Science- Grade 1		
Unit # 1	**Title:** Patterns of Change in the Sky	**Pacing:** 15 days

Stage 1- Desired Results

Established Goals/NJSLS Standards

Next Generation Science Standards/NJSLS:

ESS1:1 The Universe and Its Stars

- **Use observations of the sun, moon, and stars to describe patterns that can be predicted.** *[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 stars being seen at night and not during the day.*]* **(1-ESS1-1)**

ESS1:B Earth and the Solar System

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

Enduring Understandings ***Students will understand…***	**Essential Questions** ***Students will consider...***
ESS1:A The Universe and Its Stars ● Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. **ESS1: B Earth and the Solar System** ● Seasonal patterns of sunrise and sunset can be observed, described, and predicted.	● What patterns of change can be predicted when observing the sun, moon, and stars? ● What is the relationship between the amount of daylight and the time of year?

Knowledge ***Students will know…***	**Academic Vocabulary**
• Science assumes that natural events happen today as they happened in the past. • Many events are repeated. • Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. • Patterns in the motion of the sun, moon, and stars in the sky can be observed, described, and predicted. • Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. • Seasonal patterns of sunrise and sunset can be observed, described, and predicted.	• Compare • Day • Earth • Effect • Model • Moon • Patterns • Phases • Night • Noon • Observation • Rotation • Orbit • Stars • Season • Shadow • Gravity • Sunrise • Sunset • Daylight • Evidence • Data

Skills

Students will be able to…

- Observe and use patterns in the natural world as evidence and to describe phenomena.
- Make observations (firsthand or from media) to collect data that can be used to make comparisons.
- Make observations at different times of the year to relate the amount of daylight to the time of year. *(Note: The emphasis is on relative comparisons of the amount of daylight in the winter to the amount in the spring or fall; assessment is limited to relative amounts of daylight, not to quantifying the hours or time of daylight.)*

21ST Century/ Interdisciplinary Themes	**21st Century Skills**
Global Awareness Financial, Business, & Entrepreneurial Literacy Civic Literacy Environmental Literacy Health Literacy	**Creativity & Innovation** **Communication & Collaboration** **Media Literacy** **Critical Thinking & Problem Solving** **Information Literacy** **Information, Communication, & Technology** **Life & Career Skills**

Stage 2- Assessment Evidence
from the NJ DOE Model Curriculum

Can we predict how the sky will change over time?

In this unit of study, students observe, describe, and predict some patterns in the movement of objects in the sky. The crosscutting concept of *patterns* is called out as an organizing concept for the disciplinary core ideas. Students are expected to demonstrate grade-appropriate proficiency in *planning and carrying out investigations* and *analyzing and interpreting data*. Students are also expected to use these practices to demonstrate understanding of the core ideas.

Summative Assessment 1

Standard: **Use observations of the sun, moon, and stars to describe patterns that can be predicted.** *[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 stars being seen at night and not during the day.]* **(1-ESS1-1)**

Assessment: Students will create an informational poster describing the patterns of the sun, moon and based upon their observations.

Summative Assessment 2

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

Assessment: Students will create a booklet of their observations of the amount of daylight throughout the seasons.

Formative Assessments	*Student Self-Assessment*	*Common Assessments*
● Pre-assessments ● Labs ● Project and problem-based learning activities ● Graphic organizers ● Short research projects ● Collaborative learning projects ● Formative checks (whiteboards, T/F, vote with your feet, thumbs up or thumbs down) ● Summary Diagrams ● Open ended responses ● Short responses ● Conferencing	● Reflection activities (on the learning scale, on the daily target, on labs, on summative assessments, on collaborative work, on projects) ● Responses to inquiry-based questions ● Think-pair-share activities ● Student revising knowledge throughout the unit	● Summative Assessments

Stage 3- Learning Plan

Suggested Learning Activities

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. Grade 1 students are expected to make relative comparisons of the amount of daylight from one season to the next, and assessment should be limited to relative amounts of daylight, not quantifying the hours or time of daylight.

https://docs.google.com/document/d/12PfCjAa6rKhyZzz10-ANrMGv59lDb89mlmJ3meNwGWY/edit

Resources/Instructional Materials
(articles, novels, websites, books, magazines, art, media)

- The Dynamic Trio: In this lesson, students will learn about the stars, planets, and moons found in our solar system and how they relate to one another. The video segment enhances the learning. After a non-fiction read aloud, students work in groups to create models of the Solar System.
- Our Super Star: This is a three part lesson where students use observations, activities, and videos to learn basic facts about the Sun. Students also model the mechanics of day and night and use solar energy to make a tasty treat. One of the videos is a time-lapse video of a sunrise and a sunset.
- Keep a Moon Journal: The National Wildlife Federation's "Keep a Moon Journal" page allows students to get acquainted with the phases of the moon by keeping a moon journal to record their nightly observations for one month. The page has links to diagrams, a student printable, and activities connecting the journal to other content. The page is set up as a "family activity" and could be used as nightly homework for students then discussed weekly in class.
- Patterns of Daylight: This is a mini-unit that can be taught directly after Space Part 1or independently. The author chose to teach the Space Part 1 unit (also available on Better Lesson! at http://betterlesson.com/lesson/613469/introduction-and-pre-assessment) during January, and follows up at the end of the year in a recap in May. This lesson uses prior student knowledge and a video simulation.
- Observing the Sun: This lesson is an activity where students create a sun tracker and monitor the sun's position over the course of a day. Examples of student journals and connections within a larger unit are provided.
- **Teaching NGSS in Elementary School—First Grade:** The presenters were Carla Sembal-Saul, Professor of Science Education at Penn State University, Mary Starr, Executive Director at Michigan Mathematics and Science Centers Network, and Kathy Renfrew, K-5 Science Coordinator, VT Agency of Education and NGSS Curator introduced the *NGSS* Web seminar Series for K-5 educators. After a brief overview of this *NGSS* for First Grade web seminar, Mary discussed the science and engineering practices in relation to teaching first grade. The web seminar focused on the concept of sound, and how performance expectations should be incorporated into teaching. Sound was further considered as a disciplinary core idea within first grade teaching. Participants viewed a video of a teacher supporting students in developing towards the performance expectations. The science and engineering practices of explanation and argument was considered within the lesson presented. Claim, evidence, reasoning and rebuttal were discussed, and a CER framework was shared. Carla introduced the KLEWS chart and discussed its use in an elementary classroom. Kathy shared the importance of classroom discourse and science talk. The web seminar closed with the sharing of resources in relation to the NGSS and teaching K-5 grades. Ted, in closing, shared NSTA resources in relation to the NGSS.
- **NSTA Web Seminar: Teaching NGSS in K-5: Constructing Explanations from Evidence:** Carla Zembal-Saul, Mary Starr, and Kathy Renfrew, provided an overview of the *NGSS* for K-5th grade. The web seminar focused on the three dimensional learning of the *NGSS*, while introducing CLAIMS-EVIDENCE-REASONING (CER) as a framework for introducing explanations from evidence. The presenters highlighted and discussed the importance of engaging learners with phenomena, and included a demonstration on using a KLEWS chart to map the development of scientific explanations of those phenomena.
- **NGSS *Core* Ideas: Earth's Place in the Universe:** The presenter was Julia Plummer from Penn State University. The program featured strategies for teaching about Earth science concepts that answer questions such as "What goes on in stars?" and "What patterns are caused by Earth's movements in the solar system?" Dr. Plummer began the presentation by discussing what students should know about the disciplinary core idea of Earth's Place in the Universe. She talked about using the scientific and engineering practices to help engage students. Participants shared their ideas about applying this core idea to the classroom, and then Dr. Plummer shared strategies for effective instruction. She also discussed the importance of spatial thinking for students to begin thinking scientifically about these concepts.

Technology Resources

- www.brainpopjr.com
- http://www.sunrisesunset.com/usa/New_Jersey.asp
- www.kidastronomy.org
- www.optics4kids.org
- https://www.nasa.gov/mission_pages/hubble/main/index.html
- http://sciencenetlinks.com/lessons/sky-1-objects-in-the-sky/
- www.abetterlesson.com
- http://www.sciencepoems.net/sciencepoems/sun.aspx#.U9hJSONdXng
- https://www.youtube.com/watch?v=KGs6c7luHXM (Bill Nye, The Sun)
- https://www.timeanddate.com/moon/ (Moonrise and Moonset Calculator)
- https://www.youtube.com/watch?v=yhXlUUfxoZk (Sun, Stars, Moon Time-Lapse)
- http://www.moongiant.com/

Accommodations & Modifications

for Spec. Ed., ELL, GT, & At Risk Students

- Allow oral responses
- Allow verbalization before writing
- Use audio materials when necessary
- Modify homework assignments
- Read tests aloud
- Provide math manipulatives as necessary
- Restate, reword, clarify directions
- Re-teach concepts using small groups
- Provide educational "breaks" as necessary
- Expanding time for free reading
- Chunking Content
- Calculator
- Use mnemonic devices
- Provide a cueing system
- Untimed and/or extended test taking time
- Shorten assignments to focus on mastery concept
- Leveled Reading Materials
- Acronyms
- Graphic Organizers
- Notes Provided
- Check agenda book for parent(s) communication
- Read directions aloud
- Assignment, Project, and Assessment Modification Based on Individual Student Needs
- Speech to Text/Text to Speech Features in Google Apps
- Technology assisted instruction
- Preferential seating utilized
- Redirect student(s) as necessary
- Student choice for project or approach to assignment
- Inquiry-Based Learning
- Genius Hour

Adapted from: Wiggins, Grant and J. McTighe. (1998). *Understanding by Design*, Association for Supervision and Curriculum Development and 5E NGSS Lesson Plan from www.lewiscenter.org and NJ Science Model Curriculum athttp://www.nj.gov/education/modelcurriculum/sci/7.shtml

Science- Grade 1		
Unit # 2	**Title:** Characteristics of Living Things	**Pacing:** 15 days

Stage 1- Desired Results

Established Goals/NJSLS Standards

Next Generation Science Standards/NJSLS

1-LS3-1: Inheritance of Traits

- **Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.** *[Clarification Statement: Patterns are the similarities and differences in traits shared between offspring and their parents, or among siblings. Emphasis is on organisms other than humans.]* [Assessment Boundary: Assessment does not include genetic mechanisms of inheritance and prediction of traits. Assessment is limited to non-human examples.*]* **(1-LS3-1)**

1-LS1-2: Growth and Development of Organisms

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

Enduring Understandings ***Students will understand…***	**Essential Questions** ***Students will consider...***
LS3.A: Inheritance of Traits ● Many characteristics of organisms are inherited from their parents. (3:LS3.1) **LS3.B: Growth and Development of Organisms** ● Adult plants and animals can have young. In many kinds of animals, parents and their offspring themselves engage in behaviors that help the offspring to survive. (1:LS1.2)	● How are young plants and animals alike and different from their parents? ● What types (patterns) of behavior can be observed among parents that help offspring survive?

Knowledge *Students will know…*	Academic Vocabulary
• Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. • Individuals of the same kind of plant or animal are recognizable as similar but can also vary in many ways. • Young animals are very much, but not exactly, like their parents. Plants also are very much, but not exactly, like their parents.	• Parent • Pattern • Plants • Survive • Trait • Adaptation • Animals • Behavior • Habitat • Growth • Needs • Offspring • Phenomena • Similar • External

Skills

Students will be able to…

- Observe and use patterns in the natural world as evidence and to describe phenomena.
- Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena.
- Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.
    - Examples of patterns could include features plants or animals share.
    - Examples of observations could include that leaves from the same kind of plant are the same shape but can differ in size and that a particular breed of puppy looks like its parents but is not exactly the same.
- *[Note: Assessment does not include inheritance or animals that undergo metamorphosis or hybrids.]*

21ST Century/ Interdisciplinary Themes	21st Century Skills
Global Awareness Financial, Business, & Entrepreneurial Literacy Civic Literacy Environmental Literacy **Health Literacy**	**Creativity & Innovation** **Communication & Collaboration** **Media Literacy** **Critical Thinking & Problem Solving** **Information Literacy** **Information, Communication, & Technology** **Life & Career Skills**

Stage 2- Assessment Evidence
from the NJ DOE Model Curriculum

In this unit of study, students develop an understanding of how plants and animals use their external parts to help them survive, grow, and meet their needs, as well as how the behaviors of parents and offspring help offspring survive. The understanding that young plants and animals are like, but not exactly the same as, their parents is developed. The crosscutting concept of patterns is called out as an organizing concept for the disciplinary core ideas. Students are expected to demonstrate grade-appropriate proficiency in obtaining, evaluating, and communicating information and constructing explanations. Students are also expected to use these practices to demonstrate understanding of the core ideas.

Summative Assessment 1:

Standard: **Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.** *[Clarification Statement: Patterns are the similarities and differences in traits shared between offspring and their parents, or among siblings. Emphasis is on organisms other than humans.] [*Assessment Boundary: Assessment does not include genetic mechanisms of inheritance and prediction of traits. Assessment is limited to non-human examples.*]* **(1-LS3-1)**

Assessment: Using their data from their science journals, students will create an oral presentation about how plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.

Summative Assessment 2

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

Assessment: Through exploration my students will discover that animals can have babies and in many kinds of animals, parents and the offspring themselves engage in behaviors that help the offspring to survive. For the assessment, students will research the best animal parents and write a research piece to state their opinion.

Formative Assessments	*Student Self-Assessment*	*Common Assessments*
● Pre-assessments ● Labs ● Project and problem-based learning activities ● Graphic organizers ● Short research projects ● Collaborative learning projects ● Formative checks (whiteboards, T/F, vote with your feet, thumbs up or thumbs down) ● Summary Diagrams ● Open ended responses ● Short responses ● Conferencing	● Reflection activities (on the learning scale, on the daily target, on labs, on summative assessments, on collaborative work, on projects) ● Responses to inquiry-based questions ● Think-pair-share activities ● Student revising knowledge throughout the unit	● Summative Assessments

Stage 3- Learning Plan

Suggested Learning Activities

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.

https://docs.google.com/document/d/1JTNtC6tIOaDua1jN5cvij5HNwWkJmVDfJdcZf6ycOOo/edit

Resources/Instructional Materials

(articles, novels, websites, books, magazines, art, media)

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

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

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

Resources/Instructional Materials Continued

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

- **Teaching *NGSS* in K-5: Constructing Explanations from Evidence:** Carla Zembal-Saul, Mary Starr, and Kathy Renfrew, provided an overview of the NGSS for K-5th grade. The web seminar focused on the three dimensional learning of the NGSS, while introducing CLAIMS-EVIDENCE-REASONING (CER) as a framework for introducing explanations from evidence. The presenters highlighted and discussed the importance of engaging learners with phenomena, and included a demonstration on using a KLEWS chart to map the development of scientific explanations of those phenomena.

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

Technology Resources

- www.unitedstreaming.com
- www.brainpopjr.com
- www.betterlesson.com
- https://www.kidsdiscover.com/teacherresources/baby-animals-science-lesson/ (Animal Traits)
- https://nj.pbslearningmedia.org/collection/inheritance-traits-of-animals/#.WXYky9Tyu1s (Inheritance & Traits of Animals)
- https://www.youtube.com/watch?v=xgf7bHHR6Bs (Ultimate Animal Moms)

Accommodations & Modifications
for Spec. Ed., ELL, GT, & At Risk Students

- Allow oral responses
- Allow verbalization before writing
- Use audio materials when necessary
- Modify homework assignments
- Read tests aloud
- Provide math manipulatives as necessary
- Restate, reword, clarify directions
- Re-teach concepts using small groups
- Provide educational “breaks” as necessary
- Expanding time for free reading
- Chunking Content
- Calculator
- Use mnemonic devices
- Provide a cueing system
- Untimed and/or extended test taking time
- Shorten assignments to focus on mastery concept
- Leveled Reading Materials
- Acronyms
- Graphic Organizers
- Notes Provided
- Check agenda book for parent(s) communication
- Read directions aloud
- Assignment, Project, and Assessment Modification Based on Individual Student Needs
- Speech to Text/Text to Speech Features in Google Apps
- Technology assisted instruction
- Preferential seating utilized
- Redirect student(s) as necessary
- Student choice for project or approach to assignment
- Inquiry-Based Learning
- Genius Hour

Science- Grade 1		
Unit # 3	**Title:** Mimicking Organisms to Solve Problems	**Pacing:** 25 days

Stage 1- Desired Results

Established Goals/NJSLS Standards

Next Generation Science Standards/NJSLS:

LS1.A: Structure and Function

- **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.*** *[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.]* **(1-LS1-1)**

K-2-ETS1-2: Engineering and Design

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

Enduring Understandings ***Students will understand…***	**Essential Questions** ***Students will consider...***
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)	● How can humans mimic how plants and animals use their external parts to help them survive and grow?

Knowledge ***Students will know…***	**Academic Vocabulary**
● Every human-made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world. ● The shape and stability of structures of natural and designed objects are related to their function(s). ● 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. ● 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. ● 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.	● Adaptation ● Animals ● Behavior ● Habitat ● Growth ● Needs ● Offspring ● Mimic ● Parent ● Pattern ● Plants ● Survive ● Trait ● External ● Qualitative ● Quantitative ● Engineering Solutions

Skills

Students will be able to…

- Observe and describe how the shape and stability of structures of natural and designed objects are related to their functions.
- Use materials to design a device that solves a specific problem or [design] a solution to a specific problem.
- Use materials 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: 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.
    - Detecting intruders by mimicking eyes and ears.
- Develop a simple model based on evidence to represent a proposed object or tool.
- 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.

21ST Century/ Interdisciplinary Themes	21st Century Skills
Global Awareness Financial, Business, & Entrepreneurial Literacy Civic Literacy **Environmental Literacy** Health Literacy	**Creativity & Innovation** **Communication & Collaboration** **Media Literacy** **Critical Thinking & Problem Solving** **Information Literacy** **Information, Communication, & Technology** **Life & Career Skills**

Stage 2- Assessment Evidence
from the NJ DOE Model Curriculum

In this unit of study, students develop an understanding of how plants and animals use their parts to help them survive, grow, and meet their needs. Students also need opportunities to develop possible solutions. As students develop possible solutions, one challenge will be to keep them from immediately implementing the first solution they think of and to instead think through the problem carefully before acting. Having students sketch their ideas or make a physical model is a good way to engage them in shaping their ideas to meet the requirements of the problem. The crosscutting concept of structure and function is called out as an organizing concept for the disciplinary core ideas. Students are expected to demonstrate grade-appropriate proficiency in constructing explanations, designing solutions, and in developing and using models. Students are expected to use these practices to demonstrate understanding of the core ideas.

Summative Assessment 1

Standard: **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.*** *[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.]* **(1-LS1-1)**

Assessment: The students will use materials to design a solution to the question, " How can humans safely climb rocks or trees and which plant part would you mimic to create and design safety equipment?"

Summative Assessment 2

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

Assessment: The students will create an illustration of their Engineering Design Process for the question, " How can humans safely climb rocks or trees and which plant part would you mimic to create and design safety equipment?"

Formative Assessments	*Student Self-Assessment*	*Common Assessments*
• Pre-assessments • Labs • Project and problem-based learning activities • Graphic organizers • Short research projects • Collaborative learning projects • Formative checks (whiteboards, T/F, vote with your feet, thumbs up or thumbs down) • Summary Diagrams • Open ended responses • Short responses • Conferencing	• Reflection activities (on the learning scale, on the daily target, on labs, on summative assessments, on collaborative work, on projects) • Responses to inquiry-based questions • Think-pair-share activities • Student revising knowledge throughout the unit	• Summative Assessments

Stage 3- Learning Plan

Suggested Learning Activities

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.

Suggested Learning Activities Continued

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.

Use materials to create the design solution.

Share the design solution with others in the class.

https://docs.google.com/document/d/1k10T61dOUql82-q8expRtGg7_aiamLDRF8P_8f1bxMk/edit

Resources/Instructional Materials
(articles, novels, websites, books, magazines, art, media)

- Jack and the Beanstalk
- Non-fiction life cycle texts
- Janet Steven's book, Tops and Bottoms
- Plant Secrets by Emily Goodman
- Leaves by David Ezra Stein
- Eat Like a Bird! January: This lesson and activity is one of several lessons about birds. In this lesson, students learn that bird beaks come in many different sizes and shape. Each beak has a specific shape and function to help the bird to get and eat food.
- Why So Yummy: In this lesson students will investigate how fruits help some plants survive. The background information is important to the overall goals of this lesson. It states, "fruit-bearing plants can be distinguished from other plants, because they contain a reproductive structure that develops into an edible fruit. This reproductive structure is the shelter that protects the seeds until they are mature. This is important, because seeds are not distributed to the earth for germination until they are ripe." The teacher will need to purchase some fruits ahead of time for this lesson. Identifying a variety of e.fruits and especially fruits children might have less experience with will enhance the experience.
- **Connections Between Practices in *NGSS*, Common Core Math, and Common Core ELA**: The presenter was Sarah Michaels from Clark University. In this seminar Dr. Michaels talked about connecting the scientific and engineering practices described in A Framework for K–12 Science Education with the Common Core State Standards in Mathematics and English Language Arts.

Resources/Instructional Materials Continued

- **Engineering Design as a Core Idea:** The presenter was Cary Sneider, Associate Research Professor at Portland State University in Portland, Oregon. The seminar focused on the Core Idea of Engineering, led by Cary Sneider, Associate Research Professor at Portland State University. Cary explained the overall *NGSS* engineering components for K-2, MS and HS, and went through a number of practical examples of how teachers could develop modules and investigations for their students to learn them. Cary also spoke about the ways in which teachers could include cross-cutting engineering concepts to a number of classroom subjects. The seminar concluded with an overview of NSTA resources about *NGSS* available to teachers by Ted, and a Q & A session with Cary.
- **NGSS Core Ideas: From Molecules to Organisms: Structures and Processes:** The presenters were Aaron Rogat of Educational Testing Service (ETS) and Barbara Hug of the University of Illinois at Urbana-Champaign. The program featured strategies for teaching about life science concepts that answer questions such as "How do the structures of organisms enable life's functions?" and "How do organisms grow and develop?" Dr. Hug began the presentation by discussing the arrangement of life science core ideas within NGSS and comparing them to previous standards. Next, Dr. Rogat shared an example of a learning progression, showing how a concept can be taught from early elementary through high school. The presenters then talked about strategies for instruction and shared links to resources. Participants had the opportunity to submit their questions and comments in the chat.

Technology Resources

- https://jr.brainpop.com
- https://www.speakaboos.com/story/jack-and-the-beanstalk (Jack and the Beanstalk story)
- https://www.nationalgeographic.org/education/explorer-magazine/resources/ (National Geographic)
- https://betterlesson.com/lesson/636845/what-makes-a-root (time-lapse video on roots)
- https://www.youtube.com/watch?v=SPPrvrnzf8Q (Bill Nye on plants)
- https://www.youtube.com/watch?v=9mPwXC_ep4k (All about Leaves)
- https://www.youtube.com/watch?v=i4Nd4LPFxBU (Leaves and their Function)
- www.unitedstreaming.com

Accommodations & Modifications
for Spec. Ed., ELL, GT, & At Risk Students

- Allow oral responses
- Allow verbalization before writing
- Use audio materials when necessary
- Modify homework assignments
- Read tests aloud
- Provide math manipulatives as necessary
- Restate, reword, clarify directions
- Re-teach concepts using small groups
- Provide educational “breaks” as necessary
- Expanding time for free reading
- Chunking Content
- Calculator
- Use mnemonic devices
- Provide a cueing system
- Untimed and/or extended test taking time
- Shorten assignments to focus on mastery concept
- Leveled Reading Materials
- Acronyms
- Graphic Organizers
- Notes Provided
- Check agenda book for parent(s) communication
- Read directions aloud
- Assignment, Project, and Assessment Modification Based on Individual Student Needs
- Speech to Text/Text to Speech Features in Google Apps
- Technology assisted instruction
- Preferential seating utilized
- Redirect student(s) as necessary
- Student choice for project or approach to assignment
- Inquiry-Based Learning
- Genius Hour

Science- Grade 1

Unit # 4	**Title:** Light and Sound	**Pacing:** 20 days

Stage 1- Desired Results

Established Goals/NJSLS Standards

Next Generation Science Standards/NJSLS

PS4: Electromagnetic Radiation

- **Make observations to construct an evidence-based account that objects in darkness can be seen only when illuminated.** *[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.]* (1-PS4-2)
- **Plan and conduct investigations to determine the effect of placing objects made with different materials in the path of a beam of light.** *[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.]* (1-PS4-3)

PS4: Wave Properties

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

Enduring Understandings ***Students will understand…***	**Essential Questions** ***Students will consider...***
PS4.A: Wave Properties ● Sound can make matter vibrate, and vibrating matter can make sounds. (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 other 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)	● How can you prove that you can only see something when someone shines a light on it or if the object gives off its own light? ● What happens to a beam of light when you put different kinds of things in front of it? ● How would you design an experiment to prove your thinking? ● How do instruments (band) make sound?

Knowledge ***Students will know…***	**Academic Vocabulary**
● Simple tests can be designed to gather evidence to support or refute student ideas about causes. ● 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. ● 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.)* ● 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 about causes.	● illuminate ● reflective ● retraction ● shadows ● transparent ● translucent ● opaque ● vibration ● cause and effect ● communicate ● device ● pitch ● volume ● sound wave

Skills

Students will be able to…

- Design simple tests to gather evidence to support or refute ideas about cause and effect relationships.
- Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena.
- Make observations (e.g., in a completely dark room, using a pinhole box, using video of a cave explorer with a flashlight) to construct an evidence-based account that objects can be seen only when illuminated (from an external light source or by an object giving off its own light).
- Design simple tests to gather evidence to support or refute ideas about cause and effect relationships.
- Plan and conduct investigations collaboratively to produce data to serve as the basis for evidence to answer a question.
- 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)
    - Reflective (a mirror, a shiny metal spoon)
- Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.
- 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.

21ST Century/ Interdisciplinary Themes	21st Century Skills
Global Awareness Financial, Business, & Entrepreneurial Literacy Civic Literacy Environmental Literacy **Health Literacy**	**Creativity & Innovation** **Communication & Collaboration** **Media Literacy** **Critical Thinking & Problem Solving** **Information Literacy** **Information, Communication, & Technology** **Life & Career Skills**

Stage 2- Assessment Evidence
from the NJ DOE Model Curriculum

In this unit of study, students develop an understanding of the relationship between sound and vibrating materials as well as between the availability of light and the ability to see objects. The idea that light travels from place to place can be understood by students at this level by placing objects made with different materials in the path of a beam of light and determining the effect of the different materials.

The crosscutting concept of *cause and effect* is called out as an organizing concept for the disciplinary core ideas. Students are expected to demonstrate grade-appropriate proficiency in *planning and carrying out investigations*, *constructing explanations*, and *designing solutions*. Students are also expected to use these practices to demonstrate understanding of the core ideas.

Summative Assessment 1

Standard: **Make observations to construct an evidence-based account that objects in darkness can be seen only when illuminated.** *[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.]* **(1-PS4-2)**

Assessment: Students are given a closed shoe box with a hole on one end. There is a drawing inside. The students will put their eye up to the hole, and block all light and cannot see the drawing. They will answer the questions using their assessment sheet, "Why can't you see what's inside? What's in the shoe box?" They will open the flap and look. Since they are no longer blocking the light, students can see the drawing. On the assessment sheet, they will answer the question, “Why were you able to see the picture once you opened the flap?”

Summative Assessment 2

Standard: **Plan and conduct investigations to determine the effect of placing objects made with different materials in the path of a beam of light.** ***[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.]*** **(1-PS4-3)**

***Assessment*:** Using flashlights, students will plan and conduct an investigation to determine the effect of what happens to each material when placed in the path of a beam of light.

Summative Assessment 3

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

Assessment: Students will plan and conduct investigations to show not only that vibrations make sound, but also that sound makes vibrations. The students will rotate between stations to conduct their experiment. The four stations are: Tuning forks and cups of water//Drums with paper and a few beans or math counters//Stretched strings (a classic tissue box guitar)//Voice-boxes-- no supplies necessary

Formative Assessments	***Student Self-Assessment***	***Common Assessments***
● Pre-assessments ● Labs ● Project and problem-based learning activities ● Graphic organizers ● Short research projects ● Collaborative learning projects ● Formative checks (whiteboards, T/F, vote with your feet, thumbs up or thumbs down) ● Summary Diagrams ● Open ended responses ● Short responses ● Conferencing	● Reflection activities (on the learning scale, on the daily target, on labs, on summative assessments, on collaborative work, on projects) ● Responses to inquiry-based questions ● Think-pair-share activities ● Student revising knowledge throughout the unit	● Summative Assessments

Stage 3- Learning Plan

Suggested Learning Activities

In this unit of study, students plan and conduct investigations and make observations as they explore sound 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.

Suggested Learning Activities Continued

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.

https://docs.google.com/document/d/1AbaLv7mabNVnWUC_hFXK34xnonPEiHv6BjBPlM1L-fo/edit

Resources/Instructional Materials

(articles, novels, websites, books, magazines, art, media)

- **NSTA Web Seminar: *NGSS Core Ideas: Waves and Their Applications in Technologies for Information Transfer*** This web seminar took place on September 24, 2013, from 6:30 p.m. to 8:00 p.m. eastern daylight time. The presenter was Ramon Lopez from the University of Texas at Arlington. The program featured strategies for teaching about physical science concepts that answer questions such as "How are waves used to transfer energy and information?" and "How are instruments that transmit and detect waves used to extend human senses?" The web seminar is available at: http://learningcenter.nsta.org/resource/?id=10.2505/9/WSNGSS13_Oct22
- **Science Shorts: Making Waves** Children do not have to live near the coast to experience effects of water waves. They can throw stones into a pond and see the waves ripple outward, bob up and down while floating in a swimming pool, and splash water about while in a bathtub. As students discover how waves form and move, they can apply this understanding to other types of waves such as sound waves, light waves, and microwaves. (Adams, B., 2007) This journal article is available at: http://learningcenter.nsta.org/resource/?id=10.2505/4/sc07_044_05_50
- **NSTA Web Seminar: Teaching *NGSS* in K-5: Constructing Explanations from Evidence** Carla Zembal-Saul, Mary Starr, and Kathy Renfrew, provided an overview of the *NGSS* for K-5th grade. The web seminar focused on the three dimensional learning of the *NGSS*, while introducing CLAIMS-EVIDENCE-REASONING (CER) as a framework for introducing explanations from evidence. The presenters highlighted and discussed the importance of engaging learners with phenomena, and included a demonstration on using a KLEWS chart to map the development of scientific explanations of those phenomena. The web seminar is available at: http://learningcenter.nsta.org/products/symposia_seminars/NGSS/webseminar49.aspx
- Paul Shower's, The Listening Walk
- Why do Mosquitoes Buzz in People's Ears by Verna Aardema
- The Ear Book by Al Perkins
- Ears Are for Hearing by Paul Showers
- How Does the Ear Hear? or Now Hear This by Melissa Stewart

Technology Resources

- www.betterlesson.com
- www.brainpopjr.com
- www.unitedstreaming.com
- https://youtu.be/HMXoHKwWmU8 (How Your Ears Work)
- https://youtu.be/p3Oy4lodZU4 (Ear Anatomy | Inside the ear | 3D Human Ear animation video | Biology | Elearnin)
- https://www.nationalgeographic.org/education/explorer-magazine/resources/ (National Geographic)
- https://www.youtube.com/watch?v=ACeUO4ufx2I (Bill Nye - Sound Travels in Waves)
- https://www.youtube.com/watch?v=gdGyvGPZ1G0 (What is Sound? | The Dr. Binocs Show | Learn Videos For Kids)
- https://www.youtube.com/watch?v=d7yTlp4gBTI (Light | The Dr. Binocs Show | Learn Videos For Kids)
- http://soundsense.ca/Kids/HowDoWeHear/tabid/198/language/en-US/Default.aspx (Sound Sense)
- http://kidshealth.org/en/kids/ears.html (Your Ears)
- http://www.sciencekids.co.nz/gamesactivities/lightshadows.html (Science Games for Kids)
- https://youtu.be/EAQxNVQF_I0 (Hand Shadow - Raymond Crowe at Royal Variety Show)

Accommodations & Modifications

for Spec. Ed., ELL, GT, & At Risk Students

- Allow oral responses
- Allow verbalization before writing
- Use audio materials when necessary
- Modify homework assignments
- Read tests aloud
- Provide math manipulatives as necessary
- Restate, reword, clarify directions
- Re-teach concepts using small groups
- Provide educational “breaks” as necessary
- Expanding time for free reading
- Chunking Content
- Calculator
- Use mnemonic devices
- Provide a cueing system
- Untimed and/or extended test taking time
- Shorten assignments to focus on mastery concept
- Leveled Reading Materials
- Acronyms
- Graphic Organizers
- Notes Provided
- Check agenda book for parent(s) communication
- Read directions aloud
- Assignment, Project, and Assessment Modification Based on Individual Student Needs
- Speech to Text/Text to Speech Features in Google Apps
- Technology assisted instruction
- Preferential seating utilized
- Redirect student(s) as necessary
- Student choice for project or approach to assignment
- Inquiry-Based Learning
- Genius Hour

Adapted from: Wiggins, Grant and J. McTighe. (1998). *Understanding by Design*, Association for Supervision and Curriculum Development and 5E NGSS Lesson Plan from www.lewiscenter.org

Science- Grade 1

Unit # 5	**Title:** Communicating with Light and Sound	**Pacing:** 25 days

Stage 1- Desired Results

Established Goals/NJSLS Standards

Next Generation Science Standards/NJSLS

1-PS4-4

- **Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.*** [*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.]* (1-PS4-4)

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-ETS1-1)

K-S-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-ETS1-2)

Enduring Understandings ***Students will understand…***	**Essential Questions** ***Students will consider...***
PS4.C: Information Technologies and Instrumentation ● People also use a variety of devices to communicate (send and receive information) over long distances. (1-PS4-4) **ETS1.A: Defining and Delimiting Engineering Problems** ● A situation that people want to change or create can be approached as a problem to be solved through engineering. (K-2-ETS1-1) ● 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)	● How can light or sound be used to communicate over a distance?

Knowledge ***Students will know…***	**Academic Vocabulary**
● The shape and stability of structures of natural and designed objects are related to their function(s). ● People depend on various technologies in their lives; human life would be very different without technology. ● People also use a variety of devices to communicate (send and receive information) over long distances. ● A situation that people want to change or create can be approached as a problem to be solved through engineering. ● Asking questions, making observations, and gathering information are helpful in thinking about problems. ● Before beginning to design a solution, it is important to clearly understand the problem. ● Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people.	● Engineering ● Communicating ● Technology ● Problem ● Solution ● Design ● Shape ● Stability ● Function ● Light Source ● Signals ● Cellular

Skills

Students will be able to…

- Describe how the shape and stability of structures are related to their function.
- Ask questions based on observations to find more information about the natural and/or designed world.
- Define a simple problem that can be solved through the development of a new or improved object or tool.
- Ask questions, make observations, and gather information about a situation people want to change in order to define a simple problem that can be solved through the development of a new or improved object or tool.
- Develop a simple model based on evidence to represent a proposed object or tool.
- 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.
- Use tools and materials provided to design a device that solves a specific problem.
- 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

21ST Century/ Interdisciplinary Themes	**21st Century Skills**
Global Awareness Financial, Business, & Entrepreneurial Literacy Civic Literacy Environmental Literacy Health Literacy	**Creativity & Innovation** **Communication & Collaboration** **Media Literacy** **Critical Thinking & Problem Solving** **Information Literacy** **Information, Communication, & Technology** **Life & Career Skills**

Stage 2- Assessment Evidence
from the NJ DOE Model Curriculum

How would we communicate over a distance without the use of any of the devices that people currently use?

In this unit of study, 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 apply their knowledge of light and sound to engage in engineering design to solve a simple problem involving communication with light and sound. The crosscutting concepts of *structure and function and influence of engineering, technology, and science on society and the natural world* are called out as organizing concepts for the disciplinary core ideas. Students are expected to demonstrate grade-appropriate proficiency in *constructing explanations and designing solutions*, *asking questions and defining problems*, and *developing and using models*. Students are also expected to use these practices to demonstrate understanding of the core ideas.

Summative Assessment 1:

Standard: **Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.***
[*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.]* **(1-PS4-4)**

Assessment: Given a variety of materials, students will engineer a device that will allow communication over a distance.

Summative Assessment 2:

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

Assessment: Many times throughout the school year, students do not hear the bell at recess when it is time to line up. Can students design a better device for communicating to students that it is time to line up? Students will create a poster and explain what device would work better on the playground.

Summative Assessment 3:

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

Assessment: Students will draw a diagram showing how we communicate with light using one of theses devices (traffic lights, lighthouses, morse code, and spotlights) and how the shape of the object helps it function to solve a problem.

Formative Assessments	*Student Self-Assessment*	*Common Assessments*
● Pre-assessments ● Labs ● Project and problem-based learning activities ● Graphic organizers ● Short research projects ● Collaborative learning projects ● Formative checks (whiteboards, T/F, vote with your feet, thumbs up or thumbs down) ● Summary Diagrams ● Open ended responses ● Short responses ● Conferencing	● Reflection activities (on the learning scale, on the daily target, on labs, on summative assessments, on collaborative work, on projects) ● Responses to inquiry-based questions ● Think-pair-share activities ● Student revising knowledge throughout the unit	● Summative Assessments

Stage 3- Learning Plan

Suggested Learning Activities

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.

Suggested Learning Activities Continued

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.

https://docs.google.com/document/d/1Tjww5rgDi6Xhxu1d-S77j59tLBR-4fnvz-1BMd4k-wk/edit

Resources/Instructional Materials

(articles, novels, websites, books, magazines, art, media)

- Assessing Light Knowledge - two lessons: In these lessons the students work as partners planning and designing a communication device that will signal across the gym or hallway from one partner to the other partner. The communication device must only use light and objects that block or change the light.
- **Assessment for the *Next Generation Science Standards***: The presenters were Joan Herman, Co-Director Emeritus of the National Center for Research on Evaluation, Standards, and Student Testing (CRESST) at UCLA; and Nancy Butler Songer, Professor of Science Education and Learning Technologies, University of Michigan.
- Dr. Herman began the presentation by summarizing a report by the National Research Council on assessment for the *Next Generation Science Standards (NGSS)*. She talked about the development of the report and shared key findings. Next, Dr. Songer discussed challenges for classroom implementation and provided examples of tasks that can be used with students to assess their proficiency on the *NGSS* performance expectations. Participants had the opportunity to submit questions and share their feedback in the chat.
- ***NGSS* Crosscutting Concepts: Patterns:** The presenter was Kristin Gunckel from the University of Arizona. This was the first seminar in a series of seven focused on the crosscutting concepts that are part of the Next Generation Science Standards (NGSS).
- ***NGSS* Crosscutting Concepts: Structure and Function**: The presenters were Cindy Hmelo-Silver and Rebecca Jordan from Rutgers University. This was the sixth web seminar in a series of seven focused on the crosscutting concepts that are part of the Next Generation Science Standards (NGSS).
- Whistle for Willie, Ezra Jack Keats
- Sound All Around (Reading A-Z)

Technology Resources

- www.betterlesson.com
- www.brainpopjr.com
- www.unitedstreaming.com
- https://www.readinga-z.com/book.php?id=795 (Sound All Around)
- https://youtu.be/We0y1hwWoaU (Cheerleading: It's more than just pompoms and megaphones)
- https://youtu.be/BC8fBr154Fk (Talking Tubes from Alex Toys)
- https://youtu.be/BYiCzWZ8cBs (Sound Echoes and Dolphins)
- https://youtu.be/DsQnRnE-W8A (Animal Communication: Whales and Dolphins)
- https://youtu.be/Mo-LbbPqrm0 (Whistle for Willie)
- https://www.youtube.com/watch?v=x6O9FdyQjPE (Lighting The Way For Ships: Learning about Lighthouses at Mystic Seaport)
- https://youtu.be/QbRNgXNuR_U (Open Air illuminates Philly night sky)
- https://www.nationalgeographic.org/education/explorer-magazine/resources/ (National Geographic)
- https://youtu.be/QCWkzQqO7Ro (Tennessee fireflies: A summertime light show)
- https://youtu.be/P4xDwkLnBvk (Beautiful and Mysterious Jellyfish)
- https://youtu.be/wE-z_TJyziI (NASA | NASA for Kids: Intro to Engineering)
- https://youtu.be/QllQ6TtmXII (Fire Trucks Responding)
- https://youtu.be/ZGYq2_W7AyU (Fire Alarm, Strobe Light, & Automatic Door Test)

Accommodations & Modifications

for Spec. Ed., ELL, GT, & At Risk Students

- Allow oral responses
- Allow verbalization before writing
- Use audio materials when necessary
- Modify homework assignments
- Read tests aloud
- Provide math manipulatives as necessary
- Restate, reword, clarify directions
- Re-teach concepts using small groups
- Provide educational “breaks” as necessary
- Expanding time for free reading
- Chunking Content
- Calculator
- Use mnemonic devices
- Provide a cueing system
- Untimed and/or extended test taking time
- Shorten assignments to focus on mastery concept
- Leveled Reading Materials
- Acronyms
- Graphic Organizers
- Notes Provided
- Check agenda book for parent(s) communication
- Read directions aloud
- Assignment, Project, and Assessment Modification Based on Individual Student Needs
- Speech to Text/Text to Speech Features in Google Apps
- Technology assisted instruction
- Preferential seating utilized
- Redirect student(s) as necessary
- Student choice for project or approach to assignment
- Inquiry-Based Learning
- Genius Hour

Adapted from: Wiggins, Grant and J. McTighe. (1998). *Understanding by Design*, Association for Supervision and Curriculum Development and 5E NGSS Lesson Plan from www.lewiscenter.org