen connections between science, technology, engineering, and mathematics. Developed collaboratively with states and other stakeholders in science, science education, higher education, and industry, the NGSS present standards that are rich in content and practice and arranged in a coherent manner across disciplines and grades to prepare students for college and careers.

Our current K-5 Science instructional program reflects the learning and performance expectations found in the Next Generation Science Standards. The NGSS, adopted by the New Jersey State Board of Education in 2014, were officially renamed as the New Jersey Student Learning Standards for Science (NJSLS-S) in 2016.

The district’s curriculum is strategically designed to help students foster an understanding of the four domains of science from kindergarten through fifth grade.

In earlier grades, students begin by recognizing patterns and formulating answers to questions about the world around them. By the end of fifth grade, students are able to demonstrate grade-appropriate proficiency in gathering, describing, and using information about the natural and designed world(s).

The performance expectations in elementary school grade bands develop ideas and skills over time that will allow students to explain more complex phenomena in the four disciplines as they progress to middle and high school. While the performance expectations shown in kindergarten through fifth grade couple particular practices with specific Disciplinary Core Ideas, informed instructional decisions based on formative and summative assessment should be made by the teacher to ensure understanding of the many science and engineering practices that lead to the performance expectations.

Curriculum Writers:

Maritza Aviles, Lindeneau Elementary School          Xanthy Karamanos, Benjamin Franklin Elementary School
Julie Bateman, Washington Elementary School          Nicole Maiorelli, James Madison Primary School
Alyssa Battista, James Madison Intermediate School   Colleen Melacci, James Madison Primary School
Stephanie Cardoso, Martin Luther King Jr. Elementary School Donald Platvoet, Menlo Park Elementary School
Lynne Chonka, James Madison Intermediate School      Cathy Shaw, James Madison Intermediate School
Amy Fuentes, James Monroe Elementary School          Virginia Sanchez, Lindeneau Elementary School

Coordinated By: Steve Figurelli, District Supervisor of Elementary Education
The performance expectations in second grade help students formulate answers to questions such as:

- How does land change and what are some things that cause it to change?
- What are the different kinds of land and bodies of water?
- How are materials similar and different from one another, and how do the properties of the materials relate to their use?
- What do plants need to grow?
- How many types of living things live in a place?

Second grade performance expectations include PS1, LS2, LS4, ESS1, ESS2, and ETS1 Disciplinary Core Ideas from the National Research Council Framework.

**Physical Science:**
- An understanding of observable properties of materials is developed by students at this level through analysis and classification of different materials.

**Earth and Space Science:**
- Students are able to apply their understanding of the idea that wind and water can change the shape of the land to compare design solutions to slow or prevent such change.
- Students are able to use information and models to identify and represent the shapes and kinds of land and bodies of water in an area and where water is found on Earth.

**Life Science:**
- Students are expected to develop an understanding of what plants need to grow and how plants depend on animals for seed dispersal and pollination.
- Students are also expected to compare the diversity of life in different habitats.

**Crosscutting Concepts:** The crosscutting concepts of patterns; cause and effect; energy and matter; structure and function; stability and change; and influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for these Disciplinary Core Ideas.

**Science & Engineering Practices:** In the second grade performance expectations, students are expected to demonstrate grade appropriate proficiency in:

- Developing and using models;
- Planning and carrying out investigations;
- Analyzing and interpreting data;
- Constructing explanations and designing solutions;
- Engaging in argument from evidence; and
- Obtaining, evaluating, and communicating information.

Students are expected to use these practices to demonstrate understanding of the core ideas.

Please click [HERE](#) to view the NJSL-Science / NGSS for 2nd Grade.
## 1st Marking Period

**Physical Science - Structure & Properties of Matter**

### Unit 1: Matter (Suggested Pacing 45 Days)

- **2-PS1: Matter and Its Interactions**
  - Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties. (2-PS1-1)
  - Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose. (2-PS1-2)
  - Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object. (2-PS1-3)
  - Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot. (2-PS1-4)

- **K-2-ETS1: Engineering Design**
  - 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)

## 2nd Marking Period

**Earth & Space Science - Processes That Shape The Earth**

### Unit 2: Role Of Water and Changing of Earth (Suggested Pacing: 45 Days)

- **2-ESS1: Earth’s Place in the Universe**
  - Use information from several sources to provide evidence that Earth events can occur quickly or slowly. (2-ESS1-1)

- **2-ESS2: Earth’s Systems**
  - Develop a model to represent the shapes and kinds of land and bodies of water in an area. (2-ESS2-2)
  - Obtain information to identify where water is found on Earth and that it can be solid or liquid. (2-ESS2-3)

- **K-2-ETS1: Engineering Design**
  - 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)

## 3rd Marking Period

**Unit 3: TransDisciplinary Unit - Wind, Water, & Land (Suggested Pacing: 45 Days)**

- **2-ESS1: Earth’s Place in the Universe**
  - Use information from several sources to provide evidence that Earth events can occur quickly or slowly. (2-ESS1-1)

- **2-ESS2: Earth’s Systems**
  - Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land. (2-ESS2-1)

- **K-2-ETS1: Engineering Design**
  - 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)
### 4th Marking Period

**Life Science - Interdependent Relationships In Ecosystems**

**Unit 4: Biodiversity, Humans and Plants (Suggested Pacing: 45 Days)**

- **2-LS2: Ecosystems: Interactions, Energy, and Dynamics**
  - Plan and conduct an investigation to determine if plants need sunlight and water to grow. (2-LS2-1)
  - Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants. (2-LS2-2)

- **2-LS4: Biological Evolution: Unity and Diversity**
  - Make observations of plants and animals to compare the diversity of life in different habitats. (2-LS4-1)

- **K-2-ETS1: Engineering Design**
  - 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)
# UNIT 1

## Matter

<table>
<thead>
<tr>
<th>Grade:</th>
<th>2nd</th>
<th>Suggested Pacing:</th>
<th>Marking Period 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domain:</td>
<td>Physical Science</td>
<td>Discovery TechBook Unit:</td>
<td>Properties &amp; Interactions of Matter</td>
</tr>
</tbody>
</table>

### NJSLS - Science Performance Expectations:

- **2-PS1: Matter and Its Interactions**
  - Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties. (2-PS1-1)
  - Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose. (2-PS1-2)
  - Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object. (2-PS1-3)
  - Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot. (2-PS1-4)

- **K-2-ETS1: Engineering Design**
  - 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)

### NJSLS - Science Disciplinary Core Ideas:

- **PS1.A: Structure and Properties of Matter**
  - Different kinds of matter exist and many of them can be either solid or liquid, depending on temperature. Matter can be described and classified by its observable properties. (2-PS1-1)
  - Different properties are suited to different purposes. (2-PS1-2), (2-PS1-3)
  - A great variety of objects can be built up from a small set of pieces. (2-PS1-3)

- **PS1.B: Chemical Reactions**
  - Heating or cooling a substance may cause changes that can be observed. Sometimes these changes are reversible, and sometimes they are not. (2-PS1-4)

### NJSLS - Science CrossCutting Concepts:

- **Patterns:**
  - Patterns in the natural and human designed world can be observed. (2-PS1-1)

- **Cause and Effect:**
  - Events have causes that generate observable patterns. (2-PS1-4)
  - Simple tests can be designed to gather evidence to support or refute student ideas about causes. (2-PS1-2)

- **Energy and Matter:**
  - Objects may break into smaller pieces and be put together into larger pieces, or change shapes. (2-PS1-3)

- **Influence of Engineering, Technology, and Science on Society and the Natural World:**
  - Every human-made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world. (2-PS1-2)
<table>
<thead>
<tr>
<th>Essential Questions**</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The questions below are suggested EQs to springboard the unit. NJSLS-Science was composed for students to drive learning. Afford children the opportunity to ask the questions and define potential problems.</strong></td>
</tr>
<tr>
<td>- How can one explain the structure, properties and interactions of matter?</td>
</tr>
<tr>
<td>- How do particles combine to form the variety of matter one observes?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Enduring Understandings &amp; Practices</th>
</tr>
</thead>
<tbody>
<tr>
<td>By the end of this unit, students will understand:</td>
</tr>
<tr>
<td>- Properties of matter (such as strength, hardness, flexibility and texture).</td>
</tr>
<tr>
<td>- Certain materials are best suited for different purposes.</td>
</tr>
<tr>
<td>- An object built out of a small set of pieces can be deconstructed and built into a different object.</td>
</tr>
<tr>
<td>- Properties of solids, liquids, and gas.</td>
</tr>
<tr>
<td>- Some substances can experience reversible changes and some cannot.</td>
</tr>
<tr>
<td>By the end of this unit, students will be able to:</td>
</tr>
<tr>
<td>- Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question. (2-PS1-1)</td>
</tr>
<tr>
<td>- Analyze data from tests of an object or tool to determine if it works as intended. (2-PS1-2)</td>
</tr>
<tr>
<td>- Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena (2-PS1-3)</td>
</tr>
<tr>
<td>- Construct an argument with evidence to support a claim. (2-PS1-4)</td>
</tr>
<tr>
<td>- Search for cause and effect relationships to explain natural events. (2-PS1-4)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Prior Learning</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Kindergarten</strong></td>
</tr>
<tr>
<td>- A situation that people want to change or create can be approached as a problem to be solved through engineering.</td>
</tr>
<tr>
<td>- Asking questions, making observations, and gathering information are helpful in thinking about problems.</td>
</tr>
<tr>
<td>- Before beginning to design a solution, it is important to clearly understand the problem.</td>
</tr>
<tr>
<td>- 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.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Future Learning</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Grade 4</strong></td>
</tr>
<tr>
<td>- 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.</td>
</tr>
<tr>
<td><strong>Grade 5</strong></td>
</tr>
<tr>
<td>- Measurements of a variety of properties can be used to identify materials.</td>
</tr>
<tr>
<td>- Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon and the effects of air on larger particles or objects.</td>
</tr>
<tr>
<td>- When two or more different substances are mixed, a new substance with different properties may be formed.</td>
</tr>
<tr>
<td>- No matter what reaction or change in properties occurs, the total weight of the substances does not change. (Note: Mass and weight are not distinguished at this grade level.)</td>
</tr>
<tr>
<td>- The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish.</td>
</tr>
</tbody>
</table>
| - The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as “decomposers.” Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive
only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem.

### Effective Implementation Strategies

- 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.

### Assessment

**End-of-Unit Performance Assessment:** In this Performance Assessment (Part 1), students will sort materials based on given properties, establish testing criteria and discuss procedures to test materials for specific properties. Students will then continue their work as Materials Engineers (Part 2) to test and explain which material demonstrates the selected property the best, based on measurable data.

Please click [HERE](#) to access our 2017 - 2018 K-5 Design Rubric.

**Suggested Hands-On Activities / Classroom Inquiries:**
Absorbency Lab, Ball Bounce Lab, Design a Boat Challenge, House Design Challenge, Balloon States of Matter Activity, Inflate a Balloon Activity, What is Goop? Activity, Snowman Change of Matter Activity, Ice Cream Activity

The following is a recommended progression to support the development of understandings necessary for the performance expectation(s). Teachers should consider multiple data points when making instructional decisions.
Science Grade 2

(Please note: Though listed individually, some experiences may last longer than one class period. Time has been built into the pacing calendar to allot for this.)

<table>
<thead>
<tr>
<th>Experience</th>
<th>Objective/Desired Outcome</th>
<th>Classwork Resources</th>
</tr>
</thead>
</table>
| Student Questioning Opportunity | To spark curiosity and amplify engagement, students should formulate their own questions regarding the phenomena/topic of the unit. They should then be afforded an opportunity to investigate them (and others that emerge) throughout the unit in order to heighten authenticity and deepen their knowledge and understanding. Teachers may use these questions as a pre-assessment and as a means to guide future learning experiences. | -KWHLAQ: Organizer  
-KWHLAQ: Google Slides  
-Science Questioning Graphic Organizer  
-QFT: Formulating effective questions  
-Ideas For Phenomena To Question: NGSS Phenomena #ProjectPhenomena  

Additional Resources:  
Properties/Materials Visual  
Changes in Matter Visual |
| 1 | Establish understanding of matter and mass | -Google Slides Unit Presentation |
| 2 | Explore materials and their uses | -DE: Materials Unit- Session 1 Engage  
-DE: Materials Unit- Building Material and Glass  
-DE: Materials Unit- Sorting Objects: Investigating and Classifying  
-NJCTL: Classwork #1-2 Properties of Materials  
-Google Slides Unit Presentation |
| 3 | Investigate properties of materials | -DE: Materials Unit- Video Segments: Chains, Plastic Cups and Cutlery, Zippers, Clay from the Earth  
-NJCTL: Classwork #3 Properties of Materials  
-DE: Materials Unit: | |
| 4 | Explore characteristics of materials | -Google Slides Unit Presentation  
-Interactive Games: Characteristics of Materials, Materials Smackdown  
-Google Slides Unit Presentation |
| 5 | Using scientific method to explore characteristics of materials | -NJCTL: Absorbency Lab, Ball Bounce Lab  
-NJCTL: Materials Engineer  
-DE: Materials Unit-  
-Google Slides Unit Presentation  
-DE: Materials Engineer |
| 6 | Materials Design Challenge | -NJCTL: Boat Design Challenge and/or Design a House Challenge  
-Mystery Science: Why do we wear clothes? : Hat Challenge  
-Defined STEM: Buildings Design |
<table>
<thead>
<tr>
<th>Page</th>
<th>Activity</th>
<th>Resources</th>
</tr>
</thead>
</table>
| 7    | What are the States of Matter? | -Google Slides Unit Presentation  
  -BrainPOP: States of Matter |
| 8    | Determining States of Matter Activities | -NJCTL: Balloon States of Matter Activity, and/or, Inflate a Balloon Activity, and/or What is Goop? Activity |
| 9    | Physical Changes | -DE: Changes in Matter- Session 1 Engage - Physical Changes  
  -Google Slides Unit Presentation Slides 94-100  
  -Change It! Demo |
| 10   | Changing States of Matter | -DE: Changes in Matter- Session 2, 3, 4  
  -Core Interactive Text- How Can I Tell if Matter Has Changed? What are Some of the Ways That You Can Change Materials?  
  -Reading Passage: Melting Ice |
| 11   | Observing Matter as it Changes State Activity | -NJCTL: Snowman Changes of Matter Activity |
| 12   | Changing States of Matter Using Temperature | -DE: Changes in Matter- Session 2, 3, 4  
  -DE Video Segment: Investigating Heat Changes  
  -Hands on Lab: Heating and Cooling  
  -Mystery Science: Can you really fry an egg on hot sidewalk? |
| 13   | Types of Changes in Matter | -DE: Changes in Matter - Sessions 5,6,7  
  -DE Video Segment: Two Chemical Experiments  
  -Mystery Science: Why are toys made of plastic? |
| 14   | Heating and Cooling Matter Activity | -Hands on Activity: Changes in Matter  
  and/or NJCTL: Ice Cream Activity |
| 15   | Performance Based Assessment | PBA - Materials Engineers (Part 1)  
  PBA - Materials Engineers (Part 2) |
|      | Improve | Students are given time to revise their projects/solutions and finalize their plans based on the feedback of their peers and teacher(s).  
  -Individuals or groups modify their designs to incorporate feedback. |
## Additional Classroom Resources

- **NJCTL:**
  - [Classwork and Homework Activities](#)

- **BrainPOP:**
  - [Matter Changing States](#)

- **BrainPOP Jr:**
  - [Changing States of Matter](#)
  - [Solids, Liquids and Gases](#)
  - [Physical and Chemical Changes](#)
  - [Game: Matter Sorter](#)

- **Exploring Reversible Changes of State and Exploring Irreversible Changes of State:** These two lessons work together to explore reversible and irreversible changes of state through guided investigations. The PDF is a set of activities focusing on materials followed by some optional post-activity lessons.

- **Discovering Science: classifying and categorizing (matter, grades 2-3):** This resource is a day, or longer, lab activity aimed for second and third grade students. The lesson starts with a guided discussion and an activity identifying and classifying materials, then it guides students through a series of observations of mixing and changing different materials of different states and observing the resulting effects. Overall, the lesson targets the states of matter, and forces and motion. Some of the ideas (i.e., gas and energy) are aimed at the third grader and beyond. Please note that the link above goes to a larger set of activities and you need to click on the link Discovering science: Classifying and categorizing matter grades 2-3.

- **Materials and Their Properties, lessons Comparing the Properties of Different Materials (pp. 22); and Exploring Thermal Insulators and Conductors (pp. 23):** Students participate in an open-ended sort using various materials. Based on their self-selected categories, students explain their reasoning. Next, through a fair test trial, students use new information to decide, using evidence, which material is best suited for maintaining cold the longest.

- **The Properties of Materials and their Everyday Uses:** This wonderful set of lessons engage students in testing materials to understand their properties and discuss appropriate uses for the materials based on those properties. For example, one activity has the students examining the materials that a number of balls are made out of (plastic, rubber, aluminum, etc.) and describing the properties of the materials (light, stretchy, rigid). Next, the students test balls made of those materials for bouncing height and record their data. The students discuss which materials are best for bouncing and why. The teacher could choose to do all of the activities and have a robust alignment with the three dimensions of the NGSS PS1-2, an engineering physical science Performance Expectation.

- **Matter song a music video by untamed Science:** This is an engaging music video that defines and gives examples of matter. The video is fun, colorful and explores many different kinds of matter as part of the music video sequence. Young students will love the song and the interactive dance sequences.

- **Science Games For Kids: Properties of Materials:** This resource is an interactive simulation designed to have students test various materials for different properties including flexibility, strength, waterproof, and transparency. The simulation includes a workshop where students can select different materials to see if the selected property matches the intended use.

- **Thousands of tiny pieces can create something big:** In this resource which is based on enactment in a second grade classroom and includes videos and examples of student work, the teacher introduces students to Watt's tower, a tower made of many pieces of junk in the neighborhood. Students make their own objects out of many pieces or materials that the teacher provides and the students think about and discuss whether they could use the same set of materials to make something different.

- **Take it apart, put it together:** This is a wonderfully supported and creative lesson that involves students taking apart an old appliance and making a new object using the appliance parts. The teacher guides students using a variety of teacher prompts and individual journaling to track their idea development, questions, changing plans, and evidence-based explanations.
Science Grade 2

- **Exploring Reversible Changes of State and Exploring Irreversible Changes of State**: These two lessons work together to explore reversible and irreversible changes of state through guided investigations. The PDF is a set of activities focusing on materials followed by some optional post-activity lessons. Two of these post activity lessons deal with reversible and irreversible changes to materials. The first lesson involves teachers showing students phenomena and then asking the students to generate questions about their observations of the phenomena. The second lesson involves students engaging in investigating, explaining and asking questions about two irreversible changes and using observations to identify what about the changes make them irreversible.

- **The Magic School Bus Bakes in a Cake lesson and video, “Ready Set Dough”**: This is a lesson plan that accompanies the reading or watching of The Magic School Bus Bakes a Cake, or Ready Set Dough. The lesson is a short activity with guided questions that accompany making pretzel dough. In the book and video, which are not included in the resource, The Magic School Bus shrinks down to molecule size to observe and discuss chemical and physical changes while baking. The resource contains a link to purchase the book.

- **The Science of Macaroni Salad (and 2. Dig Deeper)**: This three minute video is great for teachers who need a short and deeper understanding of what is entailed in the Performance Expectations for Properties of Matter and what is involved when a physical and chemical change occurs. It would be over the heads of younger children, but perfect for elementary teachers who can either view the video themselves and translate the most pertinent ideas in it, or watch the video with the students and narrate in kid language. If the teacher watched the video first, they would be ensured that they had the understanding necessary for tough questions.

### 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.

#### Engineering Design as a Core Idea

The presenter was Cary Sneider, Associate Research Professor at Portland State University in Portland, Oregon. The seminar focused on the Core Idea of Engineering, led by Cary Snider, Associate Research Professor at Portland State University. Cary explained the overall NGSS engineering components for K-2, MS and HS, and went through a number of practical examples of how teachers could develop modules and investigations for their students to learn them. Cary also spoke about the ways in which teachers could include cross-cutting engineering concepts to a number of classroom subjects. The seminar concluded with an overview of NSTA resources about NGSS available to teachers by Ted, and a Q & A session with Cary.

Visit the resource collection.

#### NGSS Core Ideas: Matter and Its Interactions

The presenter was Joe Krajcik from Michigan State University. The program featured strategies for teaching about physical science concepts that answer questions such as "How do particles combine to form the variety of matter one observes?" and "How do substances combine or change (react) to make new substances?" Dr. Krajcik began the presentation by defining disciplinary core ideas and discussing the value of using core ideas to build understanding across time. He also talked about the way disciplinary core ideas work together with the other components of NGSS: scientific and engineering practices and crosscutting concepts. Dr. Krajcik talked about the disciplinary core ideas for PS1 and shared examples of student work. Participants had the opportunity to ask questions and discuss ideas for classroom application with other participating teachers.

#### 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.

NSTA Web Seminar: NGSS Core Ideas: Matter and Its Interactions

Dr. Krajcik began the presentation by defining disciplinary core ideas and discussing the value of using core ideas to build understanding across time. He also talked about the way disciplinary core ideas work together with the other components of NGSS: scientific and engineering practices and crosscutting concepts. The program featured strategies for teaching about physical science concepts that answer questions such as "How do particles combine to form the variety of matter one observes?" and "How do substances combine or change (react) to make new substances?" Dr. Krajcik talked about the disciplinary core ideas for Properties of Matter and shared examples of student work. Participants had the opportunity to ask questions and discuss ideas for classroom application with other participating teachers.

View the resource collection.

Bozeman Science

UNIT 2

Unit 2: Role Of Water and Changing of Earth

<table>
<thead>
<tr>
<th>Grade: 2nd</th>
<th>Suggested Pacing: Marking Period 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domain: Earth &amp; Space Science</td>
<td>Discovery TechBook Unit: Changes in Earth’s Systems</td>
</tr>
</tbody>
</table>

NJSLS - Science Performance Expectations:

- **2-ESS1: Earth’s Place in the Universe**
  - Use information from several sources to provide evidence that Earth events can occur quickly or slowly. (2-ESS1-1)

- **2-ESS2: Earth’s Systems**
  - Develop a model to represent the shapes and kinds of land and bodies of water in an area. (2-ESS2-2)
  - Obtain information to identify where water is found on Earth and that it can be solid or liquid. (2-ESS2-3)

- **K-2-ETS1: Engineering Design**
  - 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)

NJSLS - Science Disciplinary Core Ideas:

- **ESS2.B: Plate Tectonics and Large-Scale System Interactions**
  - Maps show where things are located. One can map the shapes and kinds of land and water in any area. (2-ESS2-2)

- **ESS2.C: The Roles of Water in Earth’s Surface Processes**
  - Water is found in the ocean, rivers, lakes, and ponds. Water exists as solid ice and in liquid form. (2-ESS2-3)

- **ESS1.C: The History of Planet Earth**
  - Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe. (2-ESS1-1)

NJSLS - Science CrossCutting Concepts:

- **Patterns**
  - Patterns in the natural world can be observed. (2-ESS2-2), (2-ESS2-3)

- **Stability and Change**
  - Things may change slowly or rapidly. (2-ESS1-1), (2-ESS2-1)

- **Influence of Engineering, Technology, and Science on Society and the Natural World:**
  - Developing and using technology has impacts on the natural world. (2-ESS2-1)

- **Science Addresses Questions About the Natural and Material World:**
  - Scientists study the natural and material world. (2-ESS2-1)
Essential Questions**

**The questions below are suggested EQs to springboard the unit. NJSL-Science was composed for students to drive learning. Afford children the opportunity to ask the questions and define potential problems.**

- Where is water found on Earth?
- What role does water play on Earth’s Surface?
- How does water cycle through its different forms?
- How do maps show things in the real world?
- What patterns in the real world can maps show?
- How and why is Earth constantly changing?
- What types of events occur in cycles?
- What types of events have a beginning and an end?
- What type of events on Earth happen very quickly?
- What types of events on Earth happen very slowly?
- What roles do weathering and erosion play in the way the planet changes?

Enduring Understandings & Practices

By the end of this unit, students will understand:

- Water is found in the ocean, rivers, lakes, and ponds.
- How to use a map to find where the water is located on Earth.
- Patterns in the real world that are represented on a map.
- Events can occur in cycles, such as day and night.
- Events can have a beginning and an end, like a volcanic eruption.
- Events can happen very slowly over a time period much longer than anyone can observe.
- Similarities and differences between physical and chemical weathering.
- Effects of weathering and erosion on Earth’s surface.
- How igneous, sedimentary, and metamorphic form.

By the end of this unit, students will be able to:

- Develop a model to represent patterns in the natural world. (2-ESS2-2)
- Make observations from several sources to construct an evidence-based account for natural phenomena. (2-ESS1-1)
- Compare multiple solutions to a problem. (2-ESS2-1)
- Obtain information using various texts, text features (e.g., headings, tables of contents, glossaries, electronic menus, icons), and other media that will be useful in answering a scientific question. (2-ESS2-3)
- Develop a model to represent patterns in the natural world. (2-ESS2-2)
- Make observations from several sources to construct an evidence-based account for natural phenomena. (2-ESS1-1)

Prior Learning

**Kindergarten**

- 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)
- 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.
Future Learning

Grade 3

- When the environment changes in ways that affect a place’s physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die.

Grade 4

- The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges. Maps can help locate the different land and water features areas of Earth.
- 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.
- Testing a solution involves investigating how well it performs under a range of likely conditions. (secondary)
- 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)
- Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints.

Grade 5

- Nearly all of Earth’s available water is in the ocean. Most freshwater is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere.
- Earth’s major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth’s surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather.

Effective Implementation Strategies

- 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.
Science Grade 2

- Collaborate with after-school programs or clubs to extend learning opportunities.
- Restructure lesson using UDL principles (http://www.cast.org/our-work/about-udl.html#VXmoXcfD_UA).

## Assessment

**End-of-Unit Performance Assessment:** Students will Plan a Landform Model (Plan) by first sketching a diagram, then students will Make a Landform Model (Create) to represent shapes of landforms and bodies of water. Finally, student scientists will Make a Map From Model Islands (Extend) to show the kinds of land and water in an area.

Please click [HERE](http://www.cast.org/our-work/about-udl.html#VXmoXcfD_UA) to access our 2017 - 2018 K-5 Design Rubric.

**Suggested Hands-On Activities / Classroom Inquiries:** Bodies of Water Venn Diagram Activity, States of Water Ice Cube Activity, Water Cycle Activity, Compare Maps Activity

The following is a recommended progression to support the development of understandings necessary for the performance expectation(s). Teachers should consider multiple data points when making instructional decisions.

*(Please note: Though listed individually, some experiences may last longer than one class period. Time has been built into the pacing calendar to allot for this.)*

<table>
<thead>
<tr>
<th>Experience</th>
<th>Objective/Desired Outcome</th>
<th>Classwork Resources</th>
</tr>
</thead>
</table>
| Student Questioning | To spark curiosity and amplify engagement, students should formulate their own questions regarding the phenomena/topic of the unit. They should then be afforded an opportunity to investigate them (and others that emerge) throughout the unit in order to heighten authenticity and deepen their knowledge and understanding. Teachers may use these questions as a pre-assessment and as a means to guide future learning experiences. | -KWHLAQ: Organizer
- KWHLAQ: Google Slides
- Science Questioning Graphic Organizer
- QFT: Formulating effective questions
- Ideas For Phenomena To Question: NGSS Phenomena #ProjectPhenomena |
| 1                   | How Do Maps Represent The Real World?                                                      | -DE Engage: Getting to Know Maps
- Google Slides Unit Presentation
- Exploring Maps from Around the World (Google Slides) |
| 2                   | Identify Patterns In The Real World That Are Represented On A Map                         | -DE Engage: Know Your Globe Activity: How Do Maps Show Things? |
|                     |                                                                                          | -DE Reading: What is a Map? |

Additional Resources:
- World Map
|   | Understand The Purpose Of Maps | -DE Engage: [Reading Maps Review](#)  
|-DE Evaluate: [Assessment (Teacher's Guide)](#) |
|   | Compare & Contrast Various Different Types of Maps and Look for Patterns | -DE [Compare Maps](#) Activity: Using existing maps or group created maps. |
|   | Water covers the majority of Earth | -DE Engage: [Know Your Oceans](#)  
|   | Activity: [Getting to Know Oceans](#)  
|   | [Google Slides Unit Presentation](#)  
|   | [BrainPOP: Oceans](#) |
|   | Different Bodies of Water Exist On Earth | -DE Engage: [Planet Water](#)  
|   | -DE Explore: [Ocean of Truth](#)  
|   | -Google Slide Unit Presentation  
|   | -Mystery Science: If you floated down a river, where would you end up?: [Paper Mountains](#) |
|   | Function of the Water Cycle | -Brainpop: [Water Cycle](#)  
|   | [Google Slides Unit Presentation](#)  
|   | [Water Cycle Activity, States of Water Ice Cube Activity](#) |
|   | Land vs. Water Activity | -DE: [Bodies of Water](#)  
|   | [Google Slides Unit Presentation](#)  
|   | [NJCTL: Bodies of Water Venn Diagram](#)  
|   | -Mystery Science: What is strong enough to make a canyon: [Cornmeal Canyons](#) |
|   | Earth Cycles | -Google Slides Unit Presentation  
|   | -BrainPOP: [Earth](#)  
|   | [NJCTL: Changing of Earth Classwork/Homework](#) |
|   | Day/Night & Seasonal Cycles | -Google Slides Unit Presentation  
|   | [Crash Course Engage: Seasons & the Sun](#)  
|   | [BrainPOP: Seasons](#) |
|   | Moon Cycles | -Google Slides Unit Presentation  
|   | [NJCTL: Earth, Sun, and Moon Model](#) |
|   | Weather Cycles | -Google Slides Unit Presentation  
|   | [NJCTL: Seasons Activity](#) |
|   | Rock Cycle: Sedimentary, Metamorphic and Igneous Rocks | -Google Slides Unit Presentation  
|   | [BrainPOP: Rock Cycle, Rock Types](#)  
|   | [NJCTL: Rock Cycle Activity](#)  
|   | -Mystery Science: Why is there sand at the beach?: [Rocking the river](#) |
|   | Defined Events: Natural Disasters | -Google Slides Unit Presentation  
|   | [BrainPOP: Natural Disasters, Earthquakes, Tsunami, Floods, Hurricanes, Volcanoes, Tornadoes](#)  
|   | -Defined STEM: [Volcanology Contest](#) |
Science Grade 2

|   | End of Unit Assessment | -Part 1: Planning a Landform Model (Plan)  
-Part 2: Making a Landform Model (Create)  
-Part 3: Making a Map From Our Own Model Islands (Extend) |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Improve</td>
<td>Students are given time to revise their projects/solutions and finalize their plans based on the feedback of their peers and teacher(s).</td>
<td>-Individuals or groups modify their designs to incorporate feedback.</td>
</tr>
</tbody>
</table>

### Additional Classroom Resources

- [www.njctl.org](http://www.njctl.org)
  - Classwork and Homework Activities
  - Parent Letter
- [www.Brainpop.com](http://www.Brainpop.com)
  - Oceans
  - Water Cycle
- **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.
- **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.
- **Keeping a Moon Journal** The National Wildlife Federation's "Keep a Moon Journal" page allows students to get acquainted with the phases of the moon by keeping a moon journal to record their nightly observations for one month. The page has links to diagrams, a student printable, and activities connecting the journal to other content. The page is set up as a “family activity” and could be used as nightly homework for students then discussed weekly in class.
- **Observing the Sun** This lesson is an activity where students create a sun tracker and monitor the sun's position over the course of a day. Examples of student journals and connections within a larger unit are provided.
- **Weather: The Many Faces of Mother Nature** This resource is part of a collection of ten activities in the Discover Earth series, designed to teach the story of Earth and its changing environment for ages 5-13. It includes differentiated task instructions for each age group. Each activity is an individual lesson plan with several activities. Each part of the unit can be used independently to teach the topic of the activity or as an entire unit to provide well-rounded coverage of Earth science standards. Activity 5 focuses on tracking and recording changes in local weather conditions and is designed for ages 5-7. Be sure to refer to the Facilitator's Guide: [http://www.lpi.usra.edu/education/explore/discoverEarth/FacilitatorResources.pdf](http://www.lpi.usra.edu/education/explore/discoverEarth/FacilitatorResources.pdf)

### Teacher Professional Learning Resources

**Assessment for the Next Generation Science Standards**
The presenters were Joan Herman, Co-Director Emeritus of the National Center for Research on Evaluation, Standards, and Student Testing (CRESST) at UCLA; and Nancy Butler Songer, Professor of Science Education and Learning Technologies, University of Michigan.
Dr. Herman began the presentation by summarizing a report by the National Research Council on assessment for the Next Generation Science Standards (NGSS). She talked about the development of the report and shared key findings. Next, Dr. Songer discussed challenges for classroom implementation and provided examples of tasks that can be used with students to assess their proficiency on the NGSS performance expectations. Participants had the opportunity to submit questions and share their feedback in the chat.

**NGSS Crosscutting Concepts: Patterns**

The presenter was Kristin Gunckel from the University of Arizona. Dr. Gunckel began the presentation by discussing how patterns fit in with experiences and explanations to make up scientific inquiry. Then she talked about the role of patterns in NGSS and showed how the crosscutting concept of patterns progresses across grade bands. After participants shared their ideas about using patterns in their own classrooms, Dr. Gunckel shared instructional examples from the elementary, middle school, and high school levels.

**NGSS Crosscutting Concepts: Structure and Function**

The presenters were Cindy Hmelo-Silver and Rebecca Jordan from Rutgers University. Dr. Hmelo-Silver and Dr. Jordan began the presentation by discussing the role of the crosscutting concept of structure and function within NGSS. They then asked participants to think about the example of a sponge and discuss in the chat how a sponge’s structure relates to its function. The presenters introduced the Structure-Behavior-Function (SBF) theory and talked about the importance of examining the relationships between mechanisms and structures. They also discussed the use of models to explore these concepts. Participants drew their own models for one example and shared their thoughts about using this strategy in the classroom.

**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.

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

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 by NSTA's Ted Willard 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](#).

**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 Krajičik, Director of the CREATE for STEM Institute. Ted Willard, NSTA's NGSS Director, introduced the web seminar by providing an overview of the Next Generation Science Standards, including how the standards were developed, which states have adopted them and which organization, including the NSTA, have been instrumental in providing assistance in the development of the NGSS. Ted also discussed the NSTA's commitment to helping teachers and educators understand the NGSS, so that teachers can begin implementing the new standards in their instructional practices. After this brief overview, Brian Reiser, Professor of Learning Sciences, School of Education at Northwestern University and Joe Krajičik, 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.
<table>
<thead>
<tr>
<th>Science Grade 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>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 &amp; A with Brian Reiser and Joe Krajcik.</td>
</tr>
</tbody>
</table>

View the resource [collection](#).

**NGSS Crosscutting Concepts: Systems and System Models**
The presenter was Ramon Lopez from the University of Texas at Arlington. This was the seventh web seminar in a series of seven focused on the crosscutting concepts that are part of the Next Generation Science Standards (NGSS).

**Bozeman Science**
## UNIT 3

TransDisciplinary Unit - Wind, Water & Land

<table>
<thead>
<tr>
<th>Grade:</th>
<th>2nd</th>
<th>Suggested Pacing:</th>
<th>Marking Period 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domain:</td>
<td>Earth &amp; Space Science</td>
<td>Discovery TechBook Unit:</td>
<td>Changes In Earth’s Systems</td>
</tr>
</tbody>
</table>

### NJSLS - Science Performance Expectations:

- **2-ESS1: Earth’s Place in the Universe**
  - Use information from several sources to provide evidence that Earth events can occur quickly or slowly. (2-ESS1-1)
- **2-ESS2: Earth’s Systems**
  - Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land. (2-ESS2-1)
- **K-2-ETS1: Engineering Design**
  - 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)

### NJSLS - Science Disciplinary Core Ideas:

- **ESS1.C: The History of Planet Earth**
  - Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe. (2-ESS1-1)
- **ESS2.A: Earth Materials and Systems**
  - Wind and water can change the shape of the land. (2-ESS2-1)
- **ESS2.C: The Roles of Water in Earth’s Surface Processes**
  - Water is found in the ocean, rivers, lakes, and ponds. Water exists as solid ice and in liquid form. (2-ESS2-3)
- **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. (secondary to 2-ESS2-1)

### NJSLS - Science CrossCutting Concepts:

- **Patterns:**
  - Patterns in the natural world can be observed. (2-ESS2-2), (2-ESS2-3)
- **Stability and Changes:**
  - Things may change slowly or rapidly. (2-ESS1-1), (2-ESS2-1)
- **Influence of Engineering, Technology, and Science on Society and the Natural World:**
  - Developing and using technology has impacts on the natural world. (2-ESS2-1)
- **Science Addresses Questions About the Natural and Material World:**
  - Scientists study the natural and material world. (2-ESS2-1)

### NJSLS - Technology:

- **8.2 Technology Education, Engineering, Design and Computational Thinking - Programming**
  - Collaborate and apply a design process to solve a simple problem from everyday experiences. (8.2.2.D.1)
**Overarching Local/Global Problem:** What can be done to stop erosion at the local park?

### Essential Questions

**The questions below are suggested EQs to springboard the unit. The NJSLN-Science was composed for students to drive learning. Afford children the opportunity to ask the questions and define potential problems.**

- What are the effects of wind and water on the land?
- What types of landforms help prevent wind and water erosion?
- How does wind and water shape the land?
- How can the effects of wind and water erosion be controlled or reduced?

### Enduring Understandings & Practices

**By the end of this unit, students will understand:**

- The differences between weathering and erosion.
- Weathering impacts the land.
- Plants can help reduce erosion.
- Wind and water erosion create landforms.
- The effects wind and water have on land

**By the end of this unit, students will be able to:**

- Develop a model to represent patterns in the natural world. (2-ESS2-2)
- Make observations from several sources to construct an evidence-based account for natural phenomena. (2-ESS2-1)
- Obtain information using various texts, text features (e.g., headings, tables of contents, glossaries, electronic menus, icons), and other media that will be useful in answering a scientific question. (2-ESS2-3)

### Prior Learning

**Kindergarten**

- 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.

### Future Learning

**Grade 3**

- When the environment changes in ways that affect a place’s physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die.

**Grade 4**

- Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around.
- Testing a solution involves investigating how well it performs under a range of likely conditions. (secondary)
- 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.
- Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints.

**Grade 5**
Earth’s major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth’s surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather.

### Effective Implementation Strategies

- 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 a 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.

### Assessment

#### End-Of-Unit Performance Assessment:
Help! The local park has a big problem! A rainstorm washed part of the hillside into the creek and left a big hole. Now the hillside will have to be filled with . . . what? No one is sure. No one wants the same thing to happen again. What can be done to stop erosion at the local park?

During this unit, you will be a soil conservationist who finds ways to decrease erosion. When you are finished, you can recommend what the park staff can do to solve the problem.

Please click [HERE](https://example.com) to access our 2017-2018 K-5 Design Rubric.

#### Suggested Hands-On Activities / Classroom Inquiries:
- Sand Pile Demonstration, Wind and Water Erosion Activity, Let It Rain, [Virtual Labs](https://example.com): Here Today, Gone Tomorrow, Soil Conservationist Science Journal/Log or Google Document.

The following is a recommended progression to support the development of understandings necessary for the performance expectation(s). Teachers should consider multiple data points when making instructional decisions.
(Please note: Though listed individually, some experiences may last longer than one class period. Time has been built into the pacing calendar to allot for this.)

<table>
<thead>
<tr>
<th>Experiences</th>
<th>Daily Objective</th>
<th>Classwork Resources</th>
</tr>
</thead>
</table>
| **Student Questioning Opportunity** | To spark curiosity and amplify engagement, students should formulate their own questions regarding the phenomena/topic of the unit. They should then be afforded an opportunity to investigate them (and others that emerge) throughout the unit in order to heighten authenticity and deepen their knowledge and understanding. Teachers may use these questions as a pre-assessment and as a means to guide future learning experiences. | - KWHLAQ: [Organizer](#)  
- KWHLAQ: [Google Slides](#)  
- [Science Questioning Graphic Organizer](#)  
- QFT: [Formulating effective questions](#)  
- [Ideas For Phenomena To Question: NGSS Phenomena](#)  
#ProjectPhenomena |
| **1**                           | WALT describe weathering and erosion.                                             | Activate Prior Knowledge  
Students visualize a sand pile on the playground. Imagine what would happen if a great storm occurred.  
After students have discussed, [Erosion Sandbox Video](#)  
**Lesson/Activity:**  
Introduce the term erosion and demonstrate erosion with different materials: soil, sand, rocks. |
| **2**                           | WALT define and describe weathering and erosion and begin to formulate ideas on ways to solve the Design Challenge. | **Stimulate Interest:** View video segment  
The Forces of Wind and Water: Weathering and Erosion to introduce the process of weathering and erosion.  
**Design Challenge** (Level 1): Provide students with materials to design a park setting.  
*(Students may move to performing Level 2 Lab based on understanding of key concepts)* |
| **3**                           | WALT define and describe wind.                                                   | **Lesson/Activity:**  
NJCTL (Wind, Water and Land Unit): [Google Slide Unit Presentation](#)  
View Brainpop Video: [Wind](#)  
Using Chromebooks, students can research velocity and wind speed effects on the land: [www.weatherwizkids.com](#) |
<table>
<thead>
<tr>
<th>4</th>
<th>WALT define and describe different types of erosion (wind, water).</th>
</tr>
</thead>
</table>
| **Lesson/Activity:** Weathering & Erosion  
**Discovery Ed. Session One:** (Students will be exposed to reading passages and video segments using a guided/directed inquiry approach) |

<table>
<thead>
<tr>
<th>5</th>
<th>WALT define and describe the effects of erosion and weathering caused by wind and water.</th>
</tr>
</thead>
</table>
| **Lesson/Activity:**  
Students will continue to add notes to their Soil Conservationist Logs. * (Can continue Guided/directed inquiry approach)  
**View Videos:**  
Discovery Education: [Erosion](#) (Segments 1 & 2-Wind Erosion and Water Erosion)  
and/or  
[Brainpop- Erosion](#) and/or  
[Brainpop-Weathering](#) and/or  
[Brainpop Jr- Slow Land Changes](#)  
[Erosion Music Video](#)  
**NJCTL:** Weathering Activity |

<table>
<thead>
<tr>
<th>6</th>
<th>WALT review the processes of weathering and erosion as well as the causes and effects of weathering and erosion.</th>
</tr>
</thead>
</table>
| **Lesson Activity:** Weathering & Erosion (continued)  
**Session 2 (Explain)**  
Read passage  
[The Changing Shape of Beaches](#)  
**NJCTL (Wind, Water and Land Unit)**  
-Google Slide Unit Presentation |

<table>
<thead>
<tr>
<th>7</th>
<th>WALT find out how wind and water cause erosion.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NJCTL (Wind, Water and Land) : Activity #2 Erosion:</strong> <a href="#">Wind and Water</a></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>8</th>
<th>WALT describe how plants help reduce erosion.</th>
</tr>
</thead>
</table>
| **Lesson Activity:** Discovery Education: Session Two-Explore  
Refer to [Google Slide](#) with the essential question of how plants help with erosion. |

<table>
<thead>
<tr>
<th>9</th>
<th>WALT describe ways to prevent wind erosion.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NJCTL (Wind Water, Land Unit): Preventing Wind Erosion:</strong> -<a href="#">Google Slide Unit Presentation</a></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>10</th>
<th>WALT describe ways to prevent water erosion</th>
</tr>
</thead>
</table>
| **NJCTL (Wind Water, Land Unit): Preventing Water Erosion:** -[Google Slide Unit Presentation](#)  
Read Works Article & Question Set |
| 11 | WALT explore erosion and deposition. | **Lesson Activity:**  
Students review concepts of erosion and deposition by completing simulation **Erosion and Deposition**  
**Defined STEM:** Erosion |
| --- | --- | --- |
| 12 | WALT practice designing and conducting virtual investigations. | Students are introduced to the use of Virtual Labs. Review 3 Key Components of Virtual Labs [HERE](#).  
The typical sequence for instruction is to:  
• Use the Introduction tab to set up the problem with the class.  
• Demonstrate how to get into the lab through the Investigate tab.  
• Show students how to manipulate the variable selector controls, run a test, and review data in the Results tab.  
• Stop the lab and model for students how you would use the student planning sheet to design an investigation on paper.  
• Finally, assign students to groups to develop their plans to investigate just one variable. |
| 13  
(May take 2-4 class periods) | WALT design and conduct virtual investigations. | Students begin Virtual Lab: [Erosion: Here Today, Gone Tomorrow](#) |
| 14 | WALT review and discuss data on virtual investigations. | Students will record and analyze the virtual lab data.  
[Student Guide (Level 1)](#)  
*Student Guide (Level 2)* (*may be used as enrichment*) |
| 15 | WALT understand and demonstrate how to minimize the effects of erosion. | [Performance Assessment](#) (Students)  
[Teacher's Guide](#)  
Working in small groups, students will complete a hands on version of the design challenge using materials such as water, soil, rock, plants and sand to create a model park. Groups will present and test to see which model is the best at minimizing erosion. |
| 16 | Extension Activities: WALT design projects that demonstrate erosion and weathering. | Students are able to conduct hands on projects to model erosion-  
**Project/Lab Ideas:** [Weathering & Erosion](#)  
**Discovery Education:** [Hands-On Activity: Let It Rain](#).  
(Provides project ideas in which to elaborate.) |
| Improve | Students are given time to revise their projects/solutions and finalize their plans based on the feedback of their peers and teacher(s). | -Individuals or groups modify their designs to incorporate feedback. |
How Can Water Change the Shape of the Land?
In this lesson plan children investigate water erosion. Students make a sand tower and observe the erosion as they drop water on it. Students observe, illustrate, and record notes about the process. Short videos and a read aloud also further support understanding of the Performance Expectation.

How Can Wind Change the Shape of the Land?
This lesson builds on another lesson created by Jeri Faber in which students discovered how water changes the earth. For this lesson, students take part in a teacher-led investigation to show how wind changes the land. The children use straws to blow on a small mound or hill of sand. As each child takes a turn, the other students record their detailed observations that will later be used to draw conclusions. Students also watch a short video on wind erosion and discuss the new learning with partners.

Finding Erosion at Our School
In this lesson, students walk around the school grounds, neighborhood, or another area of their community to locate evidence of erosion. Various problems caused by erosion are discussed and a solution is developed for one of the problems. This lesson is one in a series on erosion by Jeri Faber. A follow-up lesson is available where students compare their erosion design solutions.

Teacher Professional Learning Resources

Assessment for the Next Generation Science Standards
The presenters were Joan Herman, Co-Director Emeritus of the National Center for Research on Evaluation, Standards, and Student Testing (CRESST) at UCLA; and Nancy Butler Songer, Professor of Science Education and Learning Technologies, University of Michigan. Dr. Herman began the presentation by summarizing a report by the National Research Council on assessment for the Next Generation Science Standards (NGSS). She talked about the development of the report and shared key findings. Next, Dr. Songer discussed challenges for classroom implementation and provided examples of tasks that can be used with students to assess their proficiency on the NGSS performance expectations. Participants had the opportunity to submit questions and share their feedback in the chat.

View the resource collection.

NGSS Crosscutting Concepts: Patterns
The presenter was Kristin Gunckel from the University of Arizona. Dr. Gunckel began the presentation by discussing how patterns fit in with experiences and explanations to make up scientific inquiry. Then she talked about the role of patterns in NGSS and showed how the crosscutting concept of patterns progresses across grade bands. After participants shared their ideas about using patterns in their own classrooms, Dr. Gunckel shared instructional examples from the elementary, middle school, and high school levels.

NGSS Crosscutting Concepts: Structure and Function
The presenters were Cindy Hmelo-Silver and Rebecca Jordan from Rutgers University. Dr. Hmelo-Silver and Dr. Jordan began the presentation by discussing the role of the crosscutting concept of structure and function within NGSS. They then asked participants to think about the example of a sponge and discuss in the chat how a sponge’s structure relates to its function. The presenters introduced the Structure-Behavior-Function (SBF) theory and talked about the
importance of examining the relationships between mechanisms and structures. They also discussed the use of models to explore these concepts. Participants drew their own models for one example and shared their thoughts about using this strategy in the classroom.

**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.

**Bozeman Science**
# UNIT 4

## Unit 4: Biodiversity, Humans, and Plants

<table>
<thead>
<tr>
<th>Grade: 2nd</th>
<th>Suggested Pacing: Marking Period 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domain: Life Science</td>
<td>Discovery TechBook Unit: What Do Living Things Need? &amp; Kinds of Plants</td>
</tr>
</tbody>
</table>

### NJSLS - Science Performance Expectations:

- **2-LS2: Ecosystems: Interactions, Energy, and Dynamics**
  - Plan and conduct an investigation to determine if plants need sunlight and water to grow. (2-LS2-1)
  - Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants. (2-LS2-2)
- **2-LS4: Biological Evolution: Unity and Diversity**
  - Make observations of plants and animals to compare the diversity of life in different habitats. (2-LS4-1)
- **K-2-ETS1: Engineering Design**
  - 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)

### NJSLS - Science Disciplinary Core Idea:

- **LS4-D: Biodiversity and Humans**
  - There are many different kinds of living things in any area, and they exist in different places on land and in water. (2-LS4-1)
- **LS2.A: Interdependent Relationships in Ecosystems**
  - Plants depend on water and light to grow. (2-LS2-1)
  - Plants depend on animals for pollination or to move their seeds around. (2-LS2-2)

### NJSLS - Science CrossCutting Concepts:

- **Cause and Effect:**
  - Events have causes that generate observable patterns. (2-LS2-1)
- **Structure and Function:**
  - The shape and stability of structures of natural and designed objects are related to their function(s). (2-LS2-2)

### NJSLS - Technology:

- **8.2 Technology Education, Engineering, Design and Computational Thinking - Programming**
  - Brainstorm ideas on how to solve a problem or build a product. (8.2.2.C.1)
  - Create a drawing of a product or device that communicates its function to peers and discuss. (8.2.2.C.2)
  - Explain why we need to make new products. (8.2.2.C.3)

### Essential Questions**

**The questions below are suggested EQs to springboard the unit. NJSLS-Science was composed for students to drive learning. Afford children the opportunity to ask the questions and define potential problems.**

- How can there be so many similarities among organisms yet so many different kinds of plants, animals, and microorganisms?
- How and why do organisms interact with their environment and what are the effects of these interactions?
- How does biodiversity affect humans?
- What resources are needed for plants to grow?
- How does pollination occur?
- How does seed dispersal occur?
### Enduring Understandings & Practices

**By the end of this unit, students will understand:**
- The meaning of biodiversity.
- That biodiversity is key to the planet's health as a system.
- The roles of producers, consumers and decomposers on land and in water.
- Characteristics of several ecosystems.
- Organisms and their environments are directly related.
- How humans affect biodiversity.
- The characteristics and needs of plants.
- The inputs and outputs of photosynthesis.
- The effects sunlight and water have on the growth of plants.
- How pollination occurs.
- How dispersal occurs.

**By the end of this unit, students will be able to:**
- Develop a simple model based on evidence to represent a proposed object or tool. (2-LS2-2)
- Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question. (2-LS2-1)
- Make observations (firsthand or from media) to collect data which can be used to make comparisons. (2-LS4-1)
- Look for patterns and order when making observations about the world. (2-LS4-1)
- Scientists look for patterns and order when making observations about the world. (2-LS4-1)

### Prior Learning

**Kindergarten**
- 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.
- 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.
- 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.

### Future Learning

**Grade 3**
- For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.
- Populations live in a variety of habitats, and change in those habitats affects the organisms living there.

**Grade 5**
- Plants acquire their material for growth chiefly from air and water.
- The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as “decomposers.” Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem.
Effective Implementation Strategies

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

Assessment

End-of-Unit Performance Assessment: In the Performance Assessment, I Scream, You Scream, We All Scream for VANILLA Ice Cream!, students design a vanilla plant pollinator. Students pretend to be employees of Ben and Jerry’s ice cream company and help to plan and design a pollinator for the vanilla plant so that the great vanilla flavored ice cream can continue to be produced. Students use the engineering design process to build and test the plant pollinator they planned. Students will then develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants. Finally students improve their plant pollinator models and retest the pollinator’s effectiveness.

Unit 4 PBA Part 2 (Plan)
Unit 4 PBA Part 3 (Create)
Unit 4 PBA Part 4 (Improve)

Please click HERE to access our 2017 - 2018 K-5 Design Rubric.


The following is a recommended progression to support the development of understandings necessary for the performance expectation(s). Teachers should consider multiple data points when making instructional decisions.

(Please note: Though listed individually, some experiences may last longer than one class period. Time has been built into the pacing calendar to allot for this.)
<table>
<thead>
<tr>
<th>Experience</th>
<th>Objective/Desired Outcome</th>
<th>Classwork Resources</th>
</tr>
</thead>
</table>
| Student Questioning Opportunity | To spark curiosity and amplify engagement, students should formulate their own questions regarding the phenomena/topic of the unit. They should then be afforded an opportunity to investigate them (and others that emerge) throughout the unit in order to heighten authenticity and deepen their knowledge and understanding. Teachers may use these questions as a pre-assessment and as a means to guide future learning experiences. | - KWHLAQ: Organizer  
- KWHLAQ: Google Slides  
- Science Questioning Graphic Organizer  
- QFT: Formulating effective questions  
- Ideas For Phenomena To Question:  
  NGSS Phenomena  
  #ProjectPhenomena |
| 1          | What is biodiversity?                                                                     | - Google Slides Unit Presentation  
- NJCTL: Biodiversity Collage |
- DE: Session 3,4,5: Resources: Segment Clips |
| 3          | Types of Living Things                                                                    | - DE: Video Clip: Ecology vs Ecosystems  
- DE: Reading Passage: Getting to Know Features of Ecosystems  
- Google Slides Unit Presentation |
| 4          | Living Things on Land                                                                     | - DE: Video Clip: Explore the Ecosystem of the Seregenti Plains  
- Defined STEM: Producers and Consumers  
- Google Slides Unit Presentation |
| 5          | Land Ecosystems                                                                          | - DE: Video Clip: Explore the Ecosystem of the Seregenti Plains  
- Defined STEM: Producers and Consumers  
- Google Slides Unit Presentation |
| 6          | Living Things in Water/Aquatic Ecosystems                                                | - Google Slides Unit Presentation  
- NJCTL: Living Things In Ecosystems |
| 7          | Ecosystems and Organisms                                                                  | - Google Slides Unit Presentation  
- NJCTL: Animal Teeth  
- Defined STEM: Zoo Veterinarian |
| 8          | Biodiversity and Humans                                                                   | - Google Slides Unit Presentation  
- NJCTL: Biodiversity and Humans |
| 9          | What Are Plants?                                                                         | - DE: Session 1 and 2  
- DE: Video: Plants Habitats Around the World  
- DE: Video: Three Main Parts of a Plant  
- Google Slides Unit Presentation |
| 10         | Plants: Similarities and Differences                                                      | - DE: Session 3 and 4, Sessions 5 and 6  
- DE Hands On Activity: Walk in the Park  
- Mystery Science: Should you water a cactus? |
<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
</table>
| 11 | Why Are Plants Important? | -DE Reading Passages: [Plant Parts That We Eat Green Food](#)  
-DE Video: [Plant Parts We Eat: Roots and Stems](#)  
[Plant Parts We Eat: Fruits and Seeds](#)  
-Mystery Science: [Do plants eat dirt?](#)  
-Google Slides Unit Presentation |
| 12 | Photosynthesis | -Google Slides Unit Presentation  
-DE Video: [Food: Energy From the Sun](#)  
-NJCTL: [What Do Plants Need? Lab](#) Slides 92-95  
-Mystery Science: [Why do trees grow so tall?](#)  
-RAFT Idea: Napkin Nursery |
| 14 | Pollination | -DE: [Sessions 10, 11 and 12](#)  
-DE Video: [Seed Dispersal](#)  
-Google Slides Unit Presentation  
-DE Hands On Activity: [Animals Pollinate Plants](#)  
-NJCTL: [Design a Model: Pollination](#) |
| 15 | Dispersal | -DE: [Session 13](#)  
-Google Slides Unit Presentation  
-Mystery Science: [Where do plants grow best?](#) |
| 16 | How Do Seeds Travel? | -DE: [Sessions 14-15](#)  
-Google Slides Unit Presentation  
-NJCTL: [How Do Seeds Travel? Activity](#)  
-Mystery Science: [How did a tree travel halfway around the world?](#) |
| 17 | Performance Assessment |  
-**I Scream, You Scream, We All Scream for Vanilla Ice Cream!**  
○ Unit 4 PBA Part 2 (Plan)  
○ Unit 4 PBA Part 3 (Create)  
○ Unit 4 PBA Part 4 (Improve) |
| Improve | Students are given time to revise their projects/solutions and finalize their plans based on the feedback of their peers and teacher(s). | -Individuals or groups modify their designs to incorporate feedback. |
### Additional Classroom Resources

- **Defined STEM - Safety And Design: Building A New Town** - Your team must design construction along the riverbank so that you keep the natural beauty of the area as well as keep the people safe who move into the area.
- **DE: Debbie Greenthumb: How Plants Grow**
- **www.njctl.org**
- **Brainpop Jr: Plants Unit**
- **Do Plants Need Sunlight?**. Students will explore the importance sunlight for a plant's survival by conducting an investigation. Each group of students will cover parts of plants' leaves with black construction paper and make observations of the plant’s leaves over several days. This lesson serves to model the process of investigation. The investigation will take 7 days to complete. Then students can remove the black paper, place the plants back in the sunlight, and view the leaves in a second investigation. *(Note: Chlorophyll is not a necessary concept/vocabulary term to address in this lesson.)*
- **Who Needs What?**. Students identify the physical needs of animals. Through classroom discussion, students speculate on the needs of plants. With teacher guidance, students then design an experiment that can take place in the classroom to test whether or not plants need light and water in order to grow. Students conduct the associated activity in which sunflower seeds are planted in plastic cups, and once germinated, are exposed to different conditions. In the classroom setting, students test for the effects of light versus darkness, and watered versus non-watered conditions. During exposure of the plants to these different conditions, students measure growth of the seedlings every few days using non-standard measurement. After a few weeks, students compare the growth of plants exposed to the different conditions, and make pictorial bar graphs that demonstrate these comparisons.
- **The Bug Chicks-Mission: Pollination (Episode 5)**: The Bug Chicks’ five minute video provides a fun, animated way of learning about the fascinating world of pollination and insects. In this video, the students observe interesting museums and habitats to look at lesser known insect pollinators. The student challenge at the end leads students into their environment to look for other pollinators and encourages them to bring their observations back to the classroom to discuss.

### Teacher Professional Learning Resources

**Teaching NGSS in Elementary School—Second Grade**

The presenters were Carla Sembal-Saul, Professor of Science Education at Penn State University, Mary Starr, Executive Director at Michigan Mathematics and Science Centers Network, and Kathy Renfrew, K-5 Science Coordinator, VT Agency of Education and NGSS Curator introduced the NGSS Web seminar Series for K-5 educators. The seminar was introduced by Ted Willard, NSTA's Director for NGSS, on how Elementary School standards - and specifically for the Second Grade - fit into the framework in terms of core ideas and performance expectations. Carla, Mary and Kathy engaged with participants to gauge their familiarity with NGSS for the second grade, and provided a number of example activities and videos on how to implement it, e.g., explaining how solids and liquids respond in the presence of a heat source. 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 the Second Grade, as well as other grade levels.

Visit the resource [collection](#).

**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](#).

**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...
Science Grade 2

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. Participants had the opportunity to submit questions and share their feedback in the chat.

Bozeman Science