Grade 1

Science Curriculum

Oradell Public School District

Oradell, NJ

2023

OPS BOE Born on Date: July 2017
Revised on: July 2022
Annual Revision: September 2023

Oradell Public School District

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Board Policy

This revision is aligned with the New Jersey Student Learning Standards for Science, the New Jersey Student Learning Standards for Computer Science and Design Thinking, the New Jersey Student Learning Standards for Career Readiness, Life Literacies, and Key Skills, and includes connections to Social-Emotional Learning Competencies.

Affirmative Action

During the development of this course of study, particular attention was paid to the elimination or exclusion of any materials which might discriminate on the basis of race, color, national origin, ancestry, age, sex, affectional or sexual orientation, gender identity or expression, marital status, familial status, genetic information, mental or physical disabilities, or in educational opportunities. Every effort has been made to uphold both the letter and spirit of Affirmative Action mandates as applied to the content, the texts and the instruction inherent in this course.

Megan Bozios, Superintendent
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The Science curriculum was developed by the Oradell School District and aligned to the

New Jersey Student Learning Standards (NJSLS).

Oradell Public School District

Suggested Pacing Guide for Science

Grade 1

Unit	Approximate Months	Unit	Skills
1	Sept-Nov	Earth & Space Science	Space Systems: Patterns and Cycles
2	Dec-Mar	Life Science	Structure and Function
3	Apr-Jun	Waves	Light and Sound
Appendix A			K-2 Engineering Design Standards

Grade 1 Science Curriculum

Unit 1: Earth and Space Science- Space Systems: Patterns and Cycles

Unit Overview

(*Introduction excerpt from New Jersey Model Curriculum- Grade 1, Science Unit 1, "What it Looks Like in the Classroom"*)

In this unit of study, students observe, describe, and predict some patterns of the movement of objects in the sky. Throughout the unit students look for patterns as they plan and carry out investigations and analyze and interpret data.

In this unit's progression of learning, students develop the understanding that natural events happen today as they happened in the past, and that many events are repeated. In addition, they observe and use patterns in the natural world as evidence and to describe phenomena. First graders ask questions and use observations of the sun, moon, and stars to describe apparent patterns of change in each. These patterns are then used to answer questions and make predictions. Some examples of patterns include:

- The sun and moon appear to rise in one part of the sky, move across the sky, and set.
- The shape of the moon appears to change over a period of time in a predictable pattern.
- Stars, other than our sun, are visible at night but not during the day.

After students observe and document these types of patterns over a period of time, they need opportunities to describe the patterns and to make predictions about the changes that occur in the objects in the sky. It is important that they use observed patterns as evidence to support predictions they might make about the sun, moon, and stars.

In this unit, students also learn that seasonal patterns of sunrise and sunset can be observed, described, and predicted. They relate the amount of daylight to the time of year by making observations at different times of the year. Over time, they collect and use data in order to identify the relationship between the amount of sunlight and the season. First grade students are expected to make relative comparisons of the amount of daylight from one season to the next.

Big Idea/Common Thread:

- Patterns exist within the movement of objects in the sky.

Enduring Understanding:

- Patterns of movement of the sun, moon, and stars as seen from Earth can be observed, described, and predicted.

Essential Questions:

- How can we predict how the objects in the sky (sun, moon, stars) will change over time?
- What is the relationship between the amount of daylight and the time of year?

Assessments

Possible Ongoing Formative Assessments
• Teacher Observation • Student Participation • Wrap It Up! Questions • Various levels of questioning • Teacher Observation • Class Discussions/Partner Talk • Science Notebook activities • Performance Expectation Activities: Investigate; Think Like a Scientist; Think Like an Engineer, STEAM Projects • Teacher Rubrics for Performance Expectations Activities
Summative Assessments
• Earth Science Unit Assessment
Alternative Assessments
• Modified Earth Science Unit Assessment (Less answer choices, highlighted vocabulary, etc.)

Standards (NJSLS) Addressed in this Unit

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) **ESS1.B: Earth and the Solar System** • Seasonal patterns of sunrise and sunset can be observed, described, and predicted. (1-ESS1-2)
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)

Science and Engineering Practices

Planning and Carrying Out Investigations

- Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.
    - Make observations (firsthand or from media) to collect data that can be used to make comparisons. (1-ESS1-2)

Analyzing and Interpreting Data

- Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.
    - Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (1- ESS1-1)

Connections to Nature of Science

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)

Computer Science and Design Thinking

- 8.1.2.DA.1: Collect and present data, including climate change data, in various visual formats
- 8.1.2.DA.3: Identify and describe patterns in data visualizations.
- 8.1.2.DA.4: Make predictions based on data using charts or graphs.

Career Readiness, Life Literacies and Key Skills

CAREER AWARENESS, EXPLORATION, PREPARATION, AND TRAINING

9.2.5.CAP.1 Evaluate personal likes and dislikes and identify careers that might be suited to personal likes.
9.2.5.CAP.2 Identify how you might like to earn an income.
9.2.5.CAP.3 Identify qualifications needed to pursue traditional and non-traditional careers and occupations.
9.2.5.CAP.4 Explain the reasons why some jobs and careers require specific training, skills, and certification (e.g., life guards, child care, medicine, education) and examples of these requirements.

LIFE LITERACY AND KEY SKILLS

9.4.2.CI.1 Demonstrate openness to new ideas and perspectives (e.g., 1.1.2.CR1a, 2.1.2.EH.1, 6.1.2.CivicsCM.2).
9.4.2.CI.2 Demonstrate originality and inventiveness in work (e.g., 1.3A.2CR1a).
9.4.2.CT.1 Gather information about an issue, such as climate change, and collaboratively

brainstorm ways to solve the problem (e.g., K-2-ETS1-1, 6.3.2.GeoGI.2).
9.4.2.CT.2 Identify possible approaches and resources to execute a plan (e.g., 1.2.2.CR1b, 8.2.2.ED.3).
9.4.2.CT.3 Use a variety of types of thinking to solve problems (e.g., inductive, deductive).
9.4.2.DC.7 Describe actions peers can take to positively impact climate change (e.g., 6.3.2.CivicsPD.1).

PRACTICES
CLKSP4 Demonstrate creativity and innovation.
CLKSP5 Utilize critical thinking to make sense of problems and persevere in solving them.
CLKSP6 Model integrity, ethical leadership and effective management.

Interdisciplinary Connections:

ELA
Reading Standards - Informational Text

- **RI.1.1** Ask and answer questions about key details in a text.
- **RI.1.4** Ask and answer questions to help determine or clarify the meaning of words and phrases in a text.
- **RI.1.10** With prompting and support, read informational texts at grade level text complexity or above.

Writing- Literacy in History/SS, Science and Technical Subjects

- **W.1.7** Participate in shared research and writing projects.
- **W.1.8** With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.

Speaking and Listening

- **SL.1.1** Participate in collaborative conversations with diverse partners about *grade 1 topics and texts* with peers and adults in small and larger groups.
    a) Follow agreed-upon norms for discussions (e.g., listening to others with care, speaking one at a time about the topics and texts under discussion).
    b) Build on others' talk in conversations by responding to the comments of others through multiple exchanges.
    c) Ask questions to clear up any confusion about the topics and texts under discussion.
- **SL.1.5** Add drawings or other visual displays to descriptions when appropriate to clarify ideas, thoughts, and feelings.

Mathematics

Mathematical Practices

- **MP.2** Reason abstractly and quantitatively.
- **MP.4** Model with mathematics.
- **MP.5** Use appropriate tools strategically.

Operations and Algebraic Thinking

- **1.OA.A.1** Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using objects, drawings, and equations to represent the problem.

Measurement and Data

- **1.MD.C.4** Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.

Social-Emotional Competencies

- **Self-Awareness**: ability to recognize one's emotions and know one's strengths and limitations
    - Connections:
        - Reflecting on one's learning (Oral, Thumbs Up, Thumbs Down, Pictures, etc.)

- **Self-Management**: ability to regulate and control one's emotions and behaviors, particularly in stressful situations
    - Connections:
        - Visit mindfulness corner/cool down corner in classroom and doing self-soothing activities
        - Playing soft music

- **Social Awareness**: ability to take the perspective of others, demonstrate empathy, acknowledge and appreciate similarities and differences, and understand how one's actions influence and are influenced by others
    - Connections:
        - Students collaborate during hands-on STEAM projects

- **Relationship Skills**: refers to one's ability to demonstrate prosocial skills and behaviors in order to develop meaningful relationships and resolve interpersonal conflicts
    - Connections:
        - Class discussions
        - Incentives for individual students and small groups

- **Responsible Decision-Making**: refers to the ability to use multiple pieces of information to make ethical and responsible decisions
    - Connections:
        - Class rules and routines
        - Class discussions
        - Following directions

UNIT OBJECTIVES

Students will be able to …

- Use observations of the sun, moon, and stars to describe patterns that can be predicted. (1-ESS1-1)

  [*Clarification Statement:* Examples of patterns could include that the sun and moon appear to rise in one part of the sky, move across the sky, and set; and stars other than our sun are visible at night but not during the day.]
  [*Assessment Boundary:* Assessment of star patterns is limited to the knowledge that stars are seen at night and not during the day.]

  Disciplinary Core Ideas
    - Understand that patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted.

  Science and Engineering Practices
    - Use observations to describe patterns in order to answer scientific questions.

  Crosscutting Concepts
    - Recognize that patterns in the natural world can be observed, used to describe phenomena, and used as evidence.

1-ESS1-1

Concepts	Students Can...
• Patterns in the motion of the sun, moon, and stars in the sky can be observed, described, and predicted. • Science assumes that many natural events are repeated. • Patterns in the natural world can be observed, and used to describe events.	• Observe the sun, moon, and stars to describe patterns. Examples of patterns could include: ○ The sun and moon appear to rise in one part of the sky, move across the sky, and set. ○ Stars other than our sun are visible at night but not during the day. • Describe patterns in the natural world in order to answer scientific questions.

	● Observe patterns in the natural world

Students will be able to …

- Make observations at different times of year to relate the amount of daylight to the time of year. (1-ESS1-2)

  [*Clarification Statement*: Emphasis is on relative comparisons of the amount of daylight in the winter to the amount in the spring or fall.]
  [*Assessment Boundary*: Assessment is limited to relative amounts of daylight, not quantifying the hours or time of daylight.]

  Disciplinary Core Ideas
    - Understand that seasonal patterns of sunrise and sunset can be observed, described, and predicted.

  Science and Engineering Practices
    - Make observations (firsthand or from media) to collect data that can be used to make comparisons.

  Crosscutting Concepts
    - Recognize that patterns in the natural world can be observed, used to describe phenomena, and used as evidence.

1-ESS1-2

Concepts	Students Can...
● Seasonal patterns of sunrise and sunset can be observed, described, and predicted. ● Making observations helps to collect data that can be used to make comparisons. ● Patterns in the natural world can be observed	● Observe patterns of sunrise and sunset at different times of the year. ● Make comparisons using their data. ● Recognize that patterns in sunrise and sunset exist.

SUGGESTED ACTIVITIES

- Students observe, describe, plot and predict some patterns of sunrise/sunset.
    - Sunrise Sunset: 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.

- Students observe, describe, plot and predict some patterns of daylight.
  - Patterns in the sky
  - Size of Earth, Sun, Moon activity: http://betterlesson.com/lesson/613469/introduction-and-pre-assessment This lesson uses prior student knowledge and a video simulation.
  - Bring the students to a human or traditional sundial, where they can observe that shadows point in different directions as the day progresses.

- Students observe, describe, plot and predict some patterns of the moon in regards to shape and movement across the sky.
  - 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.
  - The Moon

- Students observe, describe, plot and predict some patterns of star visibility (daytime vs. night).
  - Students can track the visibility of stars on a T-chart, labeled ‘Day’ vs. ‘Night’
  - Students can draw an image of the sky at night vs. the sky during the day. (What objects in the sky are visible during the day vs. night?)
  - Students can predict star visibility at night, based on the day’s weather.
  - Take the students into the Starlab and point out that stars can be seen at night, not during the day.
  - Starlab allows for the students to visualize star patterns.

Unit Specific Vocabulary
cycle- a series of repeated events **moon-** the natural satellite of the earth **pattern-** something that repeats over and over again

phase- a period of time in a process of change
season- each of the four divisions of the year (spring, summer, autumn, and winter) marked by particular weather patterns and daylight hours, resulting from the earth's changing position with regard to the sun
star- an object in the sky that gives off light and heat
sun- the star which the Earth goes around
sunrise- the time in the morning in which the sun appears
sunset- the time in the evening in which the sun disappears

Instructional Materials and Learning Activities

Core Instructional Materials:

- *National Geographic* Exploring Science
- *National Geographic* My NG connect Exploring Science 1 Digital Resources
- *National Geographic* Exploring Science through Literacy Teacher's Guide
- *Hand2Mind* Exploring Science Hands on Kit
- Science Tech Book
- Supplies: As per lab manuals
- Trade books:
  - Next Time You See a Sunset, a nonfiction picture book, by Emily Morgan
  - Next TIme You See The Moon by Emily Morgan
  - Armadillo Ray by John Beifuss

Digital Resources:

- http://sciencespot.net/Pages/refdeskNextGen.html - lesson ideas
- https://www.generationgenius.com/

Leveled Readers:

- Day and Night at the Festival of Colors-Level G
- Day and Night During Chinese New Year-Level H
- Day and Night on Cinco de Mayo-Level E
- The Sun Shines-Level D
- What Do You See in the Moon?-Level E

Suggested Modifications

These strategies can be adapted to scaffold for students needing more support or extending the learning for higher level students. Differentiation is accomplished through content, process, product, and learning environment.

NGSS Appendix D - "All Standards, All Students": Making the Next Generation Science Standards Accessible to All Students

Special Education Students
● Have students make a simple drawing of a house, grass, and sky. Show them how to add the arch-shaped path of the sun. Ask them to draw the sun where it appears in the morning. Then have them label the drawing *Morning*. Have students repeat this activity to represent the sun's position at noon and late in the day. ● Help students complete sentence stems that describe how visible the moon is at night and during the day. Provide these stems: *It is harder to see the moon . . . It is easier to see the moon . .* ● Give small groups four cards, each labeled with a season, and different lengths of yellow paper to represent the average hours of daylight in each of the four seasons, as shown on the sample chart on page 136. Have students put the labels in order and match each length of paper to a label. Ask questions such as, Which season has the fewest hours of daylight? ● Earth science word banks for assessments and certain activities ● Preview content vocabulary ● Hands on materials ● Extended time for assignments ● Prompting ● Reassurance and time to formulate ideas ● Visual clues (pictures) ● Preferential seating ● Repeated directions ● Check for understanding ● Ask explicit questions ● Instructional aides in classroom setting ● Peer models ● Social Stories for science routines ● Use of FM system to improve attention and support auditory information ● Behavior chart to increase focus and work completion ● Sensory breaks with timers ● Partner/buddy system
Students at Risk
● Have students make a simple drawing of a house, grass, and sky. Show them how to add the arch-shaped path of the sun. Ask them to draw the sun where it appears in the morning. Then have them label the drawing *Morning*. Have students repeat this activity to represent the sun's position at noon and late in the day. ● Help students complete sentence stems that describe how visible the moon is at night and during the day. Provide these stems: *It is harder to see the moon . . . It is easier to see the moon . .* ● Give small groups four cards, each labeled with a season, and different lengths of yellow paper to

represent the average hours of daylight in each of the four seasons, as shown on the sample chart on page 136. Have students put the labels in order and match each length of paper to a label. Ask questions such as, Which season has the fewest hours of daylight?
- Have students make a model of the Little Dipper on card stock and anchor it to another sheet of card stock with a brass fastener through the North Star. Have students move the Little Dipper model clockwise in an arc. Discuss which stars appeared to move and which stars did not appear to move.
- Preview earth science vocabulary
- Response to intervention - targeted skill/goal improvement plans within a set time frame
- Hands on materials
- Sound chips
- Multisensory manipulatives
- Color coding word tracking
- Preferential seating
- Behavior chart to increase focus and work completion
- Sensory breaks with timers
- Small group instruction

English Language Learners

- Ask yes/no questions, such as: Can you sometimes see the moon in the night sky? (Yes.) Can you sometimes see the moon in the daytime sky? (Yes.) Provide sentence frames, such as: *Sometimes you can see the moon against the dark sky at (night). Sometimes you can see the moon during the (day).* Help students complete sentence stems that describe how visible the moon is at night and during the day. Provide these stems: *It is harder to see the moon . . . It is easier to see the moon . .*
- Ask yes/no questions, such as: Can you see stars at night? (Yes.) Can you see stars in the daytime? (No.) Provide sentence frames, such as: *You can see stars in the (night) sky. You cannot see stars during the (day).* Help students complete sentence stems that describe when you can observe stars. Provide these stems: *You can see stars . . . You cannot see stars . .*
- Preview earth science content vocabulary
- Visual cues (pictures)
- Repeated directions
- Check for understanding
- Ask explicit questions
- Peer models
- English language supports for parents of non English speaking students. *Ex: Teacher created dictionary with pictures of the sun, moon, stars, day/night and labels in English and student's first language.*

Gifted and Talented

- Have students make a drawing that shows both the pattern of day and night and the pattern of the sun in the sky. Suggest that students fold a sheet of paper in half and label one half Day and the other half Night. On the day half, ask them to show the pattern of the sun in the sky. On the night half, have them think of a way to represent night. Display the finished drawings side-by-side to emphasize the continuing pattern of day and night.
- Have students investigate the difference between movement and apparent movement. Display a chair and move the chair. Elicit that the chair moved. Then ask students to keep looking at the chair,

but this time move themselves. Elicit that the chair appeared to move, but it actually stayed in the same place. Elicit that the students' movement makes it appear as if the chair moved. Relate the activity to the apparent movement of the Little Dipper.
- Have students think of another way to depict the number of hours of daylight in each season. For example, they might use yarn to represent the average number of daylight hours in each season, or they might make a drawing of the sun appearing to move across the sky for a different number of hours in each season. Have students share their results.
- Challenge questions
- Higher level thinking about why the sun, moon and earth are important and necessary
- Leveled readers
- Research sun, moon and earth and discuss how they work together

Students with 504 Plans

- Have students make a simple drawing of a house, grass, and sky. Show them how to add the arch-shaped path of the sun. Ask them to draw the sun where it appears in the morning. Then have them label the drawing *Morning*. Have students repeat this activity to represent the sun's position at noon and late in the day.
- Help students complete sentence stems that describe how visible the moon is at night and during the day. Provide these stems: *It is harder to see the moon . . . It is easier to see the moon . .*
- *Give small groups four cards, each labeled with a season, and different lengths of yellow paper to represent the average hours of daylight in each of the four seasons, as shown on the sample chart on page 136. Have students put the labels in order and match each length of paper to a label. Ask questions such as, Which season has the fewest hours of daylight?*
- Have students make a model of the Little Dipper on card stock and anchor it to another sheet of cardstock with a brass fastener through the North Star. Have students move the Little Dipper model clockwise in an arc. Discuss which stars appeared to move and which stars did not appear to move.
- Vocabulary picture cards
- Extended time for assignments
- Prompting
- Reassurance and time to formulate ideas
- Visual clues (pictures)
- Preferential seating
- Repeated directions
- Check for understanding
- Ask explicit questions
- Instructional aides in classroom setting
- Peer models
- Frequent breaks during read alouds
- Use of FM system to improve attention and support auditory information
- Behavior chart to increase focus and work completion
- Sensory breaks with timers
- Chromebook extensions

Grade 1 Science Curriculum

Unit 2: Life Science: Structure and Function

Unit Overview

(*Introduction excerpt from New Jersey Model Curriculum- Grade 1, Science Units 2 & 3, "What it Looks Like in the Classroom"*)

In this unit of study, students observe organisms in order to recognize that many types of young plants and animals are like, but not exactly the same as, their parents. Students also observe how organisms use their external parts to help them survive, grow, and meet their needs, and how the behaviors of parents and offspring help offspring survive. Throughout the unit, students will look for patterns; obtain, evaluate, and communicate information; and construct explanations.

People look for patterns in the natural world and use these patterns as evidence to describe phenomena. Students begin this unit by observing and comparing external features of organisms, looking for patterns in what they observe. They will need opportunities to observe a variety of plants and animals in order to look for similarities and differences in their features. For example, when comparing the shape, size, color, or number of leaves on plants, students begin to notice that plants of the same kind have leaves that are the same shape and color, but the leaves of one plant may differ from another in size or number. When comparing body coverings; number, size, and type of external features (legs, tail, eyes, mouth parts); body size, body coloring, or eye color of animals, students learn that animals of the same kind have the same type of body covering and the same number and types of external features, but the size of the body, the size of external features, body color, and/or eye color of individuals might differ. Making observations like these helps students recognize that young plants and animals look very much, but not exactly, like their parents, and that even though individuals of the same kind of plant or animal are recognizable as similar, they can also vary in many ways.

In addition to observing and documenting similarities and differences in the external features of organisms, students also need opportunities to make direct observations, read texts, or use multimedia resources to determine patterns in the behaviors of parents and offspring that help offspring survive. While both plants and animals can have young, it is the parents of young animals who might engage in behaviors that help their young survive. Some examples of these patterns of behaviors could include the signals that offspring make, such as crying, cheeping, and other vocalizations, and the responses of parents, such as feeding, comforting, and protecting their young.

Additionally, in this unit of study, students investigate how plants and animals use their external structures to help them survive, grow, and meet their needs. Then students are challenged to apply

their learning to design a solution to a human problem that mimics how plants and/or animals use their external parts to help them survive, grow, and meet their needs.

In order to recognize ways in which animals and plants use their external structures, students need opportunities to observe and describe how the shape and stability of organisms' structures are related to their functions. Students can make direct observations and use media resources to find relevant examples for both plants and animals. They should observe that 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. In addition, animals have body parts that capture and convey different kinds of information from the environment, enabling them to respond to these inputs in ways that aid in survival. Plants, like animals, have different parts (roots, stems, leaves, flowers, fruits) that each serve specific functions in survival and growth, and plants also respond to external inputs. For each structure that students observe, they should describe how the shape and stability of that structure is related to its function.

The next step in this unit is to engage in engineering design. Students need opportunities to use materials to design a device that solves a specific human problem. Designs should mimic how plants and/or animals use their external parts to help them survive and grow. The engineering design process students engage in should include the following steps:

As a class or in small groups, students participate in shared research to find examples of human-made products that have been designed and built by applying knowledge of the natural world. For each example, students identify the human problem(s) that the product solves and how that solution was designed using an understanding of the natural world.

Students brainstorm possible human problems that can be solved by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.

Examples could include:

- Designing clothing or equipment to protect bicyclists that mimics turtle shells, acorn shells, and animal scales.
- Stabilizing structures that mimic animal tails and plant roots.
- Keeping out intruders by mimicking thorns on branches and animal quills.
- Detecting intruders by mimicking eyes and ears.

In small groups, students use sketches, drawings, or physical models to convey a design that solves a problem by mimicking one or more external structures of plants and/or animals. Students will use materials to create the design solution. Groups will share the design solution with others in the class.

With the 2020 updates of the NJSLS for Science to include climate change, in addition to the previous excerpt from the NJ Model Curriculum, students will engage in conversations regarding

the effect climate change has on our community. After learning about the various roles about plants, animals, and the environment, students will understand the importance of taking care of the world and brainstorm ways to make a positive impact.

Big Idea/Common Thread:

- Plants and animals use their external parts to help them survive, grow, and meet their needs. The behaviors of parents and offspring help offspring survive.

Enduring Understanding:

- All organisms have external parts that they use to perform daily functions.
- Parents and offspring often engage in behaviors that help the offspring survive.
- Young organisms are very much, but not exactly, like their parents and also resemble other organisms of the same kind.

Essential Questions:

- What are some ways plants and animals meet their needs so that they can survive and grow?
- How are young plants and animals alike and different from their parents?
- How can *humans* mimic how plants and/or animals use their external parts to help them survive?
- How does weather differ from climate?
- What are ways we can help make a positive impact on our environment?
- Why is it important to make a positive impact in our environment?

Assessments

Possible Ongoing Formative Assessments
• Teacher Observation • Student Participation • Wrap It Up! questions • Various levels of questioning • Teacher observation • Class discussions/Partner Talk • Science Notebook activities • Performance Expectation Activities: *Investigate; Think Like a Scientist; Think Like an Engineer, STEAM Projects* • Teacher Rubrics for Performance Expectations Activities

Summative Assessments
• Life Science Unit Assessment
Alternative Assessments
• Modified Life Science Unit Assessment (Less answer choices, word bank, highlighted vocabulary, etc.)

Standards (NJSLS) Addressed in this Unit

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)

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)

LS1.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)

LS3.A: Inheritance of Traits

- Young animals are very much, but not exactly, like their parents. Plants also 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)

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 function(s). (1-LS1-1)

Science and Engineering Practices

Constructing Explanations and Designing Solutions

- Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.
    - 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)

Obtaining, Evaluating, and Communicating Information

- Obtaining, evaluating, and communicating information in K– 2 builds on prior experiences and uses observations and texts to communicate new information.
    - Read grade-appropriate texts and use media to obtain scientific information to determine patterns in the natural world. (1-LS1-2)

Connections to Engineering, Technology, and Applications of Science

- **Influence of Science, Engineering and Technology on Society and the Natural World**
    - Every human-made product is designed by applying some knowledge of the natural world and is built by using materials derived from the natural world. (1-LS1-1)

Connections to Nature of Science

- **Scientific Knowledge Assumes an Order and Consistency in Natural Systems**
    - Scientists look for patterns and order when making observations about the world. (1-LS1-2)

Computer Science and Design Thinking

- 8.2.2.ED.2: Collaborate to solve a simple problem, or to illustrate how to build a product using the design process.
- 8.2.2.ED.3: Select and use appropriate tools and materials to build a product using the design process.
- 8.2.2.ETW.1: Classify products as resulting from nature or produced as a result of technology.

Career Readiness, Life Literacies, and Key Skills

CAREER AWARENESS, EXPLORATION, PREPARATION, AND TRAINING
9.2.5.CAP.1 Evaluate personal likes and dislikes and identify careers that might be suited to personal likes.
9.2.5.CAP.2 Identify how you might like to earn an income.
9.2.5.CAP.3 Identify qualifications needed to pursue traditional and non-traditional careers and occupations.
9.2.5.CAP.4 Explain the reasons why some jobs and careers require specific training, skills, and certification (e.g., life guards, child care, medicine, education) and examples of these requirements.

LIFE LITERACY AND KEY SKILLS
9.4.2.CI.1 Demonstrate openness to new ideas and perspectives (e.g., 1.1.2.CR1a, 2.1.2.EH.1, 6.1.2.CivicsCM.2).
9.4.2.CI.2 Demonstrate originality and inventiveness in work (e.g., 1.3A.2CR1a).
9.4.2.CT.1 Gather information about an issue, such as climate change, and collaboratively brainstorm ways to solve the problem (e.g., K-2-ETS1-1, 6.3.2.GeoGI.2).
9.4.2.CT.2 Identify possible approaches and resources to execute a plan (e.g., 1.2.2.CR1b, 8.2.2.ED.3).
9.4.2.CT.3 Use a variety of types of thinking to solve problems (e.g., inductive, deductive).
9.4.2.DC.7 Describe actions peers can take to positively impact climate change (e.g., 6.3.2.CivicsPD.1).

PRACTICES
CLKSP4 Demonstrate creativity and innovation.
CLKSP5 Utilize critical thinking to make sense of problems and persevere in solving them.
CLKSP6 Model integrity, ethical leadership and effective management.

Interdisciplinary Connections:

English Language Arts
<u>Reading</u>
RI.1.1 Ask and answer questions about key details in a text.
RI.1.2 Identify the main topic and retell key details of a text.
RI.1.5 Know and use various text features (e.g., headings, tables of contents, glossaries, electronic menus, icons) to locate key facts or information in a text.
RI.1.10 With prompting and support, read informational texts at grade level text complexity or above.

<u>Writing</u>
W.1.7 Participate in shared research and writing projects.
W.1.8 With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.

<u>Speaking and Listening</u>

SL.1.1 Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups.
SL.1.5 Add drawings or other visual displays to descriptions when appropriate to clarify ideas, thoughts, and feelings.

Mathematics
MP.2 Reason abstractly and quantitatively.
MP.5 Use appropriate tools strategically.
1.NBT.B.3 Compare two two-digit numbers based on the meanings of the tens and one digits, recording the results of comparisons with the symbols >, =, and <.
1.MD.A.1 Order three objects by length; compare the lengths of two objects indirectly by using a third object.

Social-Emotional Competencies

- **Self-Awareness**: ability to recognize one's emotions and know one's strengths and limitations
    - Connections:
        - Reflecting on one's learning (Oral, Thumbs Up, Thumbs Down, Pictures, etc.)

- **Self-Management**: ability to regulate and control one's emotions and behaviors, particularly in stressful situations
    - Connections:
        - Visit mindfulness corner/cool down corner in classroom and doing self-soothing activities
        - Playing soft music

- **Social Awareness**: ability to take the perspective of others, demonstrate empathy, acknowledge and appreciate similarities and differences, and understand how one's actions influence and are influenced by others
    - Connections:
        - Students collaborate during hands-on STEAM projects

- **Relationship Skills**: refers to one's ability to demonstrate prosocial skills and behaviors in order to develop meaningful relationships and resolve interpersonal conflicts
    - Connections:
        - Class discussions
        - Incentives for individual students and small groups

- **Responsible Decision-Making**: refers to the ability to use multiple pieces of information to make ethical and responsible decisions
  - Connections:
    - Class rules and routines
    - Class discussions
    - Following directions

Diversity Mandate Read-Aloud Lesson Plans
December: *Shark Lady (The True Story of How Eugenie Clark Became the Ocean's Most Fearless Scientist)* by Jess Keating

UNIT OBJECTIVES

Students will be able to …

- Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents. (1-LS3-1)

[*Clarification Statement*: Examples of patterns could include features plants or animals share. Examples of observations could include leaves from the same kind of plant are the same shape but can differ in size; and, a particular breed of dog looks like its parents but is not exactly the same.]
[*Assessment Boundary*: Assessment does not include inheritance or animals that undergo metamorphosis or hybrids.]

Disciplinary Ideas
- Understand that young animals are very much, but not exactly, like their parents. Plants also are very much, but not exactly, like their parents.
- Understand that individuals of the same kind of plant or animal are recognizable as similar but can also vary in many ways.

Science and Engineering Practices
- Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena.

Crosscutting Concepts
- Recognize that patterns in the natural world can be observed, used to describe phenomena, and used as evidence.

1-LS3-1

Concepts	Students Can...
• Individuals of the same kind of plant or animal are recognizable as similar but can also vary. • Young animals are very much, but not exactly, like their parents. Plants also	• Notice that young plants and animals are like, but not exactly like, their parents. Examples of patterns: ○ features plants or animals share. Examples of observations:

are very much, but not exactly, like their parents. ● Observations of the natural world can help support evidence of these patterns. ● Patterns in the natural world can be observed, used to describe events, and used as evidence.	○ leaves from the same kind of plant are the same shape but can differ in size ○ a particular breed of puppy looks like its parents but is not exactly the same ● Make observations to support evidence of patterns noticed. ● Observe and use patterns in the natural world as evidence and to describe events, such as climate change.

Students will be able to …

- Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive and adapt to climate change. (1-LS1-2) (K-2- ETS1-1) *See Appendix A, K-2 Engineering Design

  [Clarification Statement: Examples of patterns of behaviors could include the signals that offspring make (such as crying, cheeping, and other vocalizations) and the responses of the parents (such as feeding, comforting, and protecting the offspring).]

Disciplinary Ideas

- Understand that 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.

Science and Engineering Practices

- Read grade-appropriate texts and use media to obtain scientific information to determine patterns in the natural world.

Crosscutting Concepts

- Recognize that patterns in the natural world can be observed, used to describe phenomena, and used as evidence.

1-LS1-2

Concepts	Students Can...
● Adult plants and animals can have offspring. ● In many kinds of animals, parents and offspring engage in behaviors that help the offspring survive. ● Scientists look for patterns and order when making observations about the natural world.	● Understand that patterns in behavior of parents and offspring help in survival in an evolving climate. Examples of patterns of behaviors: ○ The signals that offspring make, such as crying, cheeping, and other vocalizations. ○ The responses of the parents, such as feeding, comforting, and protecting the

• Patterns in the natural world can be observed.	offspring. • Read text and use media to determine patterns in the natural world, such as climate change. • Observe and use patterns in the natural world to describe natural events.

Students will be able to …

- 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, meet their needs, and adapt to climate change. (1-LS1-1)(K-2- ETS1-1)

  * See Appendix A, K-2 Engineering Design

[*Clarification Statement*: Examples of human problems that can be solved by mimicking plant or animal solutions could include designing clothing or equipment to protect bicyclists by mimicking turtle shells, acorn shells, and animal scales; stabilizing structures by mimicking animal tails and roots on plants; keeping out intruders by mimicking thorns on branches and animal quills; and, detecting intruders by mimicking eyes and ears.]

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

  ** Updated with 2020 NJSLS language

  Disciplinary Ideas
  - Understand that 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.
  - Understand that 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.

  Science and Engineering Practices
  - Use materials to design a device that solves a specific problem or a solution to a specific problem.

  Crosscutting Concepts
  - Recognize that the shape and stability of structures of natural and designed objects are related to their function(s).

1-LS1-1

Concepts	Students Can...
• All organisms have external parts, helping them to see, hear, grasp objects, protect themselves, move, and seek food, water, and air. • Animals and plants have parts that help them to grow and survive. • Designs can be conveyed through sketches, drawings, or physical models. These designs are useful in communicating ideas for solutions to problems. • The shape and stability of structures of natural and designed objects are related to their function(s). • Human-made products are designed by applying some knowledge of the natural world.	• Recognize and label external body parts on images of plants and/or animals, and understand that animals and/or plants use their body parts in ways to grow and survive. • Use materials to design a device that solves a specific problem. • Use materials to design a solution to a human problem that mimics how plants and/or animals grow and survive. Examples could include: ○ Designing clothing or equipment to protect bicyclists by mimicking turtle shells, acorn shells, and animal scales. ○ Stabilizing structures by mimicking animal tails and roots on plants. ○ Keeping out intruders by mimicking thorns on branches and animal quills. ○ Detecting intruders by mimicking eyes and ears. • Observe and describe how the shape and stability of structures of natural and designed objects are related to their functions. • Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function.

SUGGESTED ACTIVITIES

- Eat Like a Bird! January: (Go to January, page 3 for this activity.) 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.

- Parts of a Plant: 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.

- Animals Help Their Babies (Introductory lesson) In this lesson students learn how living things have babies called offsprings. Parents can help their offspring survive. Babies have behaviors to communicate their needs.

- Build a Nest STEM Challenge: http://viewsfromastepstool.com/build-a-nest-stem/

- Great Gloves STEM Challenge: http://www.onlypassionatecuriosity.com/great-gloves-marvelous-mittens-stem-challenge/?utm_campaign=coschedule&utm_source=facebook_page&utm_medium=Only%20Passionate%20Curiosity&utm_content=Great%20Gloves%20and%20Marvelous%20Mittens:%20A%20STEM%20Challenge

- Parts of Plants Activities: http://www.teachjunkie.com/sciences/parts-of-a-plant-activities-easy-quick/
- https://www.generationgenius.com/videolessons/plant-parts-video-for-kids/

- Climate Change Challenge - In this lesson students will brainstorm to figure out ways they can make a difference. Thank you to Angela McDonough for sharing this activity with teachers at OPS.

- Recycle City- Scavenger Hunt- Use this resource as a whole class discussion via smartboard, partnerships, or individually for students to explore recycle city and find ways items can be recycled or reused.

- Epic! Growing Up Green- Log on to Epic! digital resource to find the title Growing Up Green to read aloud and have a class discussion about ways to reduce, reuse and recycle.

- Epic! Recycling Earth's Resources (Recreating Paper Activity at the end of the book)- Log on to Epic! digital resource to find the title Recycling Earth's Resources to read aloud and have a class discussion about ways to reduce, reuse and recycle. After reading and discussing, complete the activity at the end of the book about using scrape paper to recreate paper

- Climate Change Read Along and Activity
    - Watch Climate Change BrainPop and discuss causes and effects of humans' impact on the environment
    - Read Winston of Churchill and discuss with students the negative impact humans' have on climate change
    - Students will draw a picture of the activities they would like to do to help the environment and write a short paragraph
- Animal Survival
    - Generation Genius- Animals Help Their Babies
    - Generation Genius- Animal External Parts

Unit Specific Vocabulary
alike- similar to each other **animals**- a living thing that is not a plant **climate:** long term weather problem **different**- not the same as another **climate change-** the long-term changes in global temperatures and other characteristics of the atmosphere. **Earth's resources**: Earth's natural resources include air, water, soil, minerals, plants, and animals **flower**- the part of a plant that makes fruits and seeds **habitat**- the place or natural area where plants and animals live **leaf**- a structure on a plant that is usually green and makes food from sunlight **life cycle**- the stages a living thing goes through **living**- alive **needs**- what a living thing has to have to survive **nutrients**- what living things need to grow and stay healthy **offspring**- a new plant or animal produced by a parent **oxygen**- a gas in air and water that plants and animals need to survive **plants**- a living thing that has roots, stems, and leaves **protect**- to prevent someone or something from getting hurt **recycle:** convert waste into reusable material **root**- a part of a plant that grows in soil **stem**- the part of a plant that carries water and food to the leaves and food back to the roots **survive**- to stay alive **weather:** weather is what the sky and the air outside are like, such as cold and cloudy

Instructional Materials and Learning Activities

Core Instructional Materials:

- *National Geographic* Exploring Science
- *National Geographic* My NG connect Exploring Science Digital Resources
- *National Geographic* Exploring Science through Literacy Teacher's Guide
- *Hand2Mind* Exploring Science Hands on Kit
- Science Tech Book

Digital Resources:

- http://ngss.nsta.org/AccessStandardsByTopic.aspx - The NGSS Standards, by topic
- https://jr.brainpop.com/socialstudies/economics/needsandwants/ - needs of living things
- http://learningcenter.nsta.org/ - background information for teachers and lesson ideas
- http://ngss.nsta.org/Classroom-Resources.aspx - lesson ideas
- http://sciencespot.net/Pages/refdeskNextGen.html - lesson ideas
- https://jr.brainpop.com/search/?keyword=plant
- Zoo Cams
- http://zoo.sandiegozoo.org/content/video-more
- http://www.houstonzoo.org/meet-the-animals/animal-webcams/
- EPIC! - books and videos
- https://www.generationgenius.com/

Supplemental Materials:

- Science Tech Book

Supplemental Resources

- STEAM Integration: UNIT 3 - The Road to ?

Mentor Texts:

- From Seed to Plant by Gail Gibbons- Level M
- The Tiny Seed by Eric Carle- Level L
- How Plants Grow by Dona Herw Rice- Level F
- How A Seed Grows by Helene Jordan - Level J

Leveled Readers:

- Oak Trees and White-Tailed Deer-Level I
- Saguaro Cacti and Elf Owls-Level H
- Water Lilies and Bullfrogs-Level G
- The Cactus Name Game-Level F
- The Giant Water Lily-Level D
- Trees, Seeds, and Leaves-Level G

Suggested Modifications

These strategies can be adapted to scaffold for students needing more support or extending the learning for higher level students. Differentiation is accomplished through content, process, product, and learning environment.

NGSS Appendix D - "All Standards, All Students": Making the Next Generation Science Standards Accessible to All Students

Special Education Students
● Help students understand what is living and what is not by using different objects in the classroom. Have students collect three objects that are not living (e.g., books, pencils, paper, math counters, crayons). Discuss how none of these objects grow nor do they require anything to survive because they are not living. Compare these to a plant, discussing how plants grow and live. ● Have students draw a plant showing flowers, fruits, and seeds. Students should label each part on their drawings. Below the drawing, have students write a sentence about each plant part to tell what it does. ● Life science word banks for assessments and certain activities ● Preview content vocabulary ● Hands on materials ● Extended time for assignments ● Prompting ● Reassurance and time to formulate ideas ● Visual clues (pictures) ● Preferential seating ● Repeated directions ● Check for understanding ● Ask explicit questions ● Instructional aides in classroom setting ● Peer models ● Social Stories for science routines ● Use of FM system to improve attention and support auditory information ● Behavior chart to increase focus and work completion ● Sensory breaks with timers ● Partner/buddy system
Students at Risk
● Help students understand what is living and what is not by using different objects in the classroom. Have students collect three objects that are not living (e.g., books, pencils, paper, math counters, crayons). Discuss how none of these objects grow nor do they require anything to survive because they are not living. Compare these to a plant, discussing how plants grow and live. ● Have students draw a plant showing flowers, fruits, and seeds. Students should label each part on their drawings. Below the drawing, have students write a sentence about each plant part to tell what it does. ● Preview life science vocabulary

- Response to intervention - targeted skill/goal improvement plans within a set time frame
- Hands on materials
- Sound chips
- Multisensory manipulatives
- Color coding word tracking
- Preferential seating
- Behavior chart to increase focus and work completion
- Sensory breaks with timers
- Small group instruction

English Language Learners

- Write *flowers, fruit*, and *seeds* on the board. Below this, draw a picture of a plant showing flowers, fruits, and seeds. Point to each part. Ask students to name each part. Draw a picture of a plant showing flowers, fruits, and seeds. Make three cards, writing each plant part on a different card. Ask volunteers to pick a card. Have students match the plant part word with the corresponding part on the picture drawn on the board. Have students draw a plant showing flowers, fruits, and seeds. Students should label each part on their drawings. Below the drawing, have students write a sentence about each plant part to tell what it does.
- Have partners draw a picture of a moving animal. Have each student point to each body part and tell about it with this sentence frame: _____*s* use _____*s* to move. Have students tell you the names of animals they know. Make a list on the board. Have students use the list to complete this sentence frame: _____*s* use _____*s* to move. Have partners draw pictures of animals that can be kept as pets. Have students explain to a partner how each animal moves.
- Preview life science content vocabulary
- Visual cues (pictures)
- Repeated directions
- Check for understanding
- Ask explicit questions
- Peer models
- English language supports for parents of non English speaking students. *Ex: Teacher created dictionary with* pictures of roots, stems, leaves, flowers, fruit, etc. with labels *in English and student's first language.*

Gifted and Talented

- Invite students to choose a plant from the photograph on *Exploring Science* pages 42–43. Challenge them to identify different plant parts that they know and to explain how they know the plant is living. Encourage students to note what their plant might need to survive.
- Have students make a chart showing the multiple variations that they notice among the plants pictured on pages 56–57. Encourage students to choose two categories to focus on, such as flower color and number of petals. Students can record the number of different colored flowers they see and the range of number of petals from the least to the greatest.
- Discuss how plants and animals are similar/different
- Challenge questions
- Higher level thinking about what plants and animals need to survive

- Leveled readers

Students with 504 Plans

- Help students understand what is living and what is not by using different objects in the classroom. Have students collect three objects that are not living (e.g., books, pencils, paper, math counters, crayons). Discuss how none of these objects grow nor do they require anything to survive because they are not living. Compare these to a plant, discussing how plants grow and live.
- Have students draw a plant showing flowers, fruits, and seeds. Students should label each part on their drawings. Below the drawing, have students write a sentence about each plant part to tell what it does.
- Vocabulary picture cards
- Extended time for assignments
- Prompting
- Reassurance and time to formulate ideas
- Visual clues (pictures)
- Preferential seating
- Repeated directions
- Check for understanding
- Ask explicit questions
- Instructional aides in classroom setting
- Peer models
- Frequent breaks during read alouds
- Use of FM system to improve attention and support auditory information
- Behavior chart to increase focus and work completion
- Sensory breaks with timers
- Chromebook extensions

Grade 1 Science Curriculum

Unit 3: Physical Science: Waves: Light and Sound

Unit Overview

(*Introduction excerpt from New Jersey Model Curriculum- Grade 1, Science Units 4 & 5, "What it Looks Like in the Classroom"*)

In this unit of study, students plan and conduct investigations and make observations as they explore sound and light energy. Students describe the relationships between sound and vibrating materials and the availability of light and the ability to see objects. They also investigate the effect on a beam of light when objects made of different materials are placed in its path. Throughout the unit, students will use their observations and data as evidence to determine cause-and-effect relationships in the natural world.

Students begin this unit by observing objects with and without available light. They need opportunities to observe a variety of objects in both illuminated and non-illuminated settings. For example, observations could be made in a completely dark room, or students can use a pinhole box to observe objects. Students can also watch videos of cave explorers deep in the earth, using light from a single flashlight. With experiences such as these, they will come to understand that objects can be seen only when illuminated, either from an external light source or by when they give off their own light.

Next, students plan and conduct simple investigations to determine what happens to a beam of light when objects made of various materials are placed in its path. Students need the opportunity to explore the interaction of light with a variety of materials, and they should record what they observe with each one. When selecting materials to use, teachers should choose some that allow all light to pass through (transparent), some that allow only a portion of the light to pass through (translucent), some that do not allow any light to pass through (opaque), and some that redirect the beam of light (reflective). Examples could include clear plastic, glass, wax paper, thin cloth, cardboard, construction paper, shiny metal spoons, and mirrors.

As students observe the interaction between light and various materials, they should notice that when some or all of the light is blocked, a shadow is created beyond the object. If only a portion of light is blocked (translucent materials), a dim shadow will form, and some light will pass through the object. If all the light is blocked (opaque materials), students will see only see a dark shadow beyond the object. They will also observe that shiny materials reflect light, redirecting the beam of light in a different direction. Students should use their observations as evidence to support their explanations of how light interacts with various objects.

After investigating light energy, students continue to plan and conduct investigations to develop an understanding of some basic properties of sound. Students can use a variety of objects and materials to observe that vibrating materials can make sound and that sound can make materials vibrate. Students need multiple opportunities to experiment with a variety of objects that will make sound. Some opportunities could include:

- Gently tapping various sizes of tuning forks on a hard surface.
- Plucking string or rubber bands stretched across an open box.
- Cutting and stretching a balloon over an open can to make a drum that can be tapped.
- Holding the end of a ruler on the edge of a table, leaving the opposite end of the ruler hanging over the edge, and then plucking the hanging end of the ruler.
- Touching a vibrating tuning fork to the surface of water in a bowl.
- Placing dry rice grains on a drum's surface and then touching the drum with a vibrating tuning fork or placing the drum near the speaker of a portable sound system.
- Holding a piece of paper near the speaker of a portable sound system.

As students conduct these simple investigations, they will notice that when objects vibrate (tuning forks that have been tapped and string, rubber bands, and rulers that have been plucked), sound is created. They will also notice that sound will cause objects to vibrate (sound from a speaker causes rice grains to vibrate on the surface of a drum, the vibrating tuning fork causes ripples on the surface of water, and sound from the speaker also causes paper to move). Students should use these types of observations as evidence when explaining the cause and effect relationship between sound and vibrating materials.

Students continue to develop their understanding of the relationship between sound and vibrating materials as well as between the availability of light and the ability to see objects. Students will apply their knowledge of light and sound to solve a simple problem involving communication with light and sound.

During this unit, students learn that people depend on various technologies in their lives, and that life would be very different without technology. Technology plays an important role in the development of devices that allow us to communicate (send and receive information) over long distances. Engineers design and build many kinds of devices, such as those used for communication. Like engineers, students engage in the engineering design process in order to design and build a device that uses light or sound to communicate over a distance.

This process should include the following steps:

- Students brainstorm a list of ways that people communicate over a distance. Some examples include telephones, cellular phones, email, and video conferencing (by computer).
- Ask students, “How would we communicate over a distance without the use of any of the devices that people currently use?”
- Use that question to guide the class to define the problem: Design and build a device that allows us to communicate over a distance.
- As a class, determine the criteria that will be used to evaluate the design solutions. One criterion MUST be that the device uses either light or sound.
- Also as a class, determine possible constraints, such as available materials and amount of time allotted for designing and building the device.
- Small groups conduct research, looking for examples of devices that use light or sound to communicate over a distance.
- Small groups can then use tools and materials to design and build their devices. Examples could include a light source that sends a signal, paper cup and string telephones, or a pattern of drum beats.
- Groups should prepare a sketch or drawing of their device. They should label the components and describe, in writing, how each component relates to the function of the device.
- Groups should present their devices to the class, demonstrating how they work.
- Students then determine which devices work as intended based on the criteria, using data as evidence to support their thinking.

Students should ask questions, make observations, gather information, and communicate with peers throughout the design process. Guidance and support from the teacher is also a critical part of the design process.

Big Idea/Common Thread:

- A relationship exists between sound and vibrating materials as well as between the availability of light and ability to see objects. Sound and light travel from place to place.

Enduring Understanding:

- Sound can make matter vibrate, and vibrating matter can make sound.
- Objects can be seen only when light is available to illuminate them.
- People use devices to send and receive information.

Essential Questions:

- How does light travel?
- How does sound travel?
- How do people use light and sound to send messages?

Assessments

Possible Ongoing Formative Assessments
• Teacher Observation • Student Participation • Wrap It Up! Questions • Teacher Observation • Class Discussions/Partner Talk • Science Notebook activities • Performance Expectation Activities: *Investigate; Think Like a Scientist; Think Like an Engineer, STEAM Projects* • Teacher Rubrics for Performance Expectations Activities
Summative Assessments
• Physical Science Unit Assessment
Alternative Assessments
• Modified Physical Science Unit Assessment (Less answer choices, highlighted vocabulary, etc.)

Standards (NJSLS) Addressed in this Unit

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 the light and create a dark shadow on any surface beyond them, where the light cannot reach. Mirrors can be used to redirect a light beam. (Boundary: The idea that light travels from place to place is developed through experiences with light sources, mirrors, and shadows, but no attempt is made to discuss the speed of light.) (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)
Crosscutting Concepts

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-PS4-3)

Science and Engineering Practices

Planning and Carrying Out Investigations

- Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.
    - 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)

Constructing Explanations and Designing Solutions

- Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.
    - 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)

Connections to Engineering, Technology, and Applications of Science

Influence of Science, Engineering and Technology 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)

Connections to Nature of Science

Scientific Knowledge Assumes an Order and Consistency in Natural Systems

- Science investigations begin with a question. (1-PS4-1)
- Scientists use different ways to study the world. (1-PS4-1)

Computer Science and Design Thinking

- 8.2.2.ED.2: Collaborate to solve a simple problem, or to illustrate how to build a product using the design process.
- 8.2.2.ED.3: Select and use appropriate tools and materials to build a product using the design process.
- 8.2.2.ETW.1: Classify products as resulting from nature or produced as a result of technology.

Career Readiness, Life Literacies, and Key Skills

CAREER AWARENESS, EXPLORATION, PREPARATION, AND TRAINING
9.2.5.CAP.1 Evaluate personal likes and dislikes and identify careers that might be suited to personal likes.
9.2.5.CAP.2 Identify how you might like to earn an income.
9.2.5.CAP.3 Identify qualifications needed to pursue traditional and non-traditional careers and occupations.
9.2.5.CAP.4 Explain the reasons why some jobs and careers require specific training, skills, and certification (e.g., life guards, child care, medicine, education) and examples of these requirements.

LIFE LITERACY AND KEY SKILLS
9.4.2.CI.1 Demonstrate openness to new ideas and perspectives (e.g., 1.1.2.CR1a, 2.1.2.EH.1, 6.1.2.CivicsCM.2).
9.4.2.CI.2 Demonstrate originality and inventiveness in work (e.g., 1.3A.2CR1a).
9.4.2.CT.1 Gather information about an issue, such as climate change, and collaboratively brainstorm ways to solve the problem (e.g., K-2-ETS1-1, 6.3.2.GeoGI.2).
9.4.2.CT.2 Identify possible approaches and resources to execute a plan (e.g., 1.2.2.CR1b, 8.2.2.ED.3).
9.4.2.CT.3 Use a variety of types of thinking to solve problems (e.g., inductive, deductive).

PRACTICES
CLKSP4 Demonstrate creativity and innovation.
CLKSP5 Utilize critical thinking to make sense of problems and persevere in solving them.
CLKSP6 Model integrity, ethical leadership and effective management.

Interdisciplinary Connections:

English Language Arts
<u>Reading</u>
RI.1.1 Ask and answer questions about key details in a text.
RI.1.4 Ask and answer questions to help determine or clarify the meaning of words and phrases in a text.
RI.1.10 With prompting and support, read informational texts at grade level text complexity or above.
<u>Writing</u>
W.1.2 Write informative/explanatory texts in which they name a topic, supply some facts about the topic, and provide some sense of closure.
W.1.7 Participate in shared research and writing projects (e.g., explore a number of “how-to” books on a given topic and use them to write a sequence of instructions).
W.1.8 With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.
<u>Speaking and Listening</u>

SL.1.1 Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups.

a. Follow agreed-upon norms for discussions (e.g., listening to others with care, speaking one at a time about the topics and texts under discussion).

b. Build on others' talk in conversations by responding to the comments of others through multiple exchanges.

c. Ask questions to clear up any confusion about the topics and texts under discussion.

SL.1.5 Add drawings or other visual displays to descriptions when appropriate to clarify ideas, thoughts, and feelings.

Mathematics

MP.5 Use appropriate tools strategically.

Measurement and Data

1.MD.A.1 Order three objects by length; compare the lengths of two objects indirectly by using a third object.

1.MD.A.2 Express the length of an object as a whole number of length units, by layering multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps

Social-Emotional Competencies

- **Self-Awareness**: ability to recognize one's emotions and know one's strengths and limitations
    - Connections:
        - Reflecting on one's learning (Oral, Thumbs Up, Thumbs Down, Pictures, etc.)

- **Self-Management**: ability to regulate and control one's emotions and behaviors, particularly in stressful situations
    - Connections:
        - Visit mindfulness corner/cool down corner in classroom and doing self-soothing activities
        - Playing soft music

- **Social Awareness**: ability to take the perspective of others, demonstrate empathy, acknowledge and appreciate similarities and differences, and understand how one's actions influence and are influenced by others
    - Connections:
        - Students collaborate during hands-on STEAM projects

- **Relationship Skills**: refers to one's ability to demonstrate prosocial skills and behaviors

in order to develop meaningful relationships and resolve interpersonal conflicts
    - Connections:
        - Class discussions
        - Incentives for individual students and small groups

- **<u>Responsible Decision-Making</u>**: refers to the ability to use multiple pieces of information to make ethical and responsible decisions
    - Connections:
        - Class rules and routines
        - Class discussions
        - Following directions

UNIT OBJECTIVES

Students will be able to …

- Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate. (1-PS4-1)

[*Clarification Statement*: Examples of vibrating materials that make sound could include tuning forks and plucking a stretched string. Examples of how sound can make matter vibrate could include holding a piece of paper near a speaker making sound and holding an object near a vibrating tuning fork.]

Disciplinary Ideas
- Understand that sound can make matter vibrate, and vibrating matter can make sound.

Science and Engineering Practices
- Plan and conduct investigations collaboratively to produce data to serve as the basis for evidence to answer a question.

Crosscutting Concepts
- Recognize that simple tests can be designed to gather evidence to support or refute student ideas about causes.

1-PS4-1

Concepts	Students Can...
• Sound can make matter vibrate, and vibrating matter can make sound. • Simple tests can be designed to gather evidence to support or refute student ideas (trial and error). Example:	• Recognize that vibrating materials can make sound and that sound can make materials vibrate. Examples: • holding a piece of paper near a speaker making sound

• Plucking a stretched rubber band as opposed to a non-stretched rubber band to see which one will make a sound	• holding an object near a vibrating tuning fork • Plan and conduct investigations to provide evidence to answer a question • Use simple tests to gather evidence to support or refute ideas

Students will be able to …

- Make observations to construct an evidence-based account that objects can be seen only when illuminated. (1-PS4-2)

[*Clarification Statement*: Examples of observations could include those made in a completely dark room, a pinhole box, and a video of a cave explorer with a flashlight. Illumination could be from an external light source or by an object giving off its own light.]

Disciplinary Ideas
- Understand that objects can be seen if light is available to illuminate them or if they give off their own light.

Science and Engineering Practices
- Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena.

Crosscutting Concepts
- Recognize that simple tests can be designed to gather evidence to support or refute student ideas about causes.

1-PS4-2

Concepts	Students Can...
• Objects can be seen if light is available to illuminate them or if they give off their own light. • Simple tests can be designed to gather evidence to support or refute student ideas about causes.	• Recognize that objects can be seen only when illuminated (from an external light source or by an object giving off its own light) • Make observations to construct an explanation for natural phenomena (light travel) Examples may include: • The need for a light source when in a dark environment • Design simple tests to gather evidence to support or refute ideas about cause

	and effect relationships.

Students will be able to …

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)

[Clarification Statement: Examples of materials could include those that are transparent (such as clear plastic), translucent (such as wax paper), opaque (such as cardboard), and reflective (such as a mirror).] [Assessment Boundary: Assessment does not include the speed of light.]

Disciplinary Ideas

- Understand that some materials allow light to pass through them, others allow only some light through and others block all the light and create a dark shadow on any surface beyond them, where the light cannot reach. Mirrors can be used to redirect a light beam. (Boundary: The idea that light travels from place to place is developed through experiences with light sources, mirrors, and shadows, but no attempt is made to discuss the speed of light.)

Science and Engineering Practices

- Plan and conduct investigations collaboratively to produce data to serve as the basis for evidence to answer a question.

Crosscutting Concepts

- Recognize that simple tests can be designed to gather evidence to support or refute student ideas about causes.

1-PS4-3

Concepts	Students Can...
• Some materials allow light to pass through them, others allow only some light through, and others block all the light. • Mirrors can be used to redirect a light beam. • Simple tests can be designed to gather evidence to support or refute student ideas	• Demonstrate how light travels Examples: ○ some materials allow light to pass through ○ others allow only some light through ○ some materials block all light from passing through • Demonstrate that mirrors can be used to redirect a light beam. • Plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light. Materials can be:

	○ Transparent (clear plastic, glass) ○ Translucent (wax paper, thin cloth) ○ Opaque (cardboard, construction paper) ● Use simple tests (trial and error) to gather evidence to support or refute ideas about cause and effect relationships.

Students will be able to …

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)*

* See Appendix A, K-2 Engineering Design

[Clarification Statement: Examples of devices could include a light source to send signals, paper cup and string "telephones," and a pattern of drum beats.]
[Assessment Boundary: Assessment does not include technological details for how communication devices work.]

Disciplinary Ideas
- ○ Understand that people also use a variety of devices to communicate (send and receive information) over long distances.

Science and Engineering Practices
- ○ Use tools and materials provided to design a device that solves a specific problem.

Crosscutting Concepts N/A

1-PS4-4

Concepts	Students Can...
● People use a variety of devices to communicate (send and receive information) over long distances. ● Tools and materials can be used to design a solution to a problem K-2 Engineering Design includes: ○ Defining the problem ○ Asking questions ○ Making observations ○ Gathering information ○ Designing through sketches/drawings/models ● The shape and stability of structures of	● Understand that people use a variety of devices to communicate over long distances. ● Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance. Examples of devices could include: ○ A light source to send signals ○ Paper cup and string telephones ○ A pattern of drum beats ● Describe how the shape and stability of structures are related to their

natural and designed objects are related to their function(s). (K-2. Engineering Design)	function.(K-2. Engineering Design)

SUGGESTED ACTIVITIES

Light Activities

- Do you need light to see? Observe when you can see and when you cannot see. (Materials: cardboard box with two holes (top and side), flashlight, masking tape) Put flashlight over hole on top, use tape to attach it. Have a partner place a mystery object in the box. Leave the flashlight off. Look through the hole, draw what you see. Turn on the flashlight and look again. Draw what you see. Switch partners.

- Make and observe shadows on a wall with a partner. One partner holds the flashlight, the other partner moves hands in front of the light. Try with the flashlight turned off and see what is different.

- Use flashlights to communicate. Partners need two flashlights. Both flashlights on means yes, one on/one off means no. Partners ask three questions and use the yes/no code to answer.

- https://www.generationgenius.com/videolessons/introduction-to-light-video-for-kids/

Sound Activities

- How can you communicate with sound? Observe how people use telephones to communicate. (Materials: two cups with slits on bottom, string with paper clips attached to each end) Directions: Put a paper clip through the slit in each cup. Hold the two cups apart. Talk softly to your partner. Have your partner listen into the other cup. Then listen while your partner talks softly. Record the messages you heard in your notebook, compare if messages were correct.

- Start the sound unit by going on a sound walk. Create a student worksheet with a T-chart of inside sounds and outside sounds. Go for a walk, recording all of the sounds they hear.

- How can vibrations make sound? Observe how a rubber band vibrates. (Materials: 2 size rubber bands (thick/thin), cardboard box, hand lens) Choose a rubber band. Predict what will happen when you pluck the rubber band. Stretch the rubber band around the box. Pluck the rubber band, use a hand lens to see how it vibrates. Record what you see and hear. Try a thicker or thinner rubber band.

- How can you use sound to make an object vibrate? Observe how the sound of your voice makes a balloon vibrate. (Materials: inflated balloon, paper towel tube) Work with a partner and hold a balloon gently with your fingertips. While your partner talks quietly into one end of a tube, hold the balloon very close to the other end. Observe what you hear, what you feel through the balloon and record what you hear or feel. Switch places and repeat.

- Make a kazoo to discover how vibrations create sounds (pg. 12 & 13) http://www.alvordschools.org/cms/lib8/CA01900929/Centricity/Domain/2616/1st%20Grade%20Teachers%20Guide%20Complete.pdf

- Tuning fork in water to see vibrations (p. 14-16) ttp://www.alvordschools.org/cms/lib8/CA01900929/Centricity/Domain/2616/1st%20Grade%20Teachers%20Guide%20Complete.pdf

- https://www.generationgenius.com/activities/introduction-to-sound-activity-for-kids/

Light and Sound Activities

- Developing a way to communicate “go away” and “come here” with a partner (pg. 41-44) ttp://www.alvordschools.org/cms/lib8/CA01900929/Centricity/Domain/2616/1st%20Grade%20Teachers%20Guide%20Complete.pdf

Unit Specific Vocabulary
blocked: when light or sound is prevented from following a path **clear**: an object that does not block any light, see through **communicate:** passing information from one person to another **light:** something that makes it possible to see objects **opaque**: no light passes through **pluck:** to pull the strings of an object with your fingers **reflect:** when light bounces back **shadow:** a dark place under or beside an object where light is blocked **sound:** something that is heard **translucent**: some light passes through **transparent**: all light passes through **vibrate:** to move quickly back and forth

Instructional Materials and Learning Activities

Core Instructional Materials:

- *National Geographic* Exploring Science
- *National Geographic* My NG connect Exploring Science Digital Resources
- *National Geographic* Exploring Science through Literacy Teacher's Guide
- *Hand2Mind* Exploring Science Hands on Kit
- Science Tech Book

Digital Resources:

- http://sciencespot.net/Pages/refdeskNextGen.html - lesson ideas
- https://jr.brainpop.com/ - light video and sound video
- Magic School Bus: In the Haunted House, Sound is Vibration
- Let There Be Light | Sid the Science Kid | PBS LearningMedia
- https://www.generationgenius.com/

Mentor Texts:

- The Simple Science of Sounds by Emily James -Level P
- All Kinds of Sounds by Marye Gregoire - Level A
- Light Is All Around Us by Wendy Pfeffer- Level K
- What is Sound Energy? by Laura Loria- Level N

Suggested Modifications

These strategies can be adapted to scaffold for students needing more support or extending the learning for higher level students. Differentiation is accomplished through content, process, product, and learning environment.

NGSS Appendix D - "All Standards, All Students": Making the Next Generation Science Standards Accessible to All Students

Special Education Students

- Provide a group of jumbled words, and have students write them in the correct order to ask a question and make a statement. For example, for the group of words, students would write: *Can drums make objects vibrate?* and *Drums can make objects vibrate*.
- Provide sentence stems to help students describe how light interacts with materials.
  For example:
  •*Clear materials…*
  •*Materials that block some light…*
- Physical science word banks for assessments and certain activities
- Preview content vocabulary
- Hands on materials
- Extended time for assignments
- Prompting

- Reassurance and time to formulate ideas
- Visual clues (pictures)
- Preferential seating
- Repeated directions
- Check for understanding
- Ask explicit questions
- Instructional aides in classroom setting
- Peer models
- Social Stories for science routines
- Use of FM system to improve attention and support auditory information
- Behavior chart to increase focus and work completion
- Sensory breaks with timers
- Partner/buddy system

Students at Risk

- Provide a group of jumbled words, and have students write them in the correct order to ask a question and make a statement. For example, for the group of words, students would write: *Can drums make objects vibrate?* and *Drums can make objects vibrate*.
- Provide sentence stems to help students describe how light interacts with materials.
  For example:
  •*Clear materials…*
  •*Materials that block some light…*
- Preview physical science vocabulary
- Response to intervention - targeted skill/goal improvement plans within a set time frame
- Hands on materials
- Sound chips
- Multisensory manipulatives
- Color coding word tracking
- Preferential seating
- Behavior chart to increase focus and work completion
- Sensory breaks with timers
- Small group instruction

English Language Learners

- Provide a group of jumbled words, and have students verbally put them in the correct order to ask a question. For example: *drums/vibrate/can/make/objects (Can drums make objects vibrate?)* Provide a group of jumbled words as shown above, and have students write them in the correct order to ask a question, adding a capital letter and question mark. Provide a group of jumbled words, and have students write them in the correct order to ask a question and make a statement. For example, for the group of words, students would write: *Can drums make objects vibrate?* and *Drums can make objects vibrate*.
- Supply students with the following list of words and phrases associated with light and descriptions of objects illuminated by light: *bright, dim, light up, shine, glow,* and *ray*. Have students with beginning, intermediate, and advanced exposure to English ask themselves if they understand each of these terms as it relates to light. Encourage students to seek assistance for terms that they would

not be comfortable using and clarify them as necessary. Have students keep these terms handy as they describe light and add to their list as they work through the lessons.
- Ask yes/no questions to help students describe how light interacts with materials. For example: Do some materials block a little light? Can you see through materials that block a little light? Use sentence frames to help students describe how light interacts with materials. For example: *When materials block* (*some*) *of the light, you can see through them, but not (clearly)*. Provide sentence stems to help students describe how light interacts with materials.
  For example:
  •*Clear materials…*
  •*Materials that block some light…*
- Preview physical science content vocabulary
- Visual cues (pictures)
- Repeated directions
- Check for understanding
- Ask explicit questions
- Peer models
- English language supports for parents of non English speaking students. *Ex: Teacher created dictionary with* pictures of vibration, sounds, light, reflection with labels *in English and student's first language.*

Gifted and Talented

- Challenge questions
- Higher level thinking about how sound, vibration and light travels and reflects, and about their importance.
- Research sound, vibrations and lights and discuss how they work together
- Leveled readers

Students with 504 Plans

- Provide a group of jumbled words, and have students write them in the correct order to ask a question and make a statement. For example, for the group of words, students would write: *Can drums make objects vibrate?* and *Drums can make objects vibrate*.
- Provide sentence stems to help students describe how light interacts with materials.
  For example:
  •*Clear materials…*
  •*Materials that block some light…*
- Vocabulary picture cards
- Extended time for assignments
- Prompting
- Reassurance and time to formulate ideas
- Visual clues (pictures)
- Preferential seating
- Repeated directions
- Check for understanding
- Ask explicit questions
- Instructional aides in classroom setting

- Peer models
- Frequent breaks during read alouds
- Use of FM system to improve attention and support auditory information
- Behavior chart to increase focus and work completion
- Sensory breaks with timers
- Chromebook extensions

Appendix A
K-2 Engineering Design Standards

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

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

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

Disciplinary Core Ideas

ETS1.A: Defining and Delimiting Engineering Problems

- A situation that people want to change or create can be approached as a problem to be solved through engineering. (K-2- ETS1-1)
- Asking questions, making observations, and gathering information are helpful in thinking about problems. (K-2-ETS1-1)
- Before beginning to design a solution, it is important to clearly understand the problem. (K-2-ETS1-1)

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)

Science and Engineering Practices

Asking Questions and Defining Problems

Asking questions and defining problems in K–2 builds on prior experiences and progresses to simple descriptive questions.

- Ask questions based on observations to find more information about the natural and/or designed world. (K-2- ETS1-1)

** Updated with 2020 NJSLS language

- Define a simple problem that can be solved through the development of a new or improved object or tool. (K-2- ETS1-1)

Developing and Using Models

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

- Develop a simple model based on evidence to represent a proposed object or tool. (K-2-ETS1-2)

Analyzing and Interpreting Data

Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.

- Analyze data from tests of
- an object or tool to determine if it works as intended. (K-2-ETS1-3)

Crosscutting Concepts

Structure and Function

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