Bi-Borough Science Curriculum
Grade One

Developed 2017
In Accordance with New Jersey Student Learning Standards for Science

Oradell Public School District
River Edge Public School District

2017 Science Curriculum Committee
Alice Buttery
Jamie Caruana
Julia Diminich
Michael Hagopian
Denise Kuehner
Kate Langan
Adrienne Spano

TABLE OF CONTENTS

Bi-BOROUGH SCIENCE CURRICULUM - GRADE ONE

UNIT ONE -

Earth & Space Science- Space Systems: Patterns and Cycles

(First Trimester- September, October, November)

INTRODUCTION OF UNIT:

(*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.

NEW JERSEY STUDENT LEARNING STANDARDS

Science

Disciplinary Core Ideas

ESS1.A: The Universe and its Stars

- Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted. (1- ESS1-1)

ESS1.B: Earth and the Solar System

- Seasonal patterns of sunrise and sunset can be observed, described, and predicted. (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)

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)

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)

NEW JERSEY STUDENT LEARNING STANDARDS

Connections to:

Technology **http://www.state.nj.us/education/aps/cccs/tech/**

- **8.1** Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge

- **8.2** Technology Education, Engineering, Design, and Computational Thinking -

  Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

ELA **http://www.state.nj.us/education/aps/cccs/lal/**

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 http://www.state.nj.us/education/cccs/2016/math/standards.pdf

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.

21st Century Life and Careers http://www.state.nj.us/education/aps/cccs/career/

- **9.2.4.A.3** Explain why knowledge and skills acquired in the elementary grades lay the foundation for future academic and career success.
- **9.3.12.AC-DES.2** Use effective communication skills and strategies (listening, speaking, reading, writing and graphic communications) to work with clients and colleagues.
- **9.3.12.ED.1** Apply communication skills with students, parents and other groups to enhance learning and a commitment to learning.

BIG IDEA/COMMON THREAD

Patterns exist within the movement of objects in the sky.

ENDURING UNDERSTANDINGS

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?

ASSESSMENT

- Teacher-created formative assessments, such as:
    - Demonstrated knowledge on charts/graphs/tables regarding:
        - phases of the moon
        - sunrise/sunset
        - star visibility patterns.
- Teacher observations, conferences
- Hands-on lab experiences

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.
    - Our Super Star: This is a three part lesson where students use observations, activities, and videos to learn basic facts about the Sun. Students also model the mechanics of day and night and use solar energy to make a tasty treat. One of the videos is a time-lapse video of a sunrise and a sunset.
    - Observing the Sun: This lesson is an activity where students create a sun tracker and monitor the sun's position over the course of a day. Examples of student journals and connections within a larger unit are provided.

- Students observe, describe, plot and predict some patterns of daylight.
    - Patterns of Daylight:
    - 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.

- 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 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

RESOURCES

Exploring Science, National Geographic

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

Websites:
http://ngss.nsta.org/AccessStandardsByTopic.aspx - The NGSS Standards, by topic
www.discoveryeducation.com - videos and lesson ideas

- https://app.discoveryeducation.com/learn/videos/7ee32245-8548-4771-8f0c-4f79f3d3c2da?hasLocalHost=false
- https://app.discoveryeducation.com/learn/videos/d8b76d38-46f7-462a-942b-7d2605d9b6c4?hasLocalHost=false
- https://app.discoveryeducation.com/builders/boards?assetGuid=65FF3372-A0D0-3B16-7719-B2BA38E5B70C&includeHeader=true&layout=default

www.opened.com - background information for teachers and lesson ideas
http://learningcenter.nsta.org/ - background information for teachers and lesson ideas
http://ngss.nsta.org/Classroom-Resources.aspx - lesson ideas
http://ngss.nsta.org/DisplayStandard.aspx?view=topic&id=6 - lesson ideas
http://sciencespot.net/Pages/refdeskNextGen.html - lesson ideas

MODIFICATIONS

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

http://www.nextgenscience.org/sites/ngss/files/Appendix%20D%20Diversity%20and%20Equity%206-14-13.pdf

Bi-BOROUGH SCIENCE CURRICULUM - GRADE ONE

UNIT TWO -

Life Science- Structure and Function

(Second Trimester- December, January, February, March)

INTRODUCTION OF UNIT:

(*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.

NEW JERSEY STUDENT LEARNING STANDARDS

Science

Disciplinary Core Ideas

LS1.A: Structure and Function

- All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water and air. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow. (1-LS1-1)

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)

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)

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)

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)

NEW JERSEY STUDENT LEARNING STANDARDS

Connections to:

Technology http://www.state.nj.us/education/aps/cccs/tech/

- **8.1** Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.

- **8.2** Technology Education, Engineering, Design, and Computational Thinking -

  Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

ELA http://www.state.nj.us/education/aps/cccs/lal/

Reading- Informational Text

- **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.

Writing

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

Mathematics http://www.state.nj.us/education/cccs/2016/math/standards.pdf

Practices

- **MP.2** Reason abstractly and quantitatively.
- **MP.5** Use appropriate tools strategically.

Number and Operations in Base Ten

- **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 <.

Measurement and Data

- **1.MD.A.1** Order three objects by length; compare the lengths of two objects

indirectly by using a third object.

21st Century Life and Careers http://www.state.nj.us/education/aps/cccs/career/

- **9.2.4.A.3** Explain why knowledge and skills acquired in the elementary grades lay the foundation for future academic and career success.
- **9.3.12.AC-DES.1** Justify design solutions through the use of research documentation and analysis of data.
- **9.3.12.AC-DES.2** Use effective communication skills and strategies (listening, speaking, reading, writing and graphic communications) to work with clients and colleagues.
- **9.3.12.AC-DES.6** Apply the techniques and skills of modern drafting, design, engineering, and construction to projects.

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 UNDERSTANDINGS

- 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?

ASSESSMENT

- Teacher-created formative assessments, such as:
    - Demonstrated knowledge based on charts, labeled diagrams or illustrations (i.e. compare/contrast chart on parents and offspring)
- Teacher observations, conferences
- Hands-on lab experiences

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 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.	• 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: ○ 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.

Students will be able to …

- Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive. (1-LS1-2)

  [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. • Patterns in the natural world can be observed.	• Understand that patterns in behavior of parents and offspring help in survival. 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 offspring. • Read text and use media to determine patterns in the natural world. • 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, and meet their needs. (1-LS1-1) *

  * 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.]

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.	• 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.

● 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.	● 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.

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

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

- 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/

UNIT VOCABULARY

alike- similar to each other

animals- a living thing that is not a plant

different- not the same as another

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

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

RESOURCES

Exploring Science, National Geographic

Supplies: As per lab manuals/resources

Trade books:
Beaks by Sneed B. Collard III
Born in the Wild: Baby Mammals and their Parents by Lita Judge
What Do You Do When Something Wants To Eat You? by Steve Jenkins
What Do You Do With a Tail Like This? by Steve Jenkins
Mr. Seahorse by Eric Carle
From Seed to Plant by Gail Gibbons
Stellaluna by Janell Cannon
Baby on Board: How Animals Carry Their Young by Marianne Berkes

Websites:
http://ngss.nsta.org/AccessStandardsByTopic.aspx - The NGSS Standards, by topic
www.discoveryeducation.com - videos and lesson ideas
https://app.discoveryeducation.com/player/view/assetGuid/0fe7a5cf-15bc-43f9-a2b3-69c184c394cc -lesson on needs of living things
www.opened.com - background information for teachers and lesson ideas
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/

MODIFICATIONS

- Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.
- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate understandings
- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.
- Provide ELL students with multiple literacy strategies.
- Collaborate with after-school programs or clubs to extend learning opportunities.
- Restructure lesson using UDL principles
  http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA
- See NGSS Appendix D
  http://www.nextgenscience.org/sites/ngss/files/Appendix%20D%20Diversity%20and%20Equity%206-14-13.pdf

Bi-BOROUGH SCIENCE CURRICULUM - GRADE ONE

UNIT THREE -

Physical Science- **Waves: Light and Sound**

(Third Trimester- March, April, May, June)

INTRODUCTION OF UNIT:

(*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 drumbeats.
- 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.

NEW JERSEY STUDENT LEARNING STANDARDS

Science

Disciplinary Core Ideas

PS4.A Wave Properties

- Sound can make matter vibrate, and vibrating matter can make sound. (1-PS4-1)

PS4.B Electromagnetic Radiation

- Objects can be seen if light is available to illuminate them or if they give off their own light. (1-PS4-2)
- Some materials allow light to pass through them, others allow only some light through and others block all 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)

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)

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)

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)

NEW JERSEY STUDENT LEARNING STANDARDS

Connections to:

Technology http://www.state.nj.us/education/aps/cccs/tech/

- **8.1** Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
- **8.2** Technology Education, Engineering, Design, and Computational Thinking -

  Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

ELA http://www.state.nj.us/education/aps/cccs/lal/

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

- **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.

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 **http://www.state.nj.us/education/cccs/2016/math/standards.pdf**

Mathematical Practices

- **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.

21st Century Life and Careers http://www.state.nj.us/education/aps/cccs/career/

- **9.2.4.A.3** Explain why knowledge and skills acquired in the elementary grades lay the foundation for future academic and career success.
- **9.3.12.AC-DES.1** Justify design solutions through the use of research documentation and analysis of data.
- **9.3.12.AC-DES.2** Use effective communication skills and strategies (listening, speaking, reading, writing and graphic communications) to work with clients and colleagues.
- **9.3.12.AC-DES.6** Apply the techniques and skills of modern drafting, design, engineering, and construction to projects.

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 UNDERSTANDINGS

- 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?

ASSESSMENT

- Teacher-created formative assessments, such as:
    - Science notebook entries, observations, data recordings
- Teacher observations, conferences
- Hands-on lab experiences

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: ◦ Plucking a stretched rubber band as opposed to a non-stretched rubber band to see which one will make a sound	• 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 ◦ 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 natural and designed objects are related to their function(s). (K-2. Engineering Design)	• 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 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.

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

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 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

RESOURCES

Exploring Science, National Geographic

Supplies: As per lab manuals

Trade books:
Flashlight by Lizi Boyd
My Five Senses by Aliki
All About Sound by Lisa Trumbauer
All About Light by Lisa Trumbauer
Fireflies by Julie Brinkloe
Sounds All Around by Wendy Pfeffer
Light is All Around Us by Wendy Pfeffer
Nothing Sticks Like a Shadow by Ann Tompert
Shadows by Caroline B. Otto
Whose Shadow Is This?: A Look at Animal Shapes - Round, Long, and Pointy by Claire Berge, Derrick Alderman (Illustrator), Denise Shea (Illustrator)
Sound: Loud, Soft, High, and Low by Natalie M. Rosinsky

Videos:
Magic School Bus: In the Haunted House, Sound is Vibration
Sid The Science Kid: Let There Be Light
https://nj.pbslearningmedia.org/resource/47861fd4-683a-4924-b490-3d53055309af/47861fd4-683a-4924-b490-3d53055309af/#.WP-QVWXDOII

Websites:
http://ngss.nsta.org/AccessStandardsByTopic.aspx - The NGSS Standards, by topic
www.discoveryeducation.com - videos and lesson ideas
www.opened.com - background information for teachers and lesson ideas
https://concord.org/stem-resources - online simulations (requires Java)
http://ngss.nsta.org/Classroom-Resources.aspx - lesson ideas
http://sciencespot.net/Pages/refdeskNextGen.html - lesson ideas
https://jr.brainpop.com/ - light video and sound video

MODIFICATIONS

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

  http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA
- See NGSS Appendix D

  http://www.nextgenscience.org/sites/ngss/files/Appendix%20D%20Diversity%20and%20Equity%206-14-13.pdf

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 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)
- 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)