Science Grade 1

Length of Course: Term
Elective/Required: Required
Schools: Elementary
Eligibility: Grade 1
Credit Value: N/A
Date Approved: August 24, 2015
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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.
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.

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1st Grade Science Curriculum Overview

The performance expectations in first grade help students formulate answers to questions such as:

- What happens when materials vibrate?
- What happens when there is no light?
- What are some ways plants and animals meet their needs so that they can survive and grow?
- How are parents and their children similar and different?
- What objects are in the sky and how do they seem to move?

First grade performance expectations include PS4, LS1, LS3, and ESS1 Disciplinary Core Ideas from the National Research Council Framework.

**Earth and Space Science:**
- Students are able to observe, describe, and predict some patterns of the movement of objects in the sky.

**Physical Science:**
- Students are expected to develop understanding of the relationship between sound and vibrating materials as well as between the availability of light and ability to see objects.
- The idea that light travels from place to place can be understood by students at this level through determining the effect of placing objects made with different materials in the path of a beam of light.

**Life Science:**
- Students are expected to develop understanding of how plants and animals use their external parts to help them survive, grow, and meet their needs as well as how behaviors of parents and offspring help the offspring survive.
- The understanding is developed that young plants and animals are like, but not exactly the same as, their parents.

**Crosscutting Concepts:** The crosscutting concepts of patterns; cause and effect; structure and function; 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 first grade performance expectations, students are expected to demonstrate grade-appropriate proficiency in:

- Planning and carrying out investigations;
- Analyzing and interpreting data;
- Constructing explanations and designing solutions; 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 NJSLS-Science / NGSS for 1st Grade.
# 1st Grade Science Scope & Sequence

## 1st Marking Period

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<td><strong>Unit 1: The Sun, Moon, Stars, &amp; Seasons</strong></td>
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<tr>
<td>(Suggested Pacing: 45 Days)</td>
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</table>

- **1-ESS1: Earth’s Place in the Universe**
  - Use observations of the sun, moon, and stars to describe patterns that can be predicted. (1-ESS1-1)
  - Make observations at different times of year to relate the amount of daylight to the time of year. (1-ESS1-2)

- **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)

## 2nd Marking Period

<table>
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<tr>
<th>Physical Science - Waves and Their Applications in Technologies for Information Transfer</th>
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<td><strong>Unit 2: TransDisciplinary Unit</strong></td>
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- **1-PS4: Waves and Their Applications in Technologies for Information Transfer**
  - Plan and conduct investigations to provide evidence that vibrating material can make sound and that sound can make materials vibrate. (1-PS4-1)
  - Make observations to construct an evidence-based account that objects can be seen only when illuminated. (1-PS4-2)
  - Plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light. (1-PS4-3)
  - Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance. (1-PS4-4)

- **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)
  - 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)
### 3rd Marking Period

**Life Science - Structure, Function, & Information Processing**

**Unit 3: Plant & Animal Structures, and Information Processing**  
(Suggested Pacing: 45 Days)

- **1-LS1: From Molecules to Organisms: Structures and Processes**
  - Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs. (1-LS1-1)

- **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)

### 4th Marking Period

**Unit 4: Plant & Animal Growth and Development/Inheritance of Traits**  
(Suggested Pacing: 45 Days)

- **1-LS1: From Molecules to Organisms: Structures and Processes**
  - Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive. (1-LS1-2)

- **1-LS3: Heredity: Inheritance and Variation of Traits**
  - Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents. (1-LS3-1)

- **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)
# UNIT 1

## The Sun, Moon, Stars, & Seasons

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<td>Domain:</td>
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<td>Discovery TechBook Unit:</td>
<td>Up In The Sky</td>
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### NJSLS - Science Performance Expectations:

- **1-ESS1: Earth’s Place in the Universe**
  - Use observations of the sun, moon, and stars to describe patterns that can be predicted. (1-ESS1-1)
  - Make observations at different times of year to relate the amount of daylight to the time of year. (1-ESS1-2)
- **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)

### NJSLS - Science Disciplinary Core Ideas:

- **ESS1.A: The Universe and its Stars**
  - Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted. (1-ESS1-1)
- **ESS.1.B: Earth and the Solar System**
  - Seasonal patterns of sunrise and sunset can be observed, described, and predicted. (1-ESS1-2)

### NJSLS - Science CrossCutting Concepts:

- **Patterns**:
  - Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (1-ESS1-1), (1-ESS1-2)
- **Scientific Knowledge Assumes an Order and Consistency in Natural Systems**
  - Science assumes natural events happen today as they happened in the past. (1-ESS1-1)
  - Many events are repeated. (1-ESS1-1)

### NJSLS - Technology:

- **8.2 Technology Education, Engineering, Design and Computational Thinking - Programming**
  - Choose a product to make and plan the tools and materials needed. (8.2.2.A.4)
  - Brainstorm ideas on how to solve a problem or build a product. (8.2.2.C.1)
  - Identify designed products and brainstorm how to improve one used in the classroom. (8.2.2.C.4)
  - Describe how the parts of a common toy or tool interact and work as part of a system. (8.2.2.C.5)
  - Collaborate and apply a design process to solve a simple problem from everyday experiences. (8.2.2.D.1)

### 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.**

- Can the patterns of the sky be predicted?
- How does the Moon’s appearance change over time?
- Why can we only see stars at night?
- What causes the seasons?
- How does the Sun’s path across the sky differ during the summer and winter?
## Enduring Understandings & Practices

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

- How the Sun appears to travel across the sky and that this is due to the Earth’s motion, not the Sun’s.
- The moon is an object that revolves around Earth.
- The Moon shines because it is reflecting sunlight.
- The Moon appears to grow and shrink in the sky based on how much reflected sunlight we can see.
- Because the Sun is so close, its brightness keeps us from seeing other stars during the day.
- Seasons are caused by the Earth’s tilt.
- The Sun appears to be higher in the sky during the summer and lower in the winter due to Earth’s tilt and revolution around the sun.

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

- Make observations (firsthand or from media) to collect data that can be used to make comparisons. (1-ESS1-2)
- Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (1-ESS1-1)

## Prior Learning

This is the first opportunity for students to encounter these ideas.

## Future Learning

**Grade 3**

- Each force acts on one particular object and has both strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object’s speed or direction of motion. [Note: The emphasis is qualitative and conceptual understanding of forces. Quantitative understanding is at a later grade level.]
- The patterns of an object’s motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it. [Note: Technical terms, such as magnitude, velocity, momentum, and vector quantity, are not introduced at this level, but the concept that some quantities need both size and direction to be described is developed.]

**Grade 5**

- The gravitational force of Earth acting on an object near Earth’s surface pulls that object toward the planet’s center.
- The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the sun, moon, and stars at different times of the day, month, and year.

## 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:
(The Perfect Play Area Design Challenge) In this investigation, students will develop a play area appropriate for a given season that enables them to play outside safely while enjoying all the phenomena the sky has to offer.

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

Suggested Hands-On Activities / Classroom Inquiries:
Night and Day, Near and Far, Energy From the Sun, Compass Rose Lab, The Shining Moon, Moon Phases, Moon Patterns, Star Patterns, Weather Walk, Seasons Activity, Earth’s Tilt 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.
● This unit may require perishable food items not included in the supply order.

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<tr>
<th>Experience</th>
<th>Objective/Desired Outcome</th>
<th>Classwork Resources</th>
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| 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 | -KWHLAQ: Organizer  
-KWHLAQ: Google Slides  
-Science Questioning Graphic Organizer  
-QFT: Formulating effective questions  
-Ideas For Phenomena To Question: NGSS Phenomena #ProjectPhenomena |
| 1 | Compare/Contrast day and night. Identify what kinds of objects can be seen in the sky during the day or at night. | -DE Song: Sky  
-DE Reading Passage: Day and Night  
-DE Video: Day and Night  
-DE Hands-on Activity: Night and Day  
-Mystery Science: Shadow Activity |
| 2 | Objects in space vary in size based on their distance from Earth. | -DE Hands-on Activity: Near and Far*  
*Use balls from Balls and Ramps Kit  
-DE Reading Passage: Up in the Sky |
| 3 | The sun is the closest star to Earth and provides light, warmth, and energy. | -Google Slides Unit Presentation  
-CTL Activity: Energy from the Sun |
| 4 | Use the terms sunrise and sunset to describe the pattern that the sun follows across the sky. | -Google Slides Unit Presentation  
-CTL Activity: Compass Rose Lab |
| 5 | Understand that the sun is stationary and the terms rotate and revolve describe the motion of the Earth. | -DE Video: The Sun and Earth  
-Google Slides Unit Presentation |
| 6 | Develop an understanding of objects in the sky and their relationships (The moon is an object in the night sky that revolves around the Earth.). | -Google Slides Unit Presentation  
-Defined STEM: Astronomer  
-Defined STEM: Constructed Response: Astronomy |
| 7 | The moon reflects light from the sun and follows a pattern of phases. | -NJCTL Activity: The Shining Moon  
-Google Slides Unit Presentation  
-DE Moon and Earth  
-NJCTL Activity: Moon Phases  
-DE Hands-On Activity: Moon Patterns |
| 8 | Understand the relationship between the sun and the stars in the sky. | -DE Reading Passage: The Stars  
-DE Video: Objects in the Sky  
-Google Slides Unit Presentation  
-DE Hands-On Activity: Star Patterns |
| 9 | There are four seasons that occur in the same order each year. | -DE Video: Weather Start: Weather and Seasons  
-DE Activity: Weather Walk  
-DE Reading Passage: Your Favorite Season  
-DE Reading Passage: Weather and Seasons  
-Google Slides Unit Presentation  
-NJCTL Activity: Seasons Activity |
| 10 | Understand the effects of Earth’s tilt on seasons and weather. | -DE The Tilt of Earth’s Axis  
-NJCTL Activity: Earth’s Tilt Activity |
### Additional Classroom Resources

**The Dynamic Trio**: In this lesson, students will learn about the stars, planets, and moons found in our solar system and how they relate to one another. The video segment enhances the learning. After a nonfiction read aloud, students work in groups to create models of the Solar System.

**Our Super Star**: This is a three part lesson where students use observations, activities, and videos to learn basic facts about the Sun. Students also model the mechanics of day and night and use solar energy to make a tasty treat. One of the videos is a time-lapse video of a sunrise and a sunset.

**Keep 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.

**Patterns of Daylight**: This is a mini-unit that can be taught directly after Space Part 1 or independently. The author chose to teach the Space Part 1 unit (also available on Better Lesson! at [http://betterlesson.com/lesson/613469/introduction-and-pre-assessment](http://betterlesson.com/lesson/613469/introduction-and-pre-assessment)) during January, and follows up at the end of the year in a recap in May. This lesson uses prior student knowledge and a video simulation.

**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.

### Teacher Professional Learning Resources

#### Teaching NGSS in Elementary School—First Grade

The presenters were Carla Zembal-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. After a brief overview of this NGSS for First Grade web seminar, Mary discussed the science and engineering practices in relation to teaching first grade. The web seminar focused on the concept of sound, and how performance expectations should be incorporated into teaching. Sound was further considered as a disciplinary core idea within first grade teaching. Participants viewed a video of a teacher supporting students in developing towards the performance expectations. The science and engineering practices of explanation and argument was considered within the lesson presented. Claim, evidence, reasoning and rebuttal were discussed, and a CER framework was shared. Carla introduced the KLEWS chart and discussed its use in an elementary classroom. Kathy shared the importance of classroom discourse and science talk. The web seminar closed with the sharing of resources in relation to the NGSS and teaching K-5 grades. Ted, in closing, shared NSTA resources in relation to the NGSS.

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.

**NGSS Core Ideas: Earth’s Place in the Universe**

The presenter was Julia Plummer from Penn State University. The program featured strategies for teaching about Earth science concepts that answer questions such as "What goes on in stars?" and "What patterns are caused by Earth's movements in the solar system?"

Dr. Plummer began the presentation by discussing what students should know about the disciplinary core idea of Earth's Place in the Universe. She talked about using the scientific and engineering practices to help engage students. Participants shared their ideas about applying this core idea to the classroom, and then Dr. Plummer shared strategies for effective instruction. She also discussed the importance of spatial thinking for students to begin thinking scientifically about these concepts.

**Bozeman Science**

## TransDisciplinary Unit: Waves and their Applications in Technologies for Information Transfer

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<tr>
<td>Domain:</td>
<td>Physical Science</td>
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<tr>
<td>Suggested Pacing</td>
<td>Marking Period 2</td>
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### NJSSS - Science Performance Expectations:

- **1-PS4: Waves and Their Applications in Technologies for Information Transfer**
  - Plan and conduct investigations to provide evidence that vibrating material can make sound and that sound can make materials vibrate. (1-PS4-1)
  - Make observations to construct an evidence-based account that objects can be seen only when illuminated. (1-PS4-2)
  - Plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light. (1-PS4-3)
  - Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance. (1-PS4-4)

- **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)
  - 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)

### NJSSS - Science Disciplinary Core Ideas:

- **PS4.A: Wave Properties**
  - Sound can make matter vibrate, and vibrating matter can make sound. (1-PS4-1)

- **PS4.B: Electromagnetic Radiation**
  - Objects can be seen if light is available to illuminate them or if they give off their own light. (1-PS4-2)
  - Some materials allow light to pass through them, others allow only some light through, and others block all light and create a dark shadow on any surface beyond them, where the light cannot reach. Mirrors can be used to redirect a light beam. (1-PS4-3)

- **PS4.C: Information Technologies and Instrumentation**
  - People also use a variety of devices to communicate (send and receive information) over long distances. (1-PS4-4)

- **ETS1.A: Defining and Delimiting Engineering Problems**
  - A situation that people want to change or create can be approached as a problem to be solved through engineering. (K-2-ETS1-1)

- **ETS1.B: Developing Possible Solutions**
  - Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem’s solutions to other people. (K-2-ETS1-2)

- **ETS1.C: Optimizing the Design Solution**
  - Because there is always more than one possible solution to a problem, it is useful to compare and test designs. (K-2-ETS1-3)
### NJSLS - Science CrossCutting Concepts:

- **Patterns:**
  - Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (1-LS1-2), (1-LS3-1)
- **Cause and Effect:**
  - Simple tests can be designed to gather evidence to support or refute student ideas about causes. (1-PS4-1), (1-PS4-2), (1-PS-3)
- **Influence of Engineering, Technology, and Science, on Society and the Natural World:**
  - People depend on various technologies in their lives; human life would be very different without technology. (1-PS4-4)

### NJSLS - Technology:

- **8.1 Educational Technology**
  - Identify the basic features of a digital device and explain its purpose. (8.1.2.A.1)
  - Engage in a variety of developmentally appropriate learning activities with students in other classes, schools, or countries using various media formats such as online collaborative tools, and social media. (8.1.2.C.1)
- **8.2 Technology Education, Engineering, Design and Computational Thinking - Programming**
  - Investigate a product that has stopped working and brainstorm ideas to correct the problem. (8.2.2.C.6)
  - Discover how a product works by taking it apart, sketching how parts fit, and putting it back together. (8.2.2.D.2)
  - Identify the strengths and weaknesses in a product or system. (8.2.2.D.3)
  - Identify the resources needed to create technological products or systems. (8.2.2.D.4)
  - Identify how using a tool (such as a bucket or wagon) aids in reducing work. (8.2.2.D.5)
  - Demonstrate an understanding of how a computer takes input through a series of written commands and then interprets and displays information as output. (8.2.2.E.2)
  - Create algorithms (a sets of instructions) using a pre-defined set of commands (e.g., to move a student or a character through a maze). (8.2.2.E.3)
  - Use appropriate terms in conversation (e.g., basic vocabulary words: input, output, the operating system, debug, and algorithm). (8.2.2.E.5)

### Overarching Local/Global Problem:

How can we use light, sound, and technology to solve problems?

### Essential Questions

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

- How do light and sound allow our senses to work?
- Why do we need light and sound to communicate with others?
- What is technology?
- How do people develop new technologies and improve old technologies?
- How can technology make life better for people?
### Enduring Understandings & Practices

**By the end of this unit, students will understand:**
- Vibrations are needed to create sound.
- Sound travels in waves and can produce different kinds of sound.
- Waves produce an up and down pattern.
- Light enables us to use our sense of sight.
- Shadows are areas of darkness behind an object that is illuminated.
- Light travels in a straight line and illuminates, passes through, or reflects off objects.
- Natural sources include the sun while artificial sources include light bulbs and TV.
- Various technologies exist and meet specific needs.
- Technology is used to communicate by sending and receiving information.
- Technologies have both benefits and limitations and is constantly being improved to make our lives better.
- Engineers follow a process to design, build, and improve technology.

**By the end of this unit, students will be able to:**
- Plan and conduct investigations collaboratively to produce data to serve as the basis for evidence to answer a question. (1-PS4-1),(1-PS4-3)
- Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena (1-PS4-2)
- Use tools and materials provided to design a device that solves a specific problem. (1-PS4-4)
- Science investigations begin with a question. (1-PS4-1)
- Scientists use different ways to study the world. (1-PS4-1)
- Define a simple problem that can be solved through the development of new or improved object or tool. (ETS1-1)
- Analyze data from tests of an object or tool to determine if it works as intended. (K-2-ETS1-3)

### Prior Learning

This is the first formal opportunity for students to engage with the Disciplinary Core Ideas.

### Future Learning

**Grade 2:**
- Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem’s solutions to other people.(secondary)
- 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.
- Different properties are suited to different purposes.
- A great variety of objects can be built up from a small set of pieces.

**Grade 4: Transfer of Energy**
- An object can be seen when light reflected from its surface enters the eyes.
- Digitized information can be transmitted over long distances without significant degradation. High-tech devices, such as computers or cellphones, can receive and decode information—convert it from digitized form to voice—and vice versa.
### 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](http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA)).

### Assessment

**End-of-Unit Performance Assessment:**
(Discovery Education: Build a Better System, Student Directions, Teacher Directions) In this investigation, students will work as a team to design and build a raft to transport cargo across a river. After building their initial raft, they will have to continue their work to make improvements on their original design. Then students will have to develop a code using light and sound to navigate their raft across the body of water in the dark without hitting any objects.

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

**Hands-On Activities / Classroom Inquiries:**
Ocean Wave Model, Ruler Sounds, Sound Explorations, Make Your Own Instrument, Light Cave Explorer Activity, Make Light Bounce, & Objects in Light’s Path Lab, Week of Code, Think Like a Computer Activity, Braille Activity, Suspension Bridge, Make a Telephone, Marine Mammal Communication Activity, Sending Messages, Flashlight Morse Code Activity, Underwater Adventure Activity

The following progression supports the development of understandings necessary for the performance expectations. 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>Daily Objective</th>
<th>Classwork</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</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 | Create, explore, and identify various types of sounds. | -Exploration: SW find an object in the classroom that can produce a quiet sound. Repeat with an object that can produce a loud sound. Review sense of hearing if needed.  
-DE Video: Identifying Sounds Without Using our Eyes  
-Lesson/Activity: Spark interest by playing sounds and having children guess origin. Use Session 1 of Making Sounds on TechBook: Use essential questions to create chart of ideas/spark conversation about sound. Waves PreAssessment. |
| 2 | Observe the up and down pattern that waves create. | -Lesson/Activity: Build background of waves through media. Describe visuals.  
-Design Challenge: Provide students with materials similar to bottle activity described in TechBook: Ocean Wave Model |
| 3 | Understand the connection between waves and sound. | -Exploration: Provide various sized rocks for students to drop in a bucket of water and aluminum tray. Challenge them to find the connection between sound and waves.  
-Lesson/Activity: Discuss essential questions.  
-DE Video: How Sound Is Made |
| 4 | Vibrations are required to produce a sound and sound produces vibrations. | -Exploration: Provide materials to students and challenge them to use the materials to create different sounds.  
-Lesson/Activity: Reaffirm findings with video. Introduce meaning of vibration. Model vibrations with tuning fork.  
-DE Video: Why Is Sound Important?  
-Mystery Science: Vibration/Sound  
-Defined STEM: Constructed Response: Vibration |
| 5 | Musical instruments make different sounds from different types of vibrations. | -Exploration: Provide different musical instruments and materials for students to explore to understand sound differences. Center rotation appropriate with iPad apps, objects, and musical instruments.  
-DE: Sessions 2/3 Ruler Sounds and Sound Exploration  
-DE: Ruler Sounds: Investigation Sheet  
-DE: Sound Exploration |
| 6 | Musical instruments make different sounds from different types of vibrations. | -DE Video: Making Your Own Musical Instruments  
-Design Challenge: Present materials to students and have them sketch and label a musical instrument that they would like to create.  
-DE: Make Your Own Instrument  
-Instrument Examples |
| 7 | Different instruments make different sounds. | -**Design Challenge:** Provide materials for students to create their planned instrument. Allow time for students to build, test, and revise their plan.  
-**Defined STEM:** [Drums and Vibrations](#) |
| 8 | We can communicate our ideas through music. | -**Design Challenge:** Group students to work as songwriters using simple (2 beat ti-ti and one beat ta) notes learned from music class. Students test out songs using instruments.  
**Teacher Background on Music Notes** |
| 9 | Different pitches and instruments can work together to create a song. | -**Design Challenge:** Student groups practice, perform, and record songs from the previous day. As an extension, teachers can playback songs and compare and contrast the volume, pitch, and beats. |
| 10 | Light allows our sense of sight to work. | -**Exploration:** SW explore a dark room or box with no light, search for objects, and report what they saw without and with light.  
**Light Cave Explorer Activity**  
-**Lesson/Activity:** Use essential questions to create chart of ideas and spark conversation about light.  
-**DE Video:** [Light](#)  
**Mystery Science:** [Light](#) |
| 11 | Light can be artificial or natural. | -**Exploration:** SW compare/contrast tools that produce light.  
**-Lesson/Activity:** Create list of artificial and natural light sources.  
-**Defined STEM:** [Preparing for Dark: An Illuminating Plan](#) |
| 12 | Light travels in a straight path and mirrors can reflect light. | -**Exploration:** In a dark room, provide flashlights, mirrors, and books. Challenge students to complete activity similar to [Making Light Bounce](#).  
-**Lesson/Activity:** Discuss findings of flashlight experiment and connect to objective. |
| 13 | Observe how objects affect light's path. | -**Exploration:** Use lab to see how objects affect light from a flashlight.  
**Objects in Light's Path Lab**  
-**Lesson/Activity:** Discuss findings and create graphic organizer. |
| 14 | Observe how opaque objects create shadows. | -**Exploration:** Students explore shadows inside the classroom or outside on a sunny day. Compare and contrast shape and size.  
-**Lesson/Activity:** Connect to previous lesson and add to graphic organizer.  
-**DE Video:** [Shade](#) |
| 15 | Understand how we can change the path of light. | -**Design Challenge:** Group students and select a Journeys fictional story for students to reenact in a shadow puppet show. See Shadow Puppet Show design challenge for details. Students will plan characters and props that will be needed for a [Shadow Performance](#). |
| 16 | Understand how we can change the path of light. | -**Design Challenge:** Student groups will construct puppets using opaque, translucent, and transparent materials. Students will test and revise ideas. Students may use knowledge of sounds to add songs/sound effects to their performances. |
| 17 | Understand how we can change the path of light. | -**Design Challenge:** Students will practice, perform, and record their performances. |
| 18 | Technology is equipment that helps us store, get, and send information. | -**DE:** [Background for Teacher](#)  
-**Google Slides Unit Presentation**  
-**NJCTL:** [Think Like a Computer Activity](#) |
<table>
<thead>
<tr>
<th>Page</th>
<th>Activity</th>
<th>Additional Resources</th>
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<tbody>
<tr>
<td>19</td>
<td>We use technology to improve the quality of life and save the Earth's resources.</td>
<td><strong>-NJCTL:</strong> <a href="#">Think Like a Computer Activity PDF</a></td>
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<tr>
<td>20</td>
<td>Sight, hearing, and touch are senses that we use with technology.</td>
<td><strong>-Google Slides Unit Presentation</strong>&lt;br&gt;<strong>-NJCTL:</strong> <a href="#">Braille Activity</a></td>
</tr>
<tr>
<td>21</td>
<td>Engineers study how parts work together and can design new technology.</td>
<td><strong>-DE Reading Passage:</strong> <a href="#">What Do Engineers Do?</a>&lt;br&gt;<strong>-DE Video:</strong> <a href="#">Engineer Jose Rostrepo</a></td>
</tr>
<tr>
<td>22</td>
<td>Engineers use a process where they design, test, revise, and retest their ideas.</td>
<td><strong>-DE Session:</strong> <a href="#">Explain</a>&lt;br&gt;<strong>-DE Hands-On Activity:</strong> <a href="#">Suspension Bridge</a>&lt;br&gt;<strong>-PBS Kids:</strong> <a href="#">How to Sketch</a></td>
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<tr>
<td>23</td>
<td>Sound waves allow technology to work.</td>
<td><strong>-DE Hands-on Activity:</strong> <a href="#">Make a Telephone</a>&lt;br&gt;<strong>-Google Slides Unit Presentation</strong>&lt;br&gt;<strong>-NJCTL:</strong> <a href="#">Marine Mammal Communication Activity</a> (PDF)</td>
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<tr>
<td>24</td>
<td>Radio waves allow technology to work.</td>
<td><strong>-Google Slides Unit Presentation</strong>&lt;br&gt;<strong>-DE Reading Passage:</strong> <a href="#">Communication Tools</a>&lt;br&gt;<strong>-DE Reading Passage:</strong> <a href="#">Cell Phones</a></td>
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<tr>
<td>25</td>
<td>Light waves allow technology to work.</td>
<td><strong>-Google Slides Unit Presentation</strong>&lt;br&gt;<strong>-DE Hands-on Activity:</strong> <a href="#">Sending Messages</a>&lt;br&gt;<strong>-NJCTL:</strong> <a href="#">Flashlight Morse Code Activity</a></td>
</tr>
<tr>
<td>26</td>
<td>Humans create technology to solve problems and seek ways to improve technology.</td>
<td><strong>-DE Session:</strong> <a href="#">Explore Improving Systems</a>&lt;br&gt;<strong>-DE Session:</strong> <a href="#">Elaborate</a> (Note: Do not complete engineering project until performance assessment.)&lt;br&gt;<strong>-NJCTL:</strong> <a href="#">Underwater Adventure Activity</a></td>
</tr>
<tr>
<td>27</td>
<td>Performance Assessment</td>
<td><strong>-Teacher Directions</strong>&lt;br&gt;<strong>-Student Directions</strong>&lt;br&gt;<strong>-Engineering Project: Build a Better System</strong></td>
</tr>
</tbody>
</table>

**Improvement:** Students are given time to revise their projects/solutions and finalize their plans based on the feedback of their peers and teacher(s).

**Additionally:** Individuals or groups modify their designs to incorporate feedback.

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**Additional Classroom Resources**

[TBAISD NGSS Moodle](#): The purpose of this website is to provide K-5 Science teachers with resources, lessons, and activities based on the NGSS which were created by teachers in our region.

**Assessing Light Knowledge - 2 lessons:** In these lessons, the students work as partners planning and designing a communication device that will signal across the gym or hallway from one partner to the other partner. The communication device must only use light and objects that block or change the light.
**Science Grade 1**

<table>
<thead>
<tr>
<th>Teacher Professional Learning Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NSTA Web Seminar: NGSS Core Ideas: Waves and Their Applications in Technologies for Information Transfer</strong>  &lt;br&gt;This web seminar took place on September 24, 2013, from 6:30 p.m. to 8:00 p.m. eastern daylight time. The presenter was Ramon Lopez from the University of Texas at Arlington. The program featured strategies for teaching about physical science concepts that answer questions such as “How are waves used to transfer energy and information?” and “How are instruments that transmit and detect waves used to extend human senses?”</td>
</tr>
<tr>
<td><strong>Science Shorts: Making Waves</strong>  &lt;br&gt;Children do not have to live near the coast to experience effects of water waves. They can throw stones into a pond and see the waves ripple outward, bob up and down while floating in a swimming pool, and splash water about while in a bathtub. As students discover how waves form and move, they can apply this understanding to other types of waves such as sound waves, light waves, and microwaves. (Adams, B., 2007)</td>
</tr>
<tr>
<td><strong>NSTA Web Seminar: Teaching NGSS in K-5: Constructing Explanations from Evidence</strong>  &lt;br&gt;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.</td>
</tr>
<tr>
<td><strong>Assessment for the Next Generation Science Standards</strong>  &lt;br&gt;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 <a href="#">collection</a>.</td>
</tr>
<tr>
<td><strong>NGSS Crosscutting Concepts: Patterns</strong>  &lt;br&gt;The presenter was Kristin Gunckel from the University of Arizona. This was the first seminar in a series of seven focused on the crosscutting concepts that are part of the Next Generation Science Standards (NGSS).</td>
</tr>
<tr>
<td><strong>NGSS Crosscutting Concepts: Structure and Function</strong>  &lt;br&gt;The presenters were Cindy Hmelo-Silver and Rebecca Jordan from Rutgers University. This was the sixth web seminar in a series of seven focused on the crosscutting concepts that are part of the Next Generation Science Standards (NGSS).</td>
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</tbody>
</table>
## UNIT 3

### Plant & Animal Structures, and Information Processing

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<tr>
<th>Grade:</th>
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<tbody>
<tr>
<td>Domain:</td>
<td>Life Science</td>
</tr>
<tr>
<td>Suggested Pacing:</td>
<td></td>
</tr>
<tr>
<td>Marking Period 3</td>
<td></td>
</tr>
<tr>
<td>Discovery TechBook Unit:</td>
<td>Animals and Plants</td>
</tr>
</tbody>
</table>

#### NJSLS - Science Performance Expectations:

- **1-LS1**: From Molecules to Organisms: Structures and Processes
  - Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs. (1-LS1-1)
- **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)

#### NJSLS - Science Disciplinary Core Ideas:

- **LS1.A**: Structure and Function
  - All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water and air. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow. (1-LS1-1)
- **LS.1.D**: Information Processing
  - Animals have body parts that capture and convey different kinds of information needed for growth and survival. Animals respond to these inputs with behaviors that help them survive. Plants also respond to some external inputs. (1-LS1-1)

#### NJSLS - Science CrossCutting Concepts:

- **Patterns**: Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (1-ESS1-1), (1-ESS1-2)
- **Structure and Function**: The shape and stability of structures of natural and designed objects are related to their function(s). (1-LS1-1)
- **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 by built using materials derived from the natural world. (1-LS1-1)

#### 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.**

- What is structure and function?
- How do animals use external structures to survive?
- How do plants use external structures to survive?
- How do plants and animals respond to their environments?

### Enduring Understandings & Practices

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

<table>
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<th>Future Learning</th>
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</table>
| ● Asking questions, making observations, and gathering information are helpful in thinking about problems. | ● Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. 
● Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal’s brain. Animals are able to use their perceptions and memories to guide their actions. |

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

<table>
<thead>
<tr>
<th>Prior Learning</th>
<th>Effective Implementation Strategies</th>
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</table>
| ● Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena. (1-LS3-1) 
● Use materials to design a device that solves a specific problem or a solution to a specific problem. (1-LS1-1) 
● Read grade-appropriate texts and use media to obtain scientific information to determine patterns in the natural world. (1-LS1-2) 
● Scientists look for patterns and order when making observations about the world. (1-LS1-2) | ● 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). |
Science Grade 1

- 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#VXmoXcID_UA).

Assessment

End-of-Unit Performance Assessment:
(Design a Solution) In this investigation, students will think about a problem they would like to solve, an animal that has already solved it, and design a solution to the problem by mimicking that animal.

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

Suggested Hands-On Activities / Classroom Inquiries:
Structure and Function Lab, Build a Monster, Why Are Flowers Colorful?, Walking Field Trip, Plant Response Demo, Design Clothing, Safe Solutions

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.
- This unit may require perishable food items not included in the supply order.

<table>
<thead>
<tr>
<th>Experience</th>
<th>Objective/Desired Outcome</th>
<th>Classwork Resources</th>
</tr>
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<tbody>
<tr>
<td>Student Questioning Opportunity</td>
<td>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.</td>
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</tr>
<tr>
<td>1</td>
<td>What is Structure?</td>
<td>-DE: Teacher Background&lt;br&gt;-Google Slides Unit Presentation</td>
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<tr>
<td></td>
<td>What is Function?</td>
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<tr>
<td></td>
<td>Identify Physical Characteristics of different organisms</td>
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<tr>
<td></td>
<td>Explore why different organisms have different physical characteristics</td>
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<tr>
<td></td>
<td>What is an external structure?</td>
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</tr>
<tr>
<td></td>
<td>Animals can see, hear, and grasp to help them survive.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Animals can move, protect themselves, and eat to survive.</td>
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<tr>
<td></td>
<td>Structures work together to help animals survive and adapt to their environment.</td>
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<tr>
<td></td>
<td>External structures of a plant.</td>
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<tr>
<td></td>
<td>Each structure of a plant has a function to help it survive.</td>
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<tr>
<td></td>
<td>How do plants get food?</td>
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<tr>
<td></td>
<td>Animal senses gather information to create a response to their environment.</td>
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</tr>
<tr>
<td></td>
<td>Plant senses gather information to create a response to their environment.</td>
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<tr>
<td></td>
<td>Humans mimic animals</td>
<td></td>
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</tbody>
</table>

- **Google Slides Unit Presentation**
- **NJCTL: **
- **Activity: **
- **Defined STEM: **
- **DE Video:**
- **DE Interactive Glossary:**
- **DE Session:**
- **Mystery Science:**
### Science Grade 1

<table>
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<th>Performance Assessment</th>
<th>-Design a Solution -Google Slides Unit Presentation</th>
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<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>
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</table>

### Additional Classroom Resources

**Eat Like a Bird! January**: This lesson and activity is one of several lessons about birds. In this lesson, students learn that bird beaks come in many different sizes and shape. Each beak has a specific shape and function to help the bird to get and eat food.

**Why So Yummy**: In this lesson students will investigate how fruits help some plants survive. The background information is important to the overall goals of this lesson. It states, "fruit-bearing plants can be distinguished from other plants, because they contain a reproductive structure that develops into an edible fruit. This reproductive structure is the shelter that protects the seeds until they are mature. This is important, because seeds are not distributed to the earth for germination until they are ripe." The teacher will need to purchase some fruits ahead of time for this lesson. Identifying a variety of fruits and especially fruits children might have less experience with will enhance the experience.

### 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 Sneider, 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: From Molecules to Organisms: Structures and Processes**
The presenters were Aaron Rogat of Educational Testing Service (ETS) and Barbara Hug of the University of Illinois at Urbana-Champaign. The program featured strategies for teaching about life science concepts that answer questions such as "How do the structures of organisms enable life’s functions?" and "How do organisms grow and develop?" Dr. Hug began the presentation by discussing the arrangement of life science core ideas within NGSS and comparing them to previous standards. Next, Dr. Rogat shared an example of a learning progression, showing how a concept can be taught from early elementary through high school. The presenters then talked about strategies for instruction and shared links to resources. Participants had the opportunity to submit their questions and comments in the chat.

**Bozeman Science**
**Chicks will be delivered to all elementary schools following Spring Break in April**

**Plant seeds should be planted early in unit so there will be plenty of time for growth**

| NJSLs - Science Performance Expectations: |  
|------------------------------------------|------------------------------------------|
| **1-LS1:** From Molecules to Organisms: Structures and Processes | ○ Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive. (1-LS1-2) |
| **1-LS3:** Heredity: Inheritance and Variation of Traits | ○ Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents. (1-LS3-1) |
| **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) |

| NJSLs - Science Disciplinary Core Ideas: |  
|------------------------------------------|------------------------------------------|
| **LS1.B:** Growth and Development of Organisms | ○ Adult plants and animals can have young. In many kinds of animals, parents and the offspring themselves engage in behaviors that help the offspring to survive. (1-LS1-2) |
| **LS3.A:** Inheritance of Traits | ○ Young animals are very much, but not exactly, like their parents. (1-LS3-1) |
| **LS3.B:** Variation of Traits | ○ Individuals of the same kind of plant or animal are recognizable as similar but can also vary in many ways. (1-LS3-1) |

| NJSLs - Science CrossCutting Concepts: |  
|------------------------------------------|------------------------------------------|
| **Patterns:** | ○ Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (1-LS1-2), (1-LS3-1) |
| **Structure and Function:** | ○ The shape and stability of structures of natural and designed objects are related to their functions(s). (1-LS1-1) |

| NJSLs - Technology: |  
|------------------------------------------|------------------------------------------|
| **8.1 Educational Technology** | ○ Develop an understanding of ownership of print and nonprint information. (8.1.2.D.1) |
### 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 are life cycles similar or different for different animals?
- How do life cycles of plants and animals differ?
- How do parents help their young survive?
- What are some similarities and differences between parents and offspring?
- Why do the traits of animals and plants vary within a species?

### Enduring Understandings & Practices

<table>
<thead>
<tr>
<th>By the end of this unit, students will understand:</th>
<th>By the end of this unit, students will be able to:</th>
</tr>
</thead>
<tbody>
<tr>
<td>● The life cycles of plants and animals.</td>
<td>● Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena. (1-LS3-1)</td>
</tr>
<tr>
<td>● Differences between direct development and metamorphosis.</td>
<td>● Read grade appropriate texts and use media to obtain scientific information to determine patterns in the natural world. (1-LS1-2)</td>
</tr>
<tr>
<td>● The composition of both a seed and an egg.</td>
<td>● Look for patterns and order when making observations about the world. (1-LS1-2)</td>
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<tr>
<td>● Plants and animals have various and distinct needs for survival.</td>
<td></td>
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<tr>
<td>● Parents care for their offspring to help them survive.</td>
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<tr>
<td>● Living things have similarities and differences.</td>
<td></td>
</tr>
<tr>
<td>● Offspring and seedlings have both similarities to and differences from their parents.</td>
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</tr>
<tr>
<td>● All living things are unique and have variation.</td>
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<tr>
<td>● Variation allows for survival.</td>
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</table>

### Prior Learning

This is the first formal opportunity for students to engage with the Disciplinary Core Ideas.

### Future Learning

**Grade 3**

- Being part of a group helps animals obtain food, defend themselves, and cope with changes. Groups may serve different functions and vary dramatically in size

**Grade 4**

- Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.
- Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions.

### 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: (Create and Sustain a Species) In this investigation, students will select two plants and animals that they would like to use to create a new species that could be helpful or desirable to humans or nature. They will research and identify beneficial traits of the parents and the new offspring. Finally, they will create a habitat that will enable the new species to survive.

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

Suggested Hands-On Activities / Classroom Inquiries:
Chicks, Dandelions, Germination Lab, Seed Lab, Egg Membrane Lab, How Strong is an Egg Lab, Baby Robins Activity, Mixed Seeds Mystery, Matching Families, Comparing Carrots Lab

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.
● This unit may require perishable food items not included in the supply order.

<table>
<thead>
<tr>
<th>Experience</th>
<th>Objective/Desired Outcome</th>
<th>Classwork Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student Questioning</td>
<td>To spark curiosity and amplify engagement, students should formulate their own questions</td>
<td>-KWHLAQ: Organizer&lt;br&gt;-KWHLAQ: Google Slides&lt;br&gt;-Science Questioning Graphic Organizer&lt;br&gt;-QFT: Formulating effective questions&lt;br&gt;-Ideas For Phenomena To Question: NGSS Phenomena #ProjectPhenomena</td>
</tr>
<tr>
<td>Questioning Opportunity</td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>All living things grow.</td>
<td>-Google Slides Unit Presentation&lt;br&gt;-DE: Teacher Background&lt;br&gt;-DE Video: Animal Life Cycles&lt;br&gt;-DE: Hands-On Activity Life Cycle Order&lt;br&gt;-NJCTL Classwork: Living Things Reproduce Classwork/Homework</td>
</tr>
</tbody>
</table>
### Science Grade 1

<table>
<thead>
<tr>
<th>Page</th>
<th>Activity</th>
<th>Content</th>
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</table>
| 2    | Many animals develop inside eggs. | Flower seeds should be planted in advance. Please note germination time and plan appropriately.  
- Defined STEM: Constructed Response: Environment (to review and understand environment)  
- Google Slides Unit Presentation  
- DE Video: Nesting, Egg Laying, Incubating, and Hatching  
- NJCTL Classwork: Animal Offspring Classwork  
- NJCTL Lab: Egg Membrane Lab |
| 3    | Chicks develop inside eggs. | - Videos: Hatching Chicks and Chick Embryo Development  
- Start Life Cycle Journal (Refer to Quiver Farm manual)  
- Chick/Egg Journal Teacher’s Instructions |
| 4    | Chicks grow into hens and roosters. | - Continue Life Cycle Journal.  
- DE interactive: Animal Life Cycles |
| 5    | Mammals are animals that do not lay eggs. | - Google Slides Unit Presentation  
- DE: Mammals Song  
- DE Videos: Mammals, Mammals Give Birth to Their Young  
- Journeys (2012): Connect to Lesson 15, Animal Groups |
| 6    | Traits are characteristics or qualities that identify living things | - Google Slides Unit Presentation |
| 7    | Animals have many similar traits. | - Google Slides Unit Presentation  
- NJCTL: Similarities Classwork/Homework |
| 8    | Animals can have different traits. | - Google Slides Unit Presentation  
- DE: Explore (see Compare and Contrast Round Robin) (Found in Session 6)  
- NJCTL: Differences Classwork/Homework |
| 9    | Offspring have similar traits as their parents. | - Google Slides Unit Presentation  
- DE Video: Investigating Heredity  
- DE: Baby Birds Reading Passage  
- NJCTL: Parent/Offspring Similarities Classwork/Homework  
- Journeys (2012): Connect to Lesson 22, Amazing Animals |
| 10   | When an animal changes into something completely new it is called metamorphosis. | - Google Slides Unit Presentation  
- Supplemental: Mr. R’s Metamorphosis Song  
- Journeys (2012): Connect to Lesson 24, A Butterfly Grows |
| 11   | Offspring can have different traits from their parents. | - Google Slides Unit Presentation  
- DE: Amphibians Video  
- NJCTL: Parent/Offspring Differences Classwork |
| 12   | Animals do many things to help their offspring survive. | - Google Slides Unit Presentation  
- 7 Surprising Ways Animals Care for Their Young  
- NJCTL: How Strong is an Egg? Lab  
- DE Video: Egg Strength |
<table>
<thead>
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<th>Resources</th>
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</table>
| 13   | Some parents take care of their young and others do not. | -Google Slides Unit Presentation  
-**NJCTL:** Baby Robins Activity  
-**PBS:** Orangutan Mom Helps Baby Swing Through Tree Tops  
-**NJCTL:** Animal Offspring Homework |
| 14   | A plant’s life cycle starts as a seed and continues to an adult. | -Google Slides Unit Presentation  
-**DE Videos:** Life Cycles, Plant Life Cycles  
-Start **Flower Observation Journal**  
-**DE Reading Passage:** Getting to Know: Plant Life Cycles  
-**DE Video:** Plant Life Cycle: Beans  
-**DE:** Explore More Resources |
| 15   | All seeds have three important parts: seed coat, embryo, and food. | -Google Slides Unit Presentation  
-**NJCTL:** Seed Lab  
-**NJCTL:** Plant Offspring Classwork |
| 16   | Plants need sunshine, space, air, soil, and water to grow. | -Sci Show Kids Video: How Does a Seed Become a Plant?  
-**NJCTL:** Germination Lab  
-**DE Parent Letter:** Plant Life Cycles |
| 17   | Plants have many similar traits. | -Google Slides Unit Presentation  
-**Hands-on Activity:** Mixed Seeds Mystery  
*please provide only 1 type of plant per student, 4 different species of plants will be grown throughout the class (divide plant variety evenly based on class size)* |
| 18   | Plants can have different traits. | -**DE:** Session Four  
-**DE:** Being Alive Fundamental |
| 19   | Seedlings have similar traits as their parents. | -Google Slides Unit Presentation  
-**DE:** Matching Families |
| 20   | Seedlings can be different from their parents. | -Google Slides Unit Presentation  
-**DE:** Flowers Grow and Change Reading Passage  
-**NJCTL:** Parent Offspring Differences Homework |
| 21   | Plants can help their young survive. | -Google Slides Unit Presentation  
-**NJCTL:** Parent Offspring Homework  
-**Defined STEM:** Animal Adaptations |
| 22   | Variations are differences in one specific trait. | -Google Slides Unit Presentation  
-**DE:** From Small to Big Reading Passage |
| 23   | Variations help living things survive and reproduce. | -Google Slides Unit Presentation  
-**NJCTL:** Comparing Carrots Lab  
-**NJCTL:** Inheritance of Traits Assessment  
-**DE:** Parent Letter  
-**NJCTL:** Variation is Important Classwork & Homework |
| 24   | Complete and Share Performance Assessment | -PBA: Create and Sustain a Species  
-Website: Switch Zoo |
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

**Chip Off the Old Block:** In this lesson students compare adult plants with young plants and then match pictures of adult animals with their young. They then are asked to identify specific physical traits of plants and animals that can be used to identify them. Note: The Parent/Offspring photo collection on page three incorrectly states the offspring of a horse is a pony.

**Eat Like a Bird! January:** This lesson and activity is one of several lessons about birds. In this lesson, students learn that bird beaks come in many different sizes and shape. Each beak has a specific shape and function to help the bird to get and eat food.

**Why So Yummy?** In this lesson students will investigate how fruits help some plants survive. The background information is important to the overall goals of this lesson. It states, "fruit-bearing plants can be distinguished from other plants, because they contain a reproductive structure that develops into an edible fruit. This reproductive structure is the shelter that protects the seeds until they are mature. This is important, because seeds are not distributed to the earth for germination until they are ripe." The teacher will need to purchase some fruits ahead of time for this lesson. Identifying a variety of fruits and especially fruits children might have less experience with will enhance the experience.

### Teacher Professional Learning Resources

**Using the NGSS Practices in the Elementary Grades**

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

**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.

**NGSS Core Ideas: Heredity: Inheritance and Variation of Traits**

The presenter was Ravit Golan Duncan of Rutgers University. The program featured strategies for teaching about life science concepts that answer questions such as "How are the characteristics of one generation related to the previous generation?" and "Why do individuals of the same species vary in how they look, function, and behave?" Dr. Duncan began the presentation by discussing the importance of heredity as a disciplinary core idea. She then described how student learning should progress across grade levels and showed examples of common preconceptions. Dr. Duncan also shared strategies and resources for teaching about heredity. Participants had the opportunity to submit their questions and comments in the chat.

Visit the resource [collection](#).

**Bozeman Science**