MEDFORD LAKES SCHOOL DISTRICT

Science Curriculum Guide

1st Grade

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(Aligned with 2016 New Jersey Student Learning Standards for Science)

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Science Philosophy Statement

The goal of the Medford Lakes School District's science program/curriculum is to produce students who have gained sufficient knowledge of the practices, crosscutting concepts, and core ideas of science and engineering to engage in public discussions on science-related issues, to be critical consumers of scientific information related to their everyday lives, and to continue to learn about science throughout their lives. They should come to appreciate that science and the current scientific understanding of the world are the result of many hundreds of years of creative human endeavor.

Given this goal, an integrated science curriculum model should drive the formation of science curriculum because:

- *The nature of science is complex and multidisciplinary.*
- *Learning theory research in science shows expert knowledge base develops better through interdisciplinary connections and not through isolated content.*
- *Effective research-based practices for curriculum and instruction in science and engineering are supported through this approach.*

Nature of Science

The nature of science is complex and multidisciplinary. From research about how scientists work, we know that scientists do not work in isolation in their own house of physics, or biology or chemistry but they reach out and create networks of scientists within and across disciplines who can contribute understanding, share ideas, and critique evidence and explanations. As we see in the science of global climate change, scientists work across the fields of geology, physics, and biology to provide evidence, plan investigations, and develop models to represent new ways to think about Earth systems. Important practices like engaging in argument from evidence, modeling, and communicating information do not occur in isolation but rely on feedback from within and across scientific communities and disciplines. Basing the district's curriculum in an integrated model where the students are engaged with a variety of topics at each grade, focused on the connection of ideas across the domains, enhances the interdisciplinary nature of science.

Learning Theory

In the elementary years, students build their understandings of core concepts across all domains of science. Continuing this model in grades 6-8 better supports student learning in that there will not be a large gap of time in which a student does not engage in a specific discipline. This model takes advantage of current research which recognizes that there is variation across children at a given age and that thinking does not develop along a preset roadmap for each student. It allows middle school students to build on what they know and think they understand from their elementary years with the goal in middle school of helping students to revise their knowledge and understanding about those core ideas. Learning theory research shows expert knowledge base develops better through interdisciplinary real-world connections then through isolated content. This is especially important in middle school where motivation is critical to learning. An integrated and better articulated middle school model science curriculum that reflects what we know currently about how children learn science and how their mastery develops over time promotes deeper learning in science. As we know and understand about how students develop understanding while learning content, it informs teachers' practice; if teachers understand where their students are in their understanding of core ideas, and anticipate what students' misconceptions and struggles may be, they are better able to differentiate instruction and provide scaffolding that allows students to develop an integrated and deeper understanding of the science.

Research Based Science Instruction and Curriculum

Effective science instruction can take many forms but includes similar components. According to the Center on Instruction's 2010 report, *Effective Science Instruction: What does the Research Tell Us?*, research-based effective practices of curriculum and instruction important to science learning are: Motivation, Eliciting Students' Prior Knowledge, Intellectual Engagement; Use of Evidence to Critique Claims, and Sense-Making. The integrated model may be better able to support some of these instructional practices especially if it frames curriculum around engaging, relevant, and real-world interdisciplinary questions that will increase student motivation, intellectual engagement and sense-making. Effective science instruction helps middle school students build their understandings and practices, makes connections among and between core concepts and practices, and links to their prior knowledge. Students in grades 6-8 come to understand the natural world in a more scientifically accurate way and understand the nature of science.

Conclusion

Science curriculum should be thematic with a focus on connections among and between core concepts and practices. This approach reinforces the interdisciplinary nature of science and allows for a sequential progression of skills and concepts. This supports developmentally appropriate teaching and assessments. Each grade level has its own specific standards from each science domain that are seen as stepping stones in the progression of learning about a core idea and that meet a specific level of understanding.

Module #	Module Title	# of Core Lessons	Resources/Instructional Materials	Pacing
#1	*"Patterns of Change in the Sky"*	**5**	Carolina Biological's Building Blocks of Science (2015) *"Sky Watchers"*	6-7 weeks
#2	*"Living Things – Exploring Organisms"*	**5**	Carolina Biological's Building Blocks of Science (2015) *"Exploring Organisms"*	6-7 weeks
#3	*"Light and Sound"*	**7**	TCI's Science Alive! (2015) Grade 1 *"Unit #2 Light & Sound"*	6-7 weeks

Grading Expectations Per Trimester	
Classwork	✓ minimum of 15 and maximum of 20
Homework	✓ minimum of 8 and maximum of 10
Quizzes	✓ minimum of 5 and maximum of 7
Tests/Assessment Task	✓ 1-2 per module

Module #1 "Patterns of Change in the Sky"

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.

This unit is based on 1-ESS1-1 and 1-ESS1-2.

New Jersey Student Learning Standards/Student Learning Objectives

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)

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)

Benchmark Assessment:

- Summative Assessment: Sky Watchers
  - TG: Appendix F pages 115 - 121

Unit Sequence	
Part A: *What patterns of change can be predicted when observing the sun, moon, and stars?*	
Concepts	**Formative Assessment**
• 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.	*Students who understand the concepts can:* • Observe and use patterns in the natural world as evidence and to describe phenomena. • Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. • Use observations of the sun, moon, and stars to describe patterns that can be predicted. 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. *(Assessment of star patterns is limited to stars being seen at night and not during the day.)*

Unit Sequence	
Part B: *What is the relationship between the amount of daylight and the time of year?*	
Concepts	**Formative Assessment**
• 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.	*Students who understand the concepts can:* • 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.)*

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. 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.

Connecting with English Language Arts/Literacy and Mathematics
English Language Arts/Literacy In this unit of study, students need opportunities to participate in shared research and writing projects about patterns of change in the sky. For example, students can use online resources or books to research the patterns of change that are visible over time when we observe the objects in the sky. With guidance from adults, students could create books that describe and illustrate the different patterns of change observed in objects in the sky. They could also describe and illustrate the relative amount of daylight in relation to the season using a sequenced set of journal entries or in a sequence-of-events foldable. *Mathematic* Students need opportunities to represent and interpret data and to use addition and subtraction. The following examples from NGSS Appendix L could provide guidance for instruction and should be done with teacher support: ✓ Science example 1: There were 16 hours of daylight yesterday. On December 21, there were 8 hours of daylight. How many more hours of daylight were there yesterday than on December 21? Science example 2: Based on the data collected and posted on the bulletin board so far, which day has been the longest of the year so far? Which day has been the shortest?

Modifications	
Special Education: • 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. multi-sensory 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. • Teacher models • Show additional number of samples/examples • Provide additional opportunities to practice • Use re-teaching and/or restating to address student's needs • Use small group table conferences to address needs • Develop target vocabulary • Scaffold comprehension when reading is necessary to fully understand science concept(s) • Use graphic organizers to develop key concepts/ideas • Teach key aspects of a topic and eliminate nonessential information.	**English Language Learners (ELLs):** • Model Thinking Aloud • Encourage Partner Talk • Repeat and Clarify • Provide a Sequence • Encourage self-selection of topics • Target vocabulary • Scaffold comprehension when reading is used to promote reader response • Scaffold content-literacy reading • Allow products to demonstrate student's learning • Provide on-going feedback

Students at Risk of School Failure:	**Gifted Students:**
● Build a relationship ● Allow flexible due dates ● Employ strategies from *"Classroom Instruction that Works"* ● Create the Opportunity to Learn strategies ● Build lessons around student interests	• Utilize flexible groups-group gifted students with other gifted students or higher-level learners • Encourage students to explore/research concepts in depth via independent studies or investigations (individual/group) • Differentiate product assignments. Employ differentiated curriculum to keep interest/motivation high • Encourage creative expression and thinking by allowing students to choose how to approach a problem or assignment (problem based learning) • Invite students to explore different points of view on a topic of study and compare the two • Provide multiple opportunities for students to "Own Their Learning" • Ask students higher-level questions that require students to look into causes, experiences, and facts to draw a conclusion to other areas of learning. (Webb's Depth of Knowledge- Level 4) • Create a room environment that encourages creativity and discovery through the use of interesting literature and reference materials. Supply reading materials on a wide variety of subjects and levels • Provide a learning-rich environment that includes a variety of resources, media, tasks, and methods of teaching

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

Future Learning
Grade 3 Unit 2: Forces and Motion • Each force acts on one particular object and has both strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object's speed or direction of motion. *[Note: The emphasis is qualitative and conceptual understanding of forces. Quantitative understanding is at a later grade level.]* • The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it. *[Note: Technical terms, such as magnitude, velocity, momentum, and vector quantity, are not introduced at this level, but the concept that some quantities need both size and direction to be described is developed.]* **Grade 5 Unit 6: Interactions within the Earth, Sun, Moon Systems** • The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center. • The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the sun, moon, and stars at different times of the day, month, and year.

Appendix A: NGSS and Foundations for the Module		
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)**		
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)**		
The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:		
Science and Engineering Practices	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Planning and Carrying Out Investigations • Plan and conduct investigations collaboratively to produce evidence to answer a question. (1-PS4-1),(1-PS4-3) **Planning and Carrying Out Investigations** • Make observations (firsthand or from media) to collect data that can be used to make comparisons. (1-ESS1-2) Analyzing and Interpreting Data • Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (1-ESS1-1)	**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)	**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)

English Language Arts	Mathematics
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). (1-ESS1-1),(1-ESS1-2) **W.1.7** With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question. (1-ESS1-1),(1-ESS1-2) **W.1.8**	Reason abstractly and quantitatively. *(1-ESS1-2)* **MP.2** Model with mathematics. *(1-ESS1-2)* **MP.4** Use appropriate tools strategically. *(1-ESS1-2)* **MP.5** 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. *(1-ESS1-2)* **1.OA.A.1** 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. *(1-ESS1-2)* **1.MD.C.4**

Module #1 "Patterns of Change in the Sky" *(CBBS – "Sky Watchers")*
Core Lesson #1 "What Can We See in the Sky?"

Essential Question(s):

How is the daytime sky like the nighttime sky?
How is the daytime sky different from the nighttime sky?

Objectives	NJSLS Standard(s)	Segment	Time	Instructional Plan & Materials
SWBAT: • Share prior knowledge in a brainstorming session of objects that appear in the day and night skies • Records observations of objects in the day and night skies through writing and illustrations in science notebooks • Compare and contrast objects seen in the day and night skies using Venn diagrams, direct observation, and class discussions	1.ESS1.1 ESS1.A L.1.1 L.1.2.B L.1.2.E SL.1.1 SL.1.3 SL.1.4 SL.1.5 SL.1.6 W.1.5 1.MD.B.3	*Introduction/ Anticipatory Set*	one 48 minute class period	• Part A: Pre-unit assessment TG pg. 4 • Notebook prompt: "Draw a place where you see shadows. What caused the shadows?"
		Activity	two 48 minute class periods	• Part B: The Daytime Sky TG pg. 5 • Student Activity Sheet 1A: "*Daytime Sky"* • Science Notebook Opportunity TG pg. 6
		Activity	two 48 minute class periods	• Part C: The Nighttime Sky TG pg. 7 • Student Activity Sheet 1B "Nighttime Sky" • Science Notebook Opportunity TG pg. 9

		Evaluate/Assess	one 48 minute class period	• Part D: Comparing and Contrasting the Day and Night Skies • Compare the day and night sky charts • Science Notebook Opportunity TG pg. 10 • Assessment Observation Sheet for Lesson #1 TG pg. 13
Key Vocabulary: • Different • Observe • Predict • Same • Day • Moon • Night • Planet • Sky • Star • Sun				

Module #1 "Patterns of Change in the Sky" *(CBBS – "Sky Watchers")*
Core Lesson #2 "Rotating Day and Night"

Essential Question:

What causes the pattern of night and day?

Objectives	NJSLS Standard(s)	Segment	Time	Instructional Plan & Materials
SWBAT: • Use models to directly observe the repeating pattern of day and night. • Discuss and model how Earth rotates on its axis around the Sun, causing the repeating pattern of day and night. • Observe how Earth is spherical in shape. • Explore the concept of rotation and how Earth spins, or rotates, once per 24 hours. • Recognize that the repeating pattern of day and night continues daily due to the rotation of Earth.	1-ESS1-1 Ess1.A L.1.1 L.1.2.B L.1.2.E SL.1.1 SL.1.3 SL.1.4 SL.1.5 SL1.6 W.1.5 1.MD.B.3	*Introduction/ Anticipatory Set*	one 48 minute class period	• Part A: Modeling Day and Night TG pg. 19 • Notebook prompt: "During the day, is the Sun moving across the sky or is Earth moving?"
		Activity	one 48 minute class period	• Part B: Day + Night = Rotation TG pg. 22 • Student Activity Sheet 2: "*Rotation"* • Science Notebook Opportunity TG pg. 23
		Evaluate/Assess	one 48 minute class period	• Literacy Series Reader: *Sky Watchers* TG pg 24 • Assessment Observation Sheet for Lesson #2 TG pg. 26

Key Vocabulary:

- Axis Half Sphere Whole Earth Model Noon Rotate Sun Sunrise Sunset

Module #1 "Patterns of Change in the Sky" *(CBBS – "Sky Watchers")*
Core Lesson #3 "Revolution and the Seasons"

Essential Question:

What is the difference between rotation and revolution?
How does the tilt of the earth cause seasons?

Objectives	NJSLS Standard(s)	Segment	Time	Instructional Plan & Materials
SWBAT: • Observe that Earth revolves around the Sun once a year in a cyclical fashion. • Observe that Earth rotates once every 24 hours on its axis, causing the repeating pattern of day and night. • Model and discuss how the Sun is the center of the solar system. • Demonstrate Earth's tilt using models, and recognize that Earth's tilt results in seasonal changes. • Observe and discuss seasons as repeated patterns that occur every year. • Begin understanding that Earth's tilt in relation to the Sun affects the temperature of the Earth.	1-ESS1-1 1-ESS1-2 ESS1.A ESS1.B L.1.1 L.1.2.B L.1.2.E RF.1.1 RF.1.2 RF.1.3 RF.1.4 SL.1.1 SL.1.3 SL.1.4 SL.1.5 SL.1.6 W.1.2 W.1.5	*Introduction/ Anticipatory Set*	one 48 minute class period	• Part A: The Reason for the Season TG pg. 32 • Learning Center Opportunity: Student Activity Sheet 3A and 3B TG pg. 33
		Activity	one 48 minute class period	• Part B: Exploring Earth's Motion TG pg. 34 • Science Notebook Opportunity TG pg. 36
		Evaluate/Assess	one 48 minute class period	• Part C: An Introduction to the Relationship Between Tilt and Seasons TG pg. 36 • Student Activity Sheet 3C: *Revolution and the Seasons* • Assessment Observation Sheet for Lesson #3 TG pg. 41

Key Vocabulary:

Counterclockwise	Day	Hour	Month	Spin	Year	Axis
Cycle	Earth	Orbit	Revolve	Seasons	Sun	Tilt

Module #1 "Patterns of Change in the Sky" *(CBBS – "Sky Watchers")*
Core Lesson #4 "Shadows and the Sun"

Essential Question:

How do shadows affect daily life on earth?
How do temperatures differ in sun and in shade?

Objectives	NJSLS Standard(s)	Segment	Time	Instructional Plan & Materials
SWBAT: • Set up an experiment to trace the pattern of a shadow over time. Record and analyze data from the experiment. • Relate collected data to the Sun's apparent movement across the sky. • Set up an experiment to compare temperatures in sunlight and shade. Record data and use it to draw conclusions. • Analyze how the Sun's position and motion appear to change over the course of a day's time. • Conclude that the Sun provides light and heat necessary to heat Earth by observing temperatures and collecting data from thermometers placed	1-ESS1-2 ESS1.B L.1.1 L.1.2.B L.1.2.E RF.1.1 RF.1.2 RF.1.3 RF.1.4 SL.1.1 SL.1.3 SL.1.4 SL.1.5 SL.1.6 W.1.2 W.1.5 1.MD.B.3 1.MD.C.4	*Introduction/ Anticipatory Set*	one 48 minute class period	• Part A: What is the Sun and Where Does it Appear? TG pg. 50 • Science Notebook Opportunity: TG pg. 50
		Activity	two 48 minute class periods	• Part B: Experimenting with Shadows TG pg. 51 • Student Activity Sheet 4A: *Shadows* • Science Notebook Opportunity TG pg. 52
		Evaluate/Assess	two 48 minute class periods	• Part C: Temperature and Shadows TG pg. 53 • Student Activity Sheet 4B: *Sun and Shade* • Science Notebook Opportunity TG pg. 54 • Assessment Observation Sheet for Lesson #4 TG pg. 55

in the sunlight and shade. • Trace and analyze how a shadow changes position over a period of time relative to an object.				
Key Vocabulary: • Position Words (front, behind, right, left) Core • Data Heat Light Shadow Shade Sun Temperature Thermometer				

Module #1 "Patterns of Change in the Sky" *(CBBS – "Sky Watchers")*
Core Lesson #5 "The Moon and Its Patterns"

Essential Question(s):

Why does the shape of the moon look different at different times during the month?

Objectives	NJSLS Standard(s)	Segment	Time	Instructional Plan & Materials
SWBAT: • Use images and direct observation to learn about the apparent shapes of the Moon. • Describe changes in the Moon's appearance over a period of time. • Recall and apply understandings about rotation and revolution. • Learn that the Moon revolves around Earth once a month. • Recognize and observe that the phases of the Moon repeat in a predictable monthly pattern. • Evaluate why the Moon appears a different shape at different times during the month. • Explain how the Moon appears to move relative to Earth and the Sun.	1.ESS1.1 ESS1.A L.1.1 L.1.2.B L.1.2.E RF.1.1 RF.1.2 RF.1.3 SL.1.1 SL.1.3 SL.1.4 SL.1.5 SL.1.6 W.1.5 1.G.A.3	*Introduction/ Anticipatory Set*	one 48 minute class period	• Part A: Phases of the Moon TG pg. 65 • Venn diagram: "What can we See in the Sky?" (Lesson 1) • Science Notebook Opportunity: TG pg. 67 • Learning Center Opportunity: Teacher Sheet 5A: *Phases of the Moon* TG pg. 67
		Activity	one 48 minute class period	• Part B: New Moon vs. Full Moon TG pg. 68 • Class Chart: New Moon vs. Full Moon TG pg. 71
		Activity	one 48 minute class period	• Part C: The Repeating Pattern of Moon Phases TG pg. 71 • Student Activity Sheet 5A: *Moon Model Cards* • Student Activity Sheet 5B: *The Cycle of the Moon's Phases* • Learning Center Opportunity

				TG pg. 74
		Evaluate/Assess	one 48 minute class period	• Part D: Rotation and Revolution TG pg. 74 • Teacher Sheet 5B: *Sample Moon Journal* • Student Activity Sheet 5C: *The Phases of the Moon* • Science Notebook Opportunity TG pg. 75 • Assessment Observation Sheet for Lesson #5 TG pg. 79
Key Vocabulary: • Direction Words (left, right, front, back, etc.) • Illuminated Pattern Repeat • Crescent Moon Earth Full Moon Gibbous moon Model New Moon Quarter Moon Solar System Sun Waning Waxing				

Module #1 "Patterns of Change in the Sky" *(CBBS – "Sky Watchers")*
Core Lesson #6 "Our Place in Space"

Essential Question(s):

How can the information learned in this unit be used to describe the relationship between the Sun, Earth, and Moon?

Objectives	NJSLS Standard(s)	Segment	Time	Instructional Plan & Materials
SWBAT: • Share prior knowledge in a brainstorming session of objects that appear in the day and night skies • Records observations of objects in the day and night skies through writing and illustrations in science notebooks • Compare and contrast objects seen in the day and night skies using Venn diagrams, direct observation, and class discussions	1.ESS1.1 ESS1.A L.1.1 L.1.2 L.1.4 RF.1.1 RF.1.2 RF.1.3 RF.1.4 SL.1.1 SL.1.3 SL.1.4 SL.1.5 SL.1.6 W.1.8 1.MD.B.3 1.MD.C.4	*Introduction/ Anticipatory Set*	one 48 minute class period	• Part A: Planning Presentations TG pg. 91 • Student Activity Sheet 6: *Group Planning*
		Activity	two 48 minute class periods	• Part B: Presenting Topics TG pg. 92 • Science Notebook Opportunity TG pg. 92
		Evaluate/Assess	one 48 minute class period	• Part C: Post-Unit Assessment TG pg. 92 • Class Charts TG pg. 92 • Assessment Observation Sheet for Lesson #6 TG pg. 95

Key Vocabulary:

- All vocabulary from previous lessons

Module #2a "Living Things - Exploring Organisms"

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.

This unit is based on 1-LS3-1 and 1-LS1-2.

New Jersey Student Learning Standards/Student Learning Objectives

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)**

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)**

Benchmark Assessment:

- Summative Assessment: Exploring Organisms
  - TG: Appendix F pages 80 – 84

Unit Sequence	
Part A: *How are young plants and animals alike and different from their parents?*	
Concepts	**Formative Assessment**
• 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.	*Students who understand the concepts are 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.]*

Unit Sequence	
Part B: *What types (patterns) of behavior can be observed among parents that help offspring survive?*	
Concepts	**Formative Assessment**
• Scientists look for patterns and order when making observations about the world. • Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. • Adult plants and animals can have young. • In many kinds of animals, parents and the offspring themselves engage in behaviors that help the offspring survive.	*Students who understand the concepts are able to:* • Observe and use patterns in the natural world as evidence and to describe phenomena. • Read grade-appropriate texts and use media to obtain scientific information to determine patterns in the natural world. • Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive. Examples of patterns of behaviors could include: ✓ 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.

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.

Connecting with English Language Arts/Literacy and Mathematics

English Language Arts

To integrate English Language Arts into this unit, students need opportunities to read informational texts to gather information about traits and behaviors of organisms. With adult guidance, they identify the main topic, retell key details from texts, and ask and answer questions about key details. Students should also participate in shared research and writing projects. They can gather information from a variety of preselected, grade-level-appropriate texts and resources and use that information to answer questions about traits and behaviors of organisms. In pairs or small groups, students can use pictures and words to create simple books that describe features that parents and offspring share or behaviors that parents and offspring exhibit that help offspring survive.

Mathematics

To integrate mathematics into this unit, students reason abstractly and quantitatively and use appropriate tools strategically as they collect and organize data, and use it to solve problems. For example, when students gather information about the shape, size, color, and number of leaves on plants, they can:

- ✓ Use grade-level-appropriate tools and strategies to measure, compare, and order leaves by length.
- ✓ Organize data (e.g., number of leaves) into simple graphs or tables, and then use strategies based on place value, properties of operations, and/or the relationship between addition and subtraction to make comparisons.
- ✓ Use drawings and equations as they solve problems (e.g., more or less, total amount, how many in each).

Modifications	
Special Education: • 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. multi-sensory 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. • Teacher models • Show additional number of samples/examples • Provide additional opportunities to practice • Use re-teaching and/or restating to address student's needs • Use small group table conferences to address needs • Develop target vocabulary • Scaffold comprehension when reading is necessary to fully understand science concept(s) • Use graphic organizers to develop key concepts/ideas • Teach key aspects of a topic and eliminate nonessential information.	**English Language Learners (ELLs):** • Model Thinking Aloud • Encourage Partner Talk • Repeat and Clarify • Provide a Sequence • Encourage self-selection of topics • Target vocabulary • Scaffold comprehension when reading is used to promote reader response • Scaffold content-literacy reading • Allow products to demonstrate student's learning • Provide on-going feedback

Students at Risk of School Failure:	**Gifted Students:**
● Build a relationship ● Allow flexible due dates ● Employ strategies from *"Classroom Instruction that Works"* ● Create the Opportunity to Learn strategies ● Build lessons around student interests	• Utilize flexible groups-group gifted students with other gifted students or higher-level learners • Encourage students to explore/research concepts in depth via independent studies or investigations (individual/group) • Differentiate product assignments. Employ differentiated curriculum to keep interest/motivation high • Encourage creative expression and thinking by allowing students to choose how to approach a problem or assignment (problem based learning) • Invite students to explore different points of view on a topic of study and compare the two • Provide multiple opportunities for students to "Own Their Learning" • Ask students higher-level questions that require students to look into causes, experiences, and facts to draw a conclusion to other areas of learning. (Webb's Depth of Knowledge- Level 4) • Create a room environment that encourages creativity and discovery through the use of interesting literature and reference materials. Supply reading materials on a wide variety of subjects and levels • Provide a learning-rich environment that includes a variety of resources, media, tasks, and methods of teaching •

Prior Learning
This is the students' first opportunity to make sense of these phenomena.

Future Learning
Grade 3 Unit 6: Organisms and the Environment • Being part of a group helps animals obtain food, defend themselves, and cope with changes. Groups may serve different functions and vary dramatically in size **Grade 4 Unit 3: Structures and Functions** • Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. **Grade 4 Unit 4: How Organisms Process Information** • Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions.

Appendix A: NGSS and Foundations for the Module		
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)**		
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)**		
The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:		
Science and Engineering Practices	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Analyzing and Interpreting Data • Analyze and interpret data to make sense of phenomena using logical reasoning. (3-LS3-1) **Obtaining, Evaluating, and Communicating Information** • Read grade-appropriate texts and use media to obtain scientific information to determine patterns in the natural world. (1-LS1-2)	**LS3.A: Inheritance of Traits** • Many characteristics of organisms are inherited from their parents. (3-LS3-1) **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)	**Patterns** • Similarities and differences in patterns can be used to sort and classify natural phenomena. (3-LS3-1) • Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence. (1-LS1-2) - ***Connections to Nature of Science*** **Scientific Knowledge is Based on Empirical Evidence** • Scientists look for patterns and order when making observations about the world. (1-LS1-2)

English Language Arts	Mathematics
Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. (3-LS3-1) **RI.3.1** Determine the main idea of a text; recount the key details and explain how they support the main idea. (3-LS3-1) **RI.3.2** Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. (3-LS3-1) **RI.3.3** 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). (1-LS1-1) **W.1.7** Write informative/explanatory texts to examine a topic and convey ideas and information clearly. (3-LS3-1) **SL.3.4** Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace. (3-LS3-1) **W.3.2**	Reason abstractly and quantitatively. (3-LS3-1) **MP.2** Model with mathematics. (3-LS3-1) **MP.4** Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters. (3-LS3-1) **3.MD.B.4**

Module #2b "Living Things 'Exploring Organisms"

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.

This unit is based on 1-LS1-1 and K-2-ETS1-2.

New Jersey Student Learning Standards/Student Learning Objectives

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)**

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)

Unit Sequence	
Part A: *How can humans mimic how plants and animals use their external parts to help them survive and grow?*	
Concepts	**Formative Assessment**
• 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.	*Students who understand the concepts are 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.

What It Looks Like in the Classroom

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.
- Use materials to create the design solution.

Share the design solution with others in the class.

Connecting with English Language Arts/Literacy and Mathematics
English Language Arts Students participate in shared research and writing projects. Engaging in engineering design provides a perfect opportunity for students to conduct shared research and complete writing projects. Students can use text and media resources to gather information about how the shape and stability of external structures of organisms are related to their functions. In addition, students can conduct simple research to find examples of how humans solve problems using an understanding of the natural world. Examples of writing projects could include creating a book that includes examples of how humans mimic the characteristics of organisms to design solutions to human problems. Students can also use drawings or other visual displays to accompany their design solutions. Students will need support from teachers to conduct shared research and complete writing projects. *Mathematics* **N/A**

Modifications	
Special Education: • 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. multi-sensory 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. • Teacher models • Show additional number of samples/examples • Provide additional opportunities to practice • Use re-teaching and/or restating to address student's needs • Use small group table conferences to address needs • Develop target vocabulary • Scaffold comprehension when reading is necessary to fully understand science concept(s) • Use graphic organizers to develop key concepts/ideas • Teach key aspects of a topic and eliminate nonessential information.	**English Language Learners (ELLs):** • Model Thinking Aloud • Encourage Partner Talk • Repeat and Clarify • Provide a Sequence • Encourage self-selection of topics • Target vocabulary • Scaffold comprehension when reading is used to promote reader response • Scaffold content-literacy reading • Allow products to demonstrate student's learning • Provide on-going feedback

Students at Risk of School Failure:	**Gifted Students:**
● Build a relationship ● Allow flexible due dates ● Employ strategies from *"Classroom Instruction that Works"* ● Create the Opportunity to Learn strategies ● Build lessons around student interests	• Utilize flexible groups-group gifted students with other gifted students or higher-level learners • Encourage students to explore/research concepts in depth via independent studies or investigations (individual/group) • Differentiate product assignments. Employ differentiated curriculum to keep interest/motivation high • Encourage creative expression and thinking by allowing students to choose how to approach a problem or assignment (problem based learning) • Invite students to explore different points of view on a topic of study and compare the two • Provide multiple opportunities for students to "Own Their Learning" • Ask students higher-level questions that require students to look into causes, experiences, and facts to draw a conclusion to other areas of learning. (Webb's Depth of Knowledge- Level 4) • Create a room environment that encourages creativity and discovery through the use of interesting literature and reference materials. Supply reading materials on a wide variety of subjects and levels • Provide a learning-rich environment that includes a variety of resources, media, tasks, and methods of teaching •

Prior Learning
Kindergarten Unit 3: Weather Asking questions, making observations, and gathering information are helpful in thinking about problems. .

Future Learning
Grade 4 Unit 3: Structures and Functions • Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. **Grade 4 Unit 4: How Organisms Process Information** • Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions.

Appendix A: NGSS and Foundations for the Module		
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)**		
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)		
The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:		
Science and Engineering Practices	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Analyzing and Interpreting Data • Analyze and interpret data to make sense of phenomena using logical reasoning. (3-LS3-1) **Constructing Explanations and Designing Solutions** • Use materials to design a device that solves a specific problem or a solution to a specific problem. (1-LS1-1) **Developing and Using Models** • Develop a simple model based on evidence to represent a proposed object or tool. (K-2-ETS1-2)	**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**	**Patterns** • Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence. (1-LS1-2) **Structure and Function** • The shape and stability of structures of natural and designed objects are related to their function(s). (1-LS1-1) • The shape and stability of structures of natural and designed objects are related to their function(s). (K-2-ETS1-2) - ***Connections to Engineering, Technology, and Applications of Science***

	• 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) **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)	**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 using materials derived from the natural world. (1-LS1-1)

English Language Arts	Mathematics
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). (1-LS1-1) Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings. (K-2-ETS1-2) **SL.2.5**	**N/A**

Module #2"Living Things – Exploring Organisms" *(CBBS – "Exploring Organisms")*
Core Lesson #1 "Needs for Survival"

Essential Question(s):
What makes something living?
What do all living things need in order to survive?

Objectives	NJSLS Standard(s)	Segment	Time	Materials
SWBAT: • Distinguish between living and nonliving things in the environment. • Identify the needs of living things. • Observe body structures that help living things meet their needs. • Set up an environment and begin growing a bean plant.	1-LS1-1 LS1.A LS1.D RI.1.1 SL.1.4 SL.1.5 1.OA.D.8	*Introduction/ Anticipatory Set*	one 48 minute class period	• Part A: Growing Bean Plants TG pg. 4 • Student Activity Sheet 1A: *Beans are Seeds* • Learning Cycle Letter (Appendix C)
		Activity	one 48 minute class period	• Part B: Living vs. Nonliving • Living vs. Nonliving Cards • Science Notebook Opportunity: TG pg. 8
		Activity	one 48 minute class period	• Part C: Needs of Living Things TG pg. 8 • Animal vs. Plant Needs Venn diagram • Literacy Series Reader: *Discovering Plants* pages 2-3 • Science Notebook Opportunity: TG pg. 10

		Evaluate/Assess	one 48 minute class period	• Part D: Obtaining Needs TG pg. 10 • External Structures Photo Card Set • Student Activity Sheet 1B: *Meeting Needs* • Assessment Observation Sheet Lesson 1 TG pg. 14
Key Vocabulary: • Animal Dead Environment Living Nonliving Organism Plant Reproduce Seed Survive Structure				

Module #2"Living Things – Exploring Organisms" *(CBBS – "Exploring Organisms")*
Core Lesson #2 "Raising Young"

Essential Question(s):
How do some animal parents take care of their babies?
What patterns of behavior exist between parents and their young?

Objectives	NJSLS Standard(s)	Segment	Time	Materials
SWBAT: • Understand that many offspring cannot survive without assistance from parents. • Use text and media to determine patterns that exist in the animal kingdom between parents and their offspring that enable the offspring a better chance of survival. • Use oral and written communication skills to explain how animal parents care for their offspring.	1-LS1-2 LS1.B RI.1.1 RI.1.2 SL.1.1 SL.1.2 SL.1.4 SL.1.5 1.NBT.B.3	*Introduction/ Anticipatory Set*	one 48 minute class period	• Part A: Parents and Their Offspring TG pg. 20 • Pictures of teacher growing up • Read *Are you My Mother* by. P.D. Eastman
		Activity	one 48 minute class period	• Part B: Parental Care TG pg. 22 • Read *How Animal Babies Stay Safe* by Mary Ann Fraser • Create *Ways Parents Care for Babies* Chart TG pg. 23 • Share video clips of parent animals interacting with their young • Science Notebook Opportunity TG pg. 24 • Learning Center Opportunity

		Evaluate/Assess	one 48 minute class period	• Assessment Observation Sheet for Lesson 2 TG pg. 27
Key Vocabulary: • Communicate Organism Pattern Protect Survive				

Module #2"Living Things – Exploring Organisms" *(CBBS – "Exploring Organisms")*
Core Lesson #3 "Parents and Their Young"

Essential Question(s):
How are offspring like, not exactly like, their parents?

Objectives	NJSLS Standard(s)	Segment	Time	Materials
SWBAT: • Compare similarities and differences between themselves and their parents. • Identify similarities and differences between animal offspring and their parents. • Observe a bean plant to collect evidence on the similarities and differences between plant parents and plant offspring. • Construct an evidence-based account that young plants and animals are similar but not identical to their parents.	1-LS3-1 LS3.A LS3.B RI.1.1 RI.1.2 SL.1.1 SL.1.2 SL.1.4 SL.1.5 1.MD.A.1	*Introduction/ Anticipatory Set*	one 48 minute class period	• Part A: Family Ties TG pg. 32 • Student Activity Sheet 3A: *Family Traits*
		Activity	one 48 minute class period	• Part B: Animal Families TG pg. 34 • Student Activity Sheet 3B: *Prove It!* • Animal Parents and Their Babies Matching Cards • Learning Center Opportunity
		Evaluate/Assess	one 48 minute class period	• Part C: Observing Bean Plants TG pg. 36 • Literacy Series Reader: *Discovering Plants pg. 10-12* • Tulip Card from External Structures Photo Card Set • Science Notebook Opportunity TG pg. 37 • Lesson 3 Assessment Observation Sheet TG pg. 39

Key Vocabulary:

- Flower Life Cycle Pattern Prediction Seed Trait

Module #2"Living Things – Exploring Organisms" *(CBBS – "Exploring Organisms")*
Core Lesson #4 "Structures and Functions for Survival"

Essential Question(s):
What external structures do plants and animals have?
How do these structures help these organisms?
How can these structures be used to design a solution to a human problem?

Objectives	NJSLS Standard(s)	Segment	Time	Materials
SWBAT: • Draw and label plant structures from a bean plant and describe their functions. • Observe and identify various animal body structures. • Predict the function of each animal structure. • Design a solution to a human problem by mimicking how plants and/or animals use their external structures to help them survive.	1-LS1-1 LS1.A LS1.D RI.1.1 RI.1.2 SL.1.1 SL.1.2 SL.1.4 SL.1.5 1.MD.A.1	*Introduction/ Anticipatory Set*	one 48 minute class period	• Part A: Plant Structures TG pg. 48 • Literacy Series Reader *Discovering Plants* pages 4-7 and 8-9 • Student Activity Sheet 4A: *My Bean Plant* • Spiny Thorny plants card from the External Structures Photo Card Set
		Activity	one 48 minute class period	• Part B: What Do You Use This For? TG pg. 50 • Student Activity Sheet 4B: *What Do You Use This For?* • Science Notebook Opportunity TG pg.53
		Activity	one 48 minute class period	• Part C: Animal Structures TG pg. 54 • Student Activity Sheet 4C: *Insects are Animals Too!*

		Evaluate/Assess	two 48 minute class periods	• Part D: Designing Solutions TG pg. 56 • Lesson 4 Assessment Observation Sheet TG pg. 59 • Summative Assessment
Key Vocabulary: • Flower Leaf Roots Stem Structure Survive				

Module #3a "Light and Sound"

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.

New Jersey Student Learning Standards/Student Learning Objectives

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)**

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)**

Benchmark Assessment:

- TCI Summative Assessment
  - Big Ideas from Lessons 1-6

Unit Sequence	
Part A: *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?*	
Concepts	**Formative Assessment**
• 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.	*Students who understand the concepts can:* • 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).

Unit Sequence	
Part B: *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?*	
Concepts	**Formative Assessment**
• 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.)*	*Students who understand the concepts can:* • 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)

Unit Sequence	
Part C: How do instruments (band) make sound?	
Concepts	**Formative Assessment**
• 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.	*Students who understand the concepts can:* • 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.

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.

Connecting with English Language Arts/Literacy and Mathematics
English Language Arts/Literacy To integrate the CCSS for English Language Arts into this unit, students need opportunities to read informational texts in order to gather information about light and sound. With adult guidance, they identify the main topic and retell key details from texts and ask and answer questions about key details. Students should also participate in shared research and writing projects. They can gather information from a variety of preselected, grade-level appropriate texts and resources, and use that information to answer questions about light and sound. In pairs or small groups, students can use pictures and words to create simple books about vibration (sound) and illumination (light). The students' writing should include facts about the topic and have a sense of closure. Throughout the unit of study, students need multiple opportunities to share their experiences with light and sound in collaborative conversations with adults and peers, in small and large group settings. *Mathematic* N/A

Modifications	
Special Education: • 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. multi-sensory 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. • Teacher models • Show additional number of samples/examples • Provide additional opportunities to practice • Use re-teaching and/or restating to address student's needs • Use small group table conferences to address needs • Develop target vocabulary • Scaffold comprehension when reading is necessary to fully understand science concept(s) • Use graphic organizers to develop key concepts/ideas • Teach key aspects of a topic and eliminate nonessential information.	**English Language Learners (ELLs):** • Model Thinking Aloud • Encourage Partner Talk • Repeat and Clarify • Provide a Sequence • Encourage self-selection of topics • Target vocabulary • Scaffold comprehension when reading is used to promote reader response • Scaffold content-literacy reading • Allow products to demonstrate student's learning • Provide on-going feedback

Students at Risk of School Failure:	**Gifted Students:**
● Build a relationship ● Allow flexible due dates ● Employ strategies from *"Classroom Instruction that Works"* ● Create the Opportunity to Learn strategies ● Build lessons around student interests	• Utilize flexible groups-group gifted students with other gifted students or higher-level learners • Encourage students to explore/research concepts in depth via independent studies or investigations (individual/group) • Differentiate product assignments. Employ differentiated curriculum to keep interest/motivation high • Encourage creative expression and thinking by allowing students to choose how to approach a problem or assignment (problem based learning) • Invite students to explore different points of view on a topic of study and compare the two • Provide multiple opportunities for students to "Own Their Learning" • Ask students higher-level questions that require students to look into causes, experiences, and facts to draw a conclusion to other areas of learning. (Webb's Depth of Knowledge- Level 4) • Create a room environment that encourages creativity and discovery through the use of interesting literature and reference materials. Supply reading materials on a wide variety of subjects and levels • Provide a learning-rich environment that includes a variety of resources, media, tasks, and methods of teaching •

Prior Learning
This is the first formal opportunity for students to engage with the disciplinary core ideas.

Future Learning
By the end of Grade 2, students understand that: • Different kinds of matter exist and many of them can be either solid or liquid, depending on temperature. Matter can be described and classified by its observable properties. • Different properties are suited to different purposes. • A great variety of objects can be built up from a small set of pieces. *By the end of Grade 4, students understand that:* • An object can be seen when light reflected from its surface enters the eyes.

Appendix A: NGSS and Foundations for the Module		
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)		
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)		
The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:		
Science and Engineering Practices	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Planning and Carrying Out Investigations • Plan and conduct investigations collaboratively to produce evidence to answer a question. (1-PS4-1),(1-PS4-3) **Constructing Explanations 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)	**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	**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 Engineering, Technology, and Science, on Society and the Natural World**

Connections to Nature of Science **Scientific Investigations Use a Variety of Methods** • Science investigations begin with a question. (1-PS4-1) • Scientists use different ways to study the world. (1-PS4-1)	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)	• People depend on various technologies in their lives; human life would be very different without technology. (1-PS4-4)

English Language Arts	Mathematics
Write informative/explanatory texts in which they name a topic, supply some facts about the topic, and provide some sense of closure. (1-PS4-2) **W.1.2** 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). (1-PS4-1),(1-PS4-2),(1-PS4-3) **W.1.7** With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question. (1-PS4-1),(1-PS4-2),(1-PS4-3) **W.1.8** Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups. (1-PS4-1),(1-PS4-2),(1-PS4-3) **SL.1.1**	**N/A**

Module #3b "Light and Sound"

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.

This unit is based on 1-PS4-4, K-2-ETS1-1, and K-2-ETS1-2.

New Jersey Student Learning Standards/Student Learning Objectives

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)

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

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

Unit Sequence	
Part A: *How can light or sound be used to communicate over a distance?*	
Concepts	**Formative Assessment**
• 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.	*Students who understand the concepts can:* • 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

What It Looks Like in the Classroom
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.

Connecting with English Language Arts/Literacy and Mathematics
English Language Arts/Literacy Students will participate in shared research and writing projects as they engage in engineering design. Students can use text and media resources to first gather information about devices that use light or sound to communicate over a distance. They can demonstrate understanding of key details in a text by asking and answering questions during class and small-group discussions. In addition, students recall information from experiences or gather information from provided sources to support their thinking as they design and build their device. As students complete their devices, they prepare a sketch or drawing of their device, label the components, and describe, in writing, how each component relates to the function of the device and how their communication device works. Students can also write a "how-to" book describing how to use tools and materials to build their design. Students can also use drawings or other visual displays to accompany their writing in order to describe their thought process and clarify their ideas. Adult support should be provided throughout the process. *Mathematic* Students need opportunities to use tools to for a variety of purposes as they design and build devices for communicating with light or sound. They can use objects such as interlocking cubes or paper clips to measure length in nonstandard units, expressing their measurements as whole numbers. Students can also use indirect measurement (i.e., compare the lengths of two objects indirectly by using a third object) to order three objects by length. For example, they might compare the lengths of string used for paper-cup telephones and observe and describe the relative effectiveness of each length of string. Students can also use graphs to organize data, such as the number of drumbeats, and then analyze the data to find a pattern. Students will reason abstractly and quantitatively as they organize data into graphs, analyze the data, and use it to solve simple put-together, take-apart, and compare problems.

Modifications	
Special Education: • 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. multi-sensory 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. • Teacher models • Show additional number of samples/examples • Provide additional opportunities to practice • Use re-teaching and/or restating to address student's needs • Use small group table conferences to address needs • Develop target vocabulary • Scaffold comprehension when reading is necessary to fully understand science concept(s) • Use graphic organizers to develop key concepts/ideas • Teach key aspects of a topic and eliminate nonessential information.	**English Language Learners (ELLs):** ● Model Thinking Aloud ● Encourage Partner Talk ● Repeat and Clarify ● Provide a Sequence ● Encourage self-selection of topics ● Target vocabulary ● Scaffold comprehension when reading is used to promote reader response ● Scaffold content-literacy reading ● Allow products to demonstrate student's learning ● Provide on-going feedback

Students at Risk of School Failure:	**Gifted Students:**
● Build a relationship ● Allow flexible due dates ● Employ strategies from *"Classroom Instruction that Works"* ● Create the Opportunity to Learn strategies ● Build lessons around student interests	• Utilize flexible groups-group gifted students with other gifted students or higher-level learners • Encourage students to explore/research concepts in depth via independent studies or investigations (individual/group) • Differentiate product assignments. Employ differentiated curriculum to keep interest/motivation high • Encourage creative expression and thinking by allowing students to choose how to approach a problem or assignment (problem based learning) • Invite students to explore different points of view on a topic of study and compare the two • Provide multiple opportunities for students to "Own Their Learning" • Ask students higher-level questions that require students to look into causes, experiences, and facts to draw a conclusion to other areas of learning. (Webb's Depth of Knowledge- Level 4) • Create a room environment that encourages creativity and discovery through the use of interesting literature and reference materials. Supply reading materials on a wide variety of subjects and levels • Provide a learning-rich environment that includes a variety of resources, media, tasks, and methods of teaching •

Prior Learning

In **Unit 4, Light and Sound**, students planned and conducted investigations to understand the relationship between vibrating materials and sound. They learned that vibrating materials can make sound and that sound can make materials vibrate. Students observed that light is necessary for objects to be seen and that light travels from place to place. They also investigated the effect of placing objects made with different materials in the path of a beam of light. This learning is foundational for the content and practices in this unit of study.

In **Unit 3, Mimicking Organisms to Solve Problems**, students engaged in engineering design in order 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. Students learned that 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.

Future Learning

Grade 2 Unit 1: Relationships in Habitats

- Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people.*(secondary)*

Grade 2 Unit 2: Properties of Matter

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

Grade 4 Unit 5: Transfer of Energy

- An object can be seen when light reflected from its surface enters the eyes.
- Digitized information can be transmitted over long distances without significant degradation. High-tech devices, such as computers or cell phones, can receive and decode information—convert it from digitized form to voice—and vice versa.

Appendix A: NGSS and Foundations for the Module		
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)**		
Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool. (K-2-ETS1-1)		
Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. (K-2-ETS1-2)		
The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:		
Science and Engineering Practices	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Planning and Carrying Out Investigations • Plan and conduct investigations collaboratively to produce evidence to answer a question. (1-PS4-1),(1-PS4-3) **Constructing Explanations and Designing Solutions** • Use tools and materials provided to design a device that solves a specific problem. (1-PS4-4) **Asking Questions and Defining Problems** • Ask questions based on observations to find more information about the natural and/or designed world(s). (K-2-ETS1-1) • Define a simple problem that can be solved through the development of a new	**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)	**Structure and Function** • The shape and stability of structures of natural and designed objects are related to their function(s). (K-2-ETS1-2) ***Connections to Engineering, Technology, and Applications of Science*** **Influence of Engineering, Technology, and Science, on Society and the Natural World** • People depend on various technologies in their lives; human life would be very different without technology. (1-PS4-4)

or improved object or tool. (K-2-ETS1-1) **Developing and Using Models** • Develop a simple model based on evidence to represent a proposed object or tool. (K-2-ETS1-2)	• 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)	

English Language Arts	Mathematics
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). (1-PS4-4) **W.1.7** Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text. (K-2-ETS1-1) **RI.2.1** With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers. (K-2-ETS1-1) **W.2.6** Recall information from experiences or gather information from provided sources to answer a question. (K-2-ETS1-1) **W.2.8** Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings. (K-2-ETS1-2) **SL.2.5**	Reason abstractly and quantitatively. (K-2-ETS1-1) **MP.2** Model with mathematics. (K-2-ETS1-1) **MP.4** Use appropriate tools strategically. (1-PS4-4),(K-2-ETS1-1) **MP.5** Order three objects by length; compare the lengths of two objects indirectly by using a third object. (1-PS4-4) **1.MD.A.1** 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. Limit to contexts where the object being measured is spanned by a whole number of length units with no gaps or overlaps. (1-PS4-4) **1.MD.A.2** Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph. (K-2-ETS1-1) **2.MD.D.10**

Module #3 "Light and Sound" *(TCISI – Unit #2 Light and Sound)*
Core Lesson #1 "How Does Light Help You See"

Essential question(s):
How does light help you see?

Objectives	NJSLS Standard(s)	Segment	Time	Materials
SWBAT: • Make observations to construct an evidence-based account that objects can be seen only when illuminated. • Know objects can be seen if light is available to illuminate them or if they give off their own light. • Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena.	1-PS4-2 PS4.B W.1.2 W.1.7 W.1.8 SL.1.1	*Introduction/ Anticipatory Set*	10 minutes	• Observing Phenomena (Slide 6) • Science Notebook: Write an I wonder Statement pg. 55 • Investigation: Spotlight Game Slides 8-12
		Activity	20 minutes	• Investigation: Dark places videos (Slides 13-18) • Record findings in Science Notebook pg.56
		Activity	20-30 minutes	• Read Lesson 1 – Student Textbook pg. 78- 85 • Student Notebook pg. 58-59
		Activity	20-30 minutes	• Write a story (Slide 19-21) • Plan story in SN pg. 57 • Write story in blank notebook
		Evaluate/Assess	20 minutes	• Lesson Wrap up and Show What You Know (Slides 22-24) • Science Notebook pg. 60

Key Vocabulary:

- light

Module #3 "Light and Sound" *(TCISI – Unit #2 Light and Sound)*
Core Lesson #2 "How Does Light Travel?"

Essential question(s):
How does light travel?

Objectives	NJSLS Standard(s)	Segment	Time	Materials
SWBAT: • **Plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light.** • **Understand how a mirror can be used to redirect a light beam.**	1-PS4-3 PS4.B W.1.7 W.1.8	*Introduction/ Anticipatory Set*	10 – 15 minutes	• Step 1: Observing Light (Slide 8) • Student Notebook pg 61
		Activity	40 minutes	• Investigation: Light Beams (Slides 11-13) • Explore a Science Question and Test Other Materials (Slides 14-18) • Student Notebook pg. 62
		Activity	20 minutes	• Investigation: Testing Mirrors (Slides 19-21)
		Activity	20 – 30 minutes	• Read Lesson 2 – Student Textbook pg. 86- 93 • Student Notebook pg. 63-65
		Evaluate/Assess	20 minutes	• Lesson Wrap up and Show What You Know (Slides 22-24) • Science Notebook pg. 66

Key Vocabulary:

- Mirror

Module #3 "Light and Sound" *(TCISI – Unit #2 Light and Sound)*
Core Lesson #3 "How are Shadows Made?"

Essential question(s):
How are shadows made?

Objectives	NJSLS Standard(s)	Segment	Time	Materials
SWBAT: • Plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light. • Know that mirrors can be used to redirect a light beam. • Know shadows form when an object blocks light.	1-PS4-3 PS4.B W.1.8 SL.1.1	*Introduction/ Anticipatory Set*	10 minutes	• Observing Phenomena – Shadows (Slide 7) • Science Notebook pg. 67
		Activity	20 – 30 minutes	• Read Lesson 3 – Student Textbook pg. 94- 103 • Student Notebook pg. 68-70
		Activity	15-20 minutes	• Investigation: Shadow Puppets (Slide 9-13) • Making Shadow Puppets • Puppet Shape handout • Student Notebook pg. 71
		Activity	20 minutes	• Investigating Shadows (Slides 14-16) • Student Notebook pg. 72-73
		Activity	60 minutes	• Planning and Performing a Shadow Puppet Show (Slides 17-18)

		Evaluate/Assess	20 minutes	• Lesson Wrap up and Show What You Know (Slides 19-21) • Science Notebook pg. 74
Key Vocabulary: • Shadow				

Module #3 "Light and Sound" *(TCISI – Unit #2 Light and Sound)*
Core Lesson #4 "How is Sound Made?"

Essential question(s):
How is sound made?

Objectives	NJSLS Standard(s)	Segment	Time	Materials
SWBAT: • Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.	1-PS4-1 PS4.A W1.7 W1.8 SL.1.1	*Introduction/ Anticipatory Set*	10 minutes	• Observing Phenomena – How is Sounds Made? (Slide 9) • Science Notebook pg. 75
		Activity	60 minutes	• Investigation: Garage Band (Slide 11) • Making Sounds (Slides 12-14) • Science Notebook page 76 • Performing in an Band (Slide 15 - 17)
		Activity	20 minutes	• Investigation: Making Objects Vibrate (Slides 18 – 20) • Science Notebook page 77
		Activity	20 – 30 minutes	• Read Lesson 4 – Student Textbook pg. 104 - 111 • Student Notebook pg. 78-79
		Evaluate/Assess	20 minutes	• Lesson Wrap up and Show What You Know (Slides 21-24) • Science Notebook pg. 80

Key Vocabulary:

- Sound vibrate

Module #3 "Light and Sound" *(TCISI – Unit #2 Light and Sound)*
Core Lesson #5 "How Does Sound Travel?"

Essential question(s):
How does sound travel?

Objectives	NJSLS Standard(s)	Segment	Time	Materials
SWBAT: • Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.	1-PS4-1 PS4.A W.1.7 W.1.8 SL.1.1	*Introduction/ Anticipatory Set*	10 minutes	• Observing Phenomena – How Does Sound Travel? (Slide 8) • Science Notebook pg. 81
		Activity	15 minutes	• Investigation: Sound Waves (Slide 11) • Investigate: Making Sounds with a Tuning Fork (Slides 12 – 14)
		Activity	40 minutes	• Testing a Science Question (Slides 15 – 16) • Science Notebook pg. 82
		Activity	15 minutes	• Planning an Investigation (Slides 17 – 19) • Science Notebook pg. 83
		Activity	20 – 30 minutes	• Read Lesson 5 – Student Textbook pg. 112 - 121 • Student Notebook pg. 84-85

		Evaluate/Assess	20 minutes	• Lesson Wrap up and Show What You Know (Slides 20-22) • Science Notebook pg. 86
Key Vocabulary: • Echo				

Module #3 "Light and Sound" *(TCISI – Unit #2 Light and Sound)*
Core Lesson #6 "How Do People Use Light and Sound to Send Messages?"

Essential question(s):
How Do People Use Light and Sound to Send Messages?

Objectives	NJSLS Standard(s)	Segment	Time	Materials
SWBAT: • Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance • Recognize that people use a variety of devices to communicate over long distances.	1-PS4-4 PS4.C W.1.7	*Introduction/ Anticipatory Set*	10 minutes	• Observing Phenomena – How Do People Use Light and Sound? (Slide 7) • Science Notebook pg. 87
		Activity	20 – 30 minutes	• Read Lesson 6 – Student Textbook pg. 122 - 131 • Student Notebook pg. 88-90
		Activity	25 minutes	• Investigation: Secret Simon (Slide 9) • Playing Simon Says (Slides 10 – 11) • Recording Messages (Slides 12 – 13) • Student Notebook pg. 91
		Activity	20 minutes	• Investigation: • Creating Secret Codes (Slides 14 – 15) • Student Notebook pg. 91
		Activity	30 minutes	• Investigation: • Sending Messages (Slides 16-17)

		Evaluate/Assess	20 minutes	• Lesson Wrap up and Show What You Know (Slides 18-20) • Science Notebook pg. 92
Key Vocabulary: • Message				