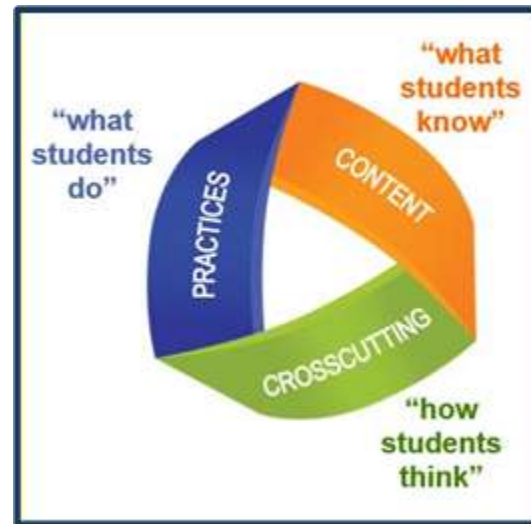


# Ledyard Public Schools First Grade NGSS Curriculum

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## District Philosophy

Ledyard's vision for K-12 inquiry based science is to engage students in scientific and engineering practices as they apply crosscutting concepts to deepen their understanding of the core ideas in these fields.

# A New Vision for Science Education

Implications of the Vision of the Framework for K-12 Science Education and the Next Generation Science Standards

SCIENCE EDUCATION WILL INVOLVE LESS:	SCIENCE EDUCATION WILL INVOLVE MORE:
Rote memorization of facts and terminology.	Facts and terminology learned as needed while developing explanations and designing solutions supported by evidence-based arguments and reasoning.
Learning of ideas disconnected from questions about phenomena.	Systems thinking and modeling to explain phenomena and to give a context for the ideas to be learned.
Teachers providing information to the whole class.	Students conducting investigations, solving problems, and engaging in discussions with teachers' guidance.
Teachers posing questions with only one right answer.	Students discussing open-ended questions that focus on the strength of the evidence used to generate claims.
Students reading textbooks and answering questions at the end of the chapter.	Students reading multiple sources, including science-related magazine and journal articles and web-based resources; students developing summaries of information.
Pre-planned outcome for “cookbook” laboratories or hands-on activities.	Multiple investigations driven by students’ questions with a range of possible outcomes that collectively lead to a deep understanding of established core scientific ideas.
Worksheets.	Student writing of journals, reports, posters, and media presentations that explain and argue.
Oversimplification of activities for students who are perceived to be less able to do science and engineering	Provision of supports so that all students can engage in sophisticated science and engineering practices

Source: National Research Council. (2015). *Guide to Implementing the Next Generation Science Standards* (pp. 8-9). Washington, DC: National Academies Press. <http://www.nap.edu/catalog/18802/guide-to-implementing-the-next-generation-science-standards>

## Three Dimensions of the *Next Generation Science Standards*: [SEP \(appendix F\)](#), [DCI \(appendix E\)](#), [CCC \(appendix G\)](#)

### Scientific and Engineering Practices Matrix

#### Asking Questions and Defining Problems

A practice of science is to ask and refine questions that lead to descriptions and explanations of how the natural and designed world works and which can be empirically tested.

Engineering questions clarify problems to determine criteria for successful solutions and identify constraints to solve problems about the designed world. Both scientists and engineers also ask questions to clarify the ideas of others.

#### Planning and Carrying Out Investigations

Scientists and engineers plan and carry out investigations in the field or laboratory, working collaboratively as well as individually. Their investigations are systematic and require clarifying what counts as data and identifying variables or parameters. Engineering investigations identify the effectiveness, efficiency, and durability of designs under different conditions.

#### Analyzing and Interpreting Data

Scientific investigations produce data that must be analyzed in order to derive meaning. Because data patterns and trends are not always obvious, scientists use a range of tools—including tabulation, graphical interpretation, visualization, and statistical analysis—to identify the significant features and patterns in the data. Scientists identify sources of error in the investigations and calculate the degree of certainty in the results. Modern technology makes the collection of large data sets much easier, providing secondary sources for analysis.

Engineering investigations include analysis of data collected in the tests of designs. This allows comparison of different solutions and determines how well each meets specific design criteria—that is, which design best solves the problem within given constraints. Like scientists, engineers require a range of tools to identify patterns within data and interpret the results. Advances in science make analysis of proposed solutions more efficient and effective.

#### Developing and Using Models

A practice of both science and engineering is to use and construct models as helpful tools for representing ideas and explanations. These tools include diagrams, drawings, physical replicas, mathematical representations, analogies, and computer simulations. Modeling tools are used to develop questions, predictions and explanations; analyze and identify flaws in systems; and communicate ideas. Models are used to build and revise scientific explanations and proposed engineered systems. Measurements and observations are used to revise models and designs.

#### Constructing Explanations and Designing Solutions

*The products of science are explanations and the products of engineering are solutions.* The goal of science is the construction of theories that provide explanatory accounts of the world. A theory becomes accepted when it has multiple lines of empirical evidence and greater explanatory power of phenomena than previous theories. The goal of engineering design is to find a systematic solution to problems that is based on scientific knowledge and models of the material world. Each proposed solution results from a process of balancing competing criteria of desired functions, technical feasibility, cost, safety, aesthetics, and compliance with legal requirements. The optimal choice depends on how well the proposed solutions meet criteria and constraints.

#### Engaging in Argument from Evidence

*Argumentation is the process by which explanations and solutions are reached.* In science and engineering, reasoning and argument based on evidence are essential to identifying the best explanation for a natural phenomenon or the best solution to a design problem. Scientists and engineers use argumentation to listen to, compare, and evaluate competing ideas and methods based on merits. Scientists and engineers engage in argumentation when investigating a phenomenon, testing a design solution, resolving questions about measurements, building data models, and using evidence to identify strengths and weaknesses of claims.

#### Using Mathematics and Computational Thinking

In both science and engineering, mathematics and computation are fundamental tools for representing physical variables and their relationships. They are used for a range of tasks such as constructing simulations; statistically analyzing data; and recognizing, expressing, and applying quantitative relationships. Mathematical and computational approaches enable scientists and engineers to predict the behavior of systems and test the validity of such predictions. Statistical methods are frequently used to identify significant patterns and establish correlational relationships.

#### Obtaining, Evaluating, and Communicating Information

Scientists and engineers must be able to communicate clearly and persuasively the ideas and methods they generate. Critiquing and communicating ideas individually and in groups is a critical professional activity. Communicating information and ideas can be done in multiple ways: using tables, diagrams, graphs, models, and equations as well as orally, in writing, and through extended discussions. Scientists and engineers employ multiple sources to acquire information that is used to evaluate the merit and validity of claims, methods, and designs.



Disciplinary Core Ideas Matrix			
Physical Science	Life Science	Earth and Space Science	Engineering, Technology, and the Application of Science
<p><b><u>PS1: Matter and Its Interactions</u></b>            PS1.A: Structure and Properties of Matter            PS1.B: Chemical Reactions            PS1.C: Nuclear Processes</p> <p><b><u>PS2: Motion and Stability: Forces and Interactions</u></b>            PS2.A: Forces and Motion            PS2.B: Types of Interactions</p> <p><b><u>PS3: Energy</u></b>            PS3.A: Definitions of Energy            PS3.B: Conservation of Energy and Energy Transfer            PS3.C: Relationship Between Energy and Forces            PS3.D: Energy in Chemical Processes and Everyday Life</p> <p><b><u>PS4: Waves and Their Applications in Technologies for Information Transfer</u></b>            PS4.A: Wave Properties            PS4.B: Electromagnetic Radiation            PS4.C: Information Technologies and Instrumentation</p>	<p><b><u>LS1: From Molecules to Organisms: Structures and Processes</u></b>            LS1.A: Structure and Function            LS1.B: Growth and Development of Organisms            LS1.C: Organization for Matter and Energy Flow in Organisms            LS1.D: Information Processing</p> <p><b><u>LS2: Ecosystems: Interactions, Energy, and Dynamics</u></b>            LS2.A: Interdependent Relationships in Ecosystems            LS2.B: Cycles of Matter and Energy Transfer in Ecosystems            LS2.C: Ecosystem Dynamics, Functioning, and Resilience            LS2.D: Social Interactions and Group Behavior</p> <p><b><u>LS3: Heredity: Inheritance and Variation of Traits</u></b>            LS3.A: Inheritance of Traits            LS3.B: Variation of Traits</p> <p><b><u>LS4: Biological Evolution: Unity and Diversity</u></b>            LS4.A: Evidence of Common Ancestry and Diversity            LS4.B: Natural Selection            LS4.C: Adaptation            LS4.D: Biodiversity and Humans</p>	<p><b><u>ESS1: Earth's Place in the Universe</u></b>            ESS1.A: The Universe and Its Stars            ESS1.B: Earth and the Solar System            ESS1.C: The History of Planet Earth</p> <p><b><u>ESS2: Earth's Systems</u></b>            ESS2.A: Earth Materials and Systems            ESS2.B: Plate Tectonics and Large-Scale Systems            ESS2.C: The Role of Water in Earth's Surface Processes            ESS2.D: Weather and Climate            ESS2.E: Biogeology</p> <p><b><u>ESS3: Earth and Human Activity</u></b>            ESS3.A: Natural Resources            ESS3.B: Natural Hazards            ESS3.C: Human Impacts on Earth Systems            ESS3.D: Global Climate Change</p>	<p><b><u>ETS1: Engineering Design</u></b>            ETS1.A: Defining and Delimiting an Engineering Problem            ETS1.B: Developing Possible Solutions            ETS1.C: Optimizing the Design Solution</p>

Crosscutting Concepts Matrix		
<p><u>Patterns</u> Observed patterns of forms and events guide organization and classification, and they prompt questions about relationships and the factors that influence them.</p> <p><u>Cause and Effect: Mechanism and Explanation</u> Events have causes, sometimes simple, sometimes multifaceted. A major activity of science is investigating and explaining causal relationships and the mechanisms by which they are mediated. Such mechanisms can then be tested across given contexts and used to predict and explain events in new contexts.</p>	<p><u>Scale, Proportion, and Quantity</u> In considering phenomena, it is critical to recognize what is relevant at different measures of size, time, and energy and to recognize how changes in scale, proportion, or quantity affect a system's structure or performance.</p> <p><u>Systems and System Models</u> Defining the system under study—specifying its boundaries and making explicit a model of that system—provides tools for understanding and testing ideas that are applicable throughout science and engineering.</p>	<p><u>Energy and Matter: Flows, Cycles, and Conservation</u> Tracking fluxes of energy and matter into, out of, and within systems helps one understand the systems' possibilities and limitations.</p> <p><u>Structure and Function</u> The way in which an object or living thing is shaped and its substructure determine many of its properties and functions.</p> <p><u>Stability and Change</u> For natural and built systems alike, conditions of stability and determinants of rates of change or evolution of a system are critical elements of study.</p>

Developed by NSTA based on content from the *Framework for K-12 Science Education* and supporting documents for the *May 2012 Public Draft of the NGSS*

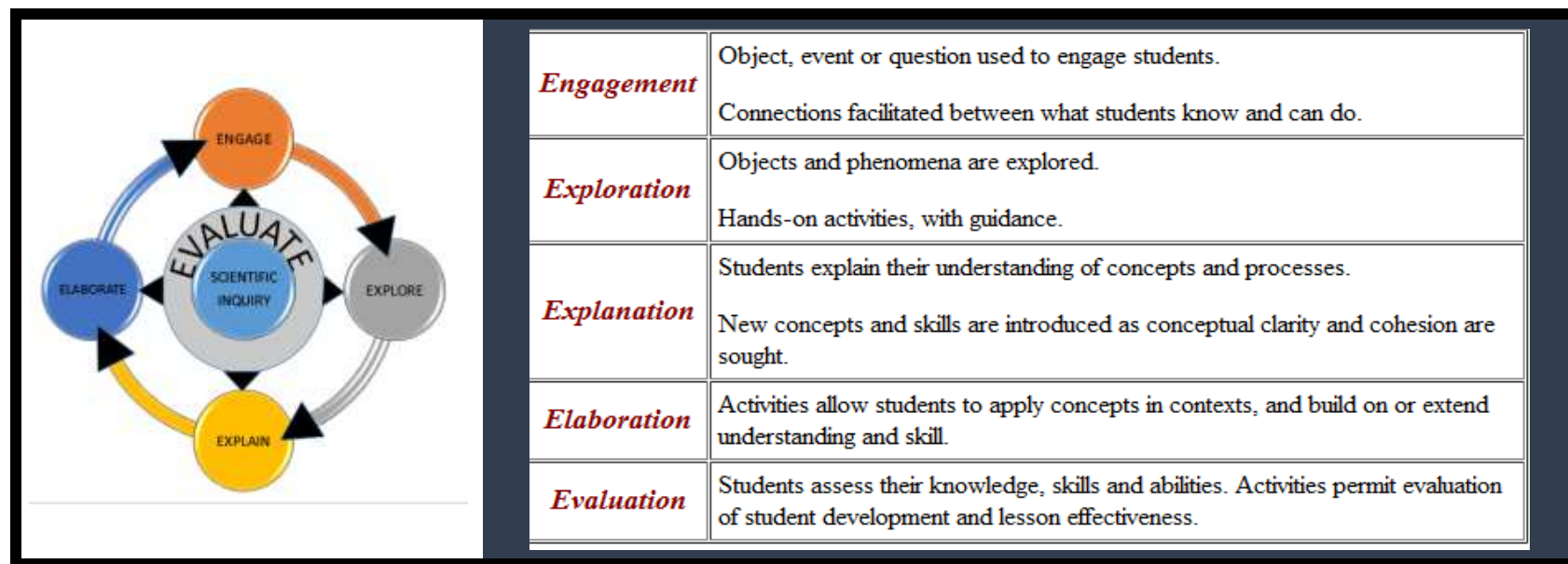
## Connections to the Nature of Science

Nature of Science Practices	Nature of Science Crosscutting Concepts
These understandings about the nature of science are closely associated with the science and engineering practices, and are found in that section of the foundation box on a standards page. More information about the Connections to Engineering, Technology and Applications of Science can be found in <a href="#">Appendix H</a> .	These understandings about the nature of science are closely associated with the crosscutting concepts, and are found in that section of the foundation box on a standards page. More information about the Connections to Engineering, Technology and Applications of Science can be found in <a href="#">Appendix H</a> .
<u>Scientific Investigations Use a Variety of Methods</u>	<u>Science is a Way of Knowing</u>
<u>Science Knowledge is Based on Empirical Evidence</u>	<u>Scientific Knowledge Assumes Order and Consistency in Natural Systems</u>
<u>Scientific Knowledge is Open to Revision in Light of New Evidence</u>	<u>Science is a Human Endeavor</u>
<u>Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena.</u>	<u>Science Addresses Questions About the Natural and Material World</u>

## How does Ledyard Define Inquiry?

Inquiry is defined as a way of seeking information, knowledge, or truth through questioning. Inquiry is a way for a learner to acquire new information and data and turn it into useful knowledge. Inquiry involves asking good questions and developing robust investigations from them. Inquiry also involves considering possible solutions and consequences. A third component of inquiry is separating evidence based claims from common opinion, and communicating claims with others, and acting upon these claims when appropriate. Questions lead to gathering information through research, study, experimentation, observation, or interviews. During this time, the original question may be revised, a line of research refined, or an entirely new path may be pursued. As more information is gathered, it becomes possible to make connections and allows individuals to construct their own understanding to form new knowledge. Sharing this knowledge with others develops the relevance of the learning for both the student and a greater community. Sharing is followed by reflection and potentially more questions, bringing the inquiry process full circle.

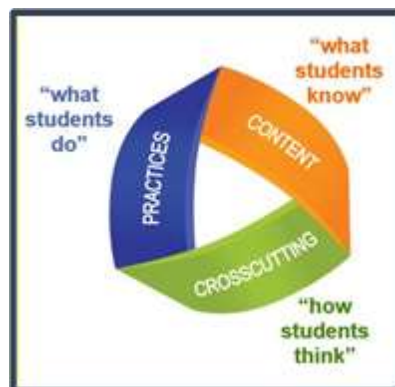
## Inquiry 5 Science Teaching Model





## Ledyard Next Generation Science Standards

### First Grade



### First Grade NGSS Storyline

The performance expectations in first grade help students formulate answers to questions such as: “What happens when materials vibrate? What happens when there is no light? What are some ways plants and animals meet their needs so that they can survive and grow? How are parents and their children similar and different? What objects are in the sky and how do they seem to move?” First grade performance expectations include PS4, LS1, LS3, and ESS1 Disciplinary Core Ideas from the NRC Framework. Students are expected to develop understanding of the relationship between sound and vibrating materials as well as between the availability of light and ability to see objects. The idea that light travels from place to place can be understood by students at this level through determining the effect of placing objects made with different materials in the path of a beam of light. Students are also expected to develop understanding of how plants and animals use their external parts to help them survive, grow, and meet their needs as well as how behaviors of parents and offspring help the offspring survive. The understanding is developed that young plants and animals are like, but not exactly the same as, their parents. Students are able to observe, describe, and predict some patterns of the movement of objects in the sky. The crosscutting concepts of patterns; cause and effect; structure and function; and influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for these disciplinary core ideas. In the first grade performance expectations, students are expected to demonstrate grade-appropriate proficiency in planning and carrying out investigations, analyzing and interpreting data, constructing explanations and designing solutions, and obtaining, evaluating, and communicating information. Students are expected to use these practices to demonstrate understanding of the core ideas.

## Ledyard Next Generation Science Standards

## Grade 1

**Unit 1: LIGHT AND SOLAR PATTERNS***August-November*

Anchoring Phenomenon	
<p><b>We can see more in the daytime than at night.</b></p> <p><b>I can make shadow puppets.</b></p>	
Essential Questions	Compelling Questions
<p><b>Why are we able to see objects?</b></p>	<ul style="list-style-type: none"><li>• <i>What kinds of classroom materials let light pass through?</i></li><li>• <i>What kinds of classroom materials do not let light pass through?</i></li><li>• <i>When is there light during a day?</i></li><li>• <i>When is there darkness during a day?</i></li></ul>

Unit 1: Light and Solar Patterns Summary			
Performance Expectations	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<ul style="list-style-type: none"> <li>• <a href="#"><u>1-PS4-2</u></a></li> <li>• <a href="#"><u>1-PS4-3</u></a></li> <li>• <a href="#"><u>1-ESS1-2</u></a></li> <li>• <a href="#"><u>K-2-ETS1-1</u></a></li> </ul> <p><i>Teacher Note: All <u>Science and Engineering Practices</u> and <u>Crosscutting Concepts</u> in bold are written in the Performance Expectations above. The italicized practices and crosscutting concepts, although not mentioned specifically, may be incorporated additionally in any science lesson at any time.</i></p>	<ul style="list-style-type: none"> <li>• <i>1: Asking Questions and Defining Problems</i></li> <li>• <i>2: Developing and Using Models</i></li> <li>• <b>3: Planning and Carrying Out Investigations</b></li> <li>• <i>4: Analyzing and Interpreting Data</i></li> <li>• <i>5: Using Mathematical Computational Thinking</i></li> <li>• <b>6: Constructing Explanations and Designing Solutions</b></li> <li>• <i>7: Engaging in Argument from Evidence</i></li> <li>• <i>8: Obtaining, Evaluating, and Communicating Information</i></li> </ul>	<p><b><u>EARTH AND SPACE SCIENCE</u></b></p> <ul style="list-style-type: none"> <li>• <b>ESS1 Earth's Place in the Universe</b> -ESS1.B: Earth and the Solar System</li> </ul> <p><b><u>ENGINEERING, TECHNOLOGY AND THE APPLICATION OF SCIENCE</u></b></p> <ul style="list-style-type: none"> <li>• <b>ETS1 Engineering Design</b> -ETS1.A: Defining and Delimiting an Engineering Problem</li> </ul> <p><b><u>PHYSICAL SCIENCE</u></b></p> <ul style="list-style-type: none"> <li>• <b>PS4 Waves and Their Applications in Technologies for Information Transfer</b> -PS4.B: Electromagnetic Radiation</li> </ul>	<ul style="list-style-type: none"> <li>• <b>1: Patterns</b></li> <li>• <b>2: Cause and Effect</b></li> <li>• <i>3: Scale, Proportion and Quantity</i></li> <li>• <i>4: Systems and System Models</i></li> <li>• <i>5: Energy and Matter</i></li> <li>• <i>6: Structure and Function</i></li> <li>• <i>7: Stability and Change</i></li> </ul>

Unit 1: Light and Solar Patterns DCI Vocabulary	
Disciplinary Core Ideas	Vocabulary
<p><b><u>EARTH AND SPACE SCIENCE</u></b></p> <ul style="list-style-type: none"> <li><b>ESS1 Earth's Place in the Universe</b> -ESS1.B: Earth and the Solar System</li> </ul> <p><b><u>ENGINEERING, TECHNOLOGY AND THE APPLICATION OF SCIENCE</u></b></p> <ul style="list-style-type: none"> <li><b>ETS1 Engineering Design</b> -ETS1.A: Defining and Delimiting an Engineering Problem</li> </ul> <p><b><u>PHYSICAL SCIENCE</u></b></p> <ul style="list-style-type: none"> <li><b>PS4 Waves and Their Applications in Technologies for Information Transfer</b> -PS4.B: Electromagnetic Radiation</li> </ul>	<p><i>This is a recommendation for domain specific terms taught to First Grade students.</i></p> <p><b><u>Domains are bold:</u></b></p> <ul style="list-style-type: none"> <li><b>Earth's Place in the Universe→Earth and the Solar System (ESS1)</b> <i>area, daylight, Earth, Earth's gravity, gas, human-made, month, night sky, season, seasonal, shadow, space, star, sun's position, sunlight, week, year</i></li> <li><b>Engineering (ETS1)</b> <i>best, design, environment, human, machine, teamwork</i></li> <li><b>Waves and Their Applications in Technologies for Information Transfer→Electromagnetic Radiation (PS4)</b> <i>cold, canopy, cool, environment, heat(v), heat(n), hot, human, ice, life, light, nature, soil, sun, sunlight, temperature, warm</i></li> </ul>

Performance Expectation		
1-PS4-2 Waves and Their Applications in Technologies for Information Transfer		
<p><i>Students who demonstrate understanding can:</i></p> <p><u>Make observations to construct an evidence-based account that objects in darkness can be seen only when illuminated.</u></p> <p><b>Clarification Statement:</b> Examples of qualitative 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.</p> <p><b>Assessment Boundary:</b> N/A</p>		
Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p><b>Constructing Explanations and Designing Solutions</b></p> <ul style="list-style-type: none"> <li>Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena.</li> </ul> <p><i>Constructing explanations and designing solutions in K-2 builds on prior experiences and progresses to the use of evidence-based accounts of natural phenomena and designing solutions.</i></p>	<p><b>PS4.B: Electromagnetic Radiation</b></p> <ul style="list-style-type: none"> <li>Objects can be seen if light is available to illuminate them or if they give off their own light.</li> </ul>	<p><b>Cause and Effect</b></p> <ul style="list-style-type: none"> <li>Simple tests can be designed to gather evidence to support or refute student ideas about causes.</li> </ul>

Performance Expectation	
1-PS4-2 Waves and Their Applications in Technologies for Information Transfer	
Connections to other DCIs in First Grade: N/A	
Articulation of DCIs across grade-levels: N/A	
<b>Common Core State Standards Connections:</b> <u>ELA/Literacy-</u> <p><b>W.1.2</b> 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)</p> <p><b>W.1.7</b> 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-PS4-2)</p> <p><b>W.1.8</b> With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question. (1-PS4-2)</p> <p><b>SL.1.1</b> Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups. (1-PS4-2)</p> <u>Mathematics-</u> N/A	
1-PS4-2 Suggested Activities	1-PS4-2 Recommended Formative Assessments
<p><a href="#"><u>“Firefly, Firefly”</u></a> (<i>Science and Children September 2016</i>) Students will observe and explain how light is necessary for people and animals to see.</p> <p><a href="#"><u>How Does Light Help You See?</u></a> (<i>TCI: Unit 2, lesson 1, pg.78</i> ) Students find evidence to support that you can only see objects when illuminated by a light source.</p>	<ul style="list-style-type: none"> <li>• <a href="#"><u>Finish the Story: What can you see with/without light?</u></a></li> <li>• Teacher observation/monitoring of classroom discussion using <a href="#"><u>Talk Moves</u></a>.</li> </ul>

Performance Expectation		
1-PS4-3 Waves and Their Applications in Technologies for Information Transfer		
<p><u>Students who demonstrate understanding can:</u></p> <p><u>Plan and conduct investigations to determine the effect of placing objects made with different materials in the path of a beam of light.</u></p> <p><b>Clarification Statement:</b> 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).</p> <p><b>Assessment Boundary:</b> Assessment does not include the speed of light.</p>		
Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p><b>Planning and Carrying Out Investigations</b></p> <ul style="list-style-type: none"> <li>Plan and conduct investigations collaboratively to produce evidence to answer a question.</li> </ul> <p><i>Planning and carrying out investigations to answer questions or test solutions to problems in K-2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.</i></p>	<p><b>PS4.B: Electromagnetic Radiation</b></p> <ul style="list-style-type: none"> <li>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.)</li> </ul>	<p><b>Cause and Effect</b></p> <ul style="list-style-type: none"> <li>Simple tests can be designed to gather evidence to support or refute student ideas about causes.</li> </ul>

Performance Expectation	
1-PS4-3 Waves and Their Applications in Technologies for Information Transfer	
Connections to other DCIs in First Grade: N/A	
Articulation of DCIs across grade-levels: <a href="#">2.PS1.A</a>	
<b>Common Core State Standards Connections:</b> <u>ELA/Literacy</u> <p><b>W.1.7</b> 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-PS4-3)</p> <p><b>W.1.8</b> With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question. (1-PS4-3)</p> <p><b>SL.1.1</b> Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups. (1-PS4-3)</p> <p><u>Mathematics</u> - N/A</p>	
1-PS4-3 Suggested Activities	1-PS4-3 Recommended Formative Assessments
<p><a href="#">How Does Light Travel?</a> (TCI: Unit 2, lesson 2, pg.86 ) Students investigate what happens when different objects are placed in the path of a beam of light, determine that light beams travel in straight lines, and that some materials let pass light through.</p> <p><a href="#">How Are Shadows Made?</a> (TCI: Unit 2, lesson 3, pg.94 ) Students investigate shadows using shadow puppets.</p> <p><a href="#">“Paper Stained Glass”</a> (Mystery Science First Grade Lights and Sounds Mystery 2: What If There Were No Windows?) Students will look at materials and examine how much light the material lets through.</p> <p><a href="#">“You Light Up My Life” and “Seeing is Believing”</a> (Science and Children January 2016) Students will investigate objects in the path of light.</p>	<ul style="list-style-type: none"> <li>• <a href="#">Will the light pass through, or get blocked?</a></li> <li>• Teacher observation/monitoring of classroom discussion using <a href="#">Talk Moves</a>.</li> </ul>



Performance Expectation 1-ESS1-2 Earth's Place in the Universe		
<p><u>Students who demonstrate understanding can:</u></p> <p><b><u>Make observations at different times of year to relate the amount of daylight to the time of year.</u></b></p> <p><b>Clarification Statement:</b> Emphasis is on relative comparisons of the amount of daylight in the winter to the amount in the spring or fall.</p> <p><b>Assessment Boundary:</b> Assessment is limited to relative amounts of daylight, not quantifying the hours or time of daylight.</p>		
Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p><b>Planning and Carrying Out Investigations</b></p> <ul style="list-style-type: none"> <li>• Make observations (firsthand or from media) to collect data that can be used to make comparisons.</li> </ul> <p><i>Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.</i></p> <p>-----</p> <p><b>Connections to Nature of Science</b></p> <p><b>Scientific Investigations Use a Variety of Methods</b></p> <ul style="list-style-type: none"> <li>• Scientists use different ways to study the world.</li> </ul>	<p><b>ESS1.B Earth and the Solar System</b></p> <ul style="list-style-type: none"> <li>• Seasonal patterns of sunrise and sunset can be observed, described, and predicted.</li> </ul>	<p><b>Patterns</b></p> <ul style="list-style-type: none"> <li>• Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.</li> </ul>

Performance Expectation 1-ESS1-2 Earth's Place in the Universe	
Connections to other DCIs in First Grade: N/A	
Articulation of DCIs across grade-levels: <a href="#">5.PS2.B</a> ; <a href="#">5.ESS1.B</a>	
<b>Common Core State Standards Connections:</b> <u>ELA /Literacy -</u> <b>W.1.7</b> 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-ESS1-2) <b>W.1.8</b> With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question. (1-ESS1-2)  <u>Mathematics –</u> <b>MP.2</b> Reason abstractly and quantitatively. (1-ESS1-2) <b>MP.4</b> Model with mathematics. (1-ESS1-2) <b>MP.5</b> Use appropriate tools strategically. (1-ESS1-2) <b>1.OA.A.1</b> 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) <b>1.MD.C.4</b> 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-ESS1-2 Suggested Activities	1-ESS1-2 Recommended Formative Assessments
<p><a href="#">How Long is the Sun in the Sky?</a> (TCI: Unit 3, lesson 3, pg.148) Students collect data, graph the data, and analyze the data, comparing the amount of daylight in each season.</p> <p><a href="#">Where is the Sun in the Sky?</a> (TCI: Unit 3, lesson 2, pg.142 ) Students learn the sun has predictable patterns. Students design a playhouse that has a window to let the sun in all day long.</p>	<ul style="list-style-type: none"> <li>• <a href="#">What Season Am I?</a></li> <li>• <a href="#">Where is the Sun During My Day?</a></li> </ul>

Performance Expectation K-2 ETS1-1 Engineering Design		
<p><i>Students who demonstrate understanding can:</i></p> <p><u>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.</u></p> <p>Clarification Statement: N/A</p> <p>Assessment Boundary: N/A</p>		
Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p><b>Asking Questions and Defining Problems</b></p> <ul style="list-style-type: none"> <li>Ask questions based on observations to find more information about the natural and/or designed world(s).</li> <li>Define a simple problem that can be solved through the development of a new or improved object or tool.</li> </ul> <p><i>Asking questions and defining problems in K-2 builds on prior experiences and progresses to simple descriptive questions.</i></p>	<p><b>ETS1.A Defining and Delimiting Engineering Problems</b></p> <ul style="list-style-type: none"> <li>A situation that people want to change or create can be approached as a problem to be solved through engineering.</li> <li>Asking questions, making observations, and gathering information are helpful in thinking about problems.</li> <li>Before beginning to design a solution, it is important to clearly understand the problem.</li> </ul>	N/A

Performance Expectation K-ETS1-1 Engineering Design	
Connections to K-2-ETS1.B: Defining and Delimiting Engineering Problems include: Kindergarten: <a href="#">K-PS2-2</a> , <a href="#">K-ESS3-2</a>	
Articulation of DCIs across grade-levels: <a href="#">3-5.ETS1.A</a> ; <a href="#">3-5.ETS1.C</a>	
<b>Common Core State Standards Connections:</b> <u>ELA/Literacy</u> - <b>RI.2.1</b> Ask and answer such questions as <i>who</i> , <i>what</i> , <i>where</i> , <i>when</i> , <i>why</i> , and <i>how</i> to demonstrate understanding of key details in a text. (K-2-ETS1-1) <b>W.2.6</b> 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) <b>W.2.8</b> Recall information from experiences or gather information from provided sources to answer a question. (K-2-ETS1-1)  <u>Mathematics</u> - <b>MP.2</b> Reason abstractly and quantitatively. (K-2-ETS1-1) <b>MP.4</b> Model with mathematics. (K-2-ETS1-1) <b>MP.5</b> Use appropriate tools strategically. (K-2-ETS1-1) <b>2.MD.D.10</b> 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)	
K-ETS1-1 Suggested Activities	K-ETS1-1 Recommended Formative Assessments
<a href="#">Where is the Sun in the Sky?</a> (TCI: Unit 3, lesson 2, pg.142) Students learn the sun has predictable patterns. Students design a playhouse that has a window to let the sun in all day long.	<ul style="list-style-type: none"> <li>Design and build a playhouse.</li> </ul>

## Ledyard Next Generation Science Standards

## Grade 1

**Unit 2: OBSERVING OBJECTS WITH SIGHT AND HEARING***December-March*

Anchoring Phenomenon	
<p><b>A speaker vibrates when it plays music.</b></p> <p><b>I can't see stars during the daytime.</b></p>	
Essential Questions	Compelling Questions
<p><b>Why can we see objects and hear sounds?</b></p>	<ul style="list-style-type: none"><li>• <i>How can we make sounds?</i></li><li>• <i>How can we see objects with no lights on?</i></li><li>• <i>How can we use light and sound to communicate?</i></li><li>• <i>How does the position of the sun or moon change in the day or night sky?</i></li></ul>

## Unit 2: Observing Objects with Sight and Hearing Summary

Performance Expectations	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<ul style="list-style-type: none"> <li>• <a href="#"><u>1-ESS1-1</u></a></li> <li>• <a href="#"><u>1-PS4-1</u></a></li> <li>• <a href="#"><u>1-PS4-4</u></a></li> <li>• <a href="#"><u>K-2 ETS1-3</u></a></li> </ul> <p><i>Teacher Note: All <u>Science and Engineering Practices</u> and <u>Crosscutting Concepts</u> in bold are written in the Performance Expectations above. The italicized practices and crosscutting concepts, although not mentioned specifically, may be incorporated additionally in any science lesson at any time.</i></p>	<ul style="list-style-type: none"> <li>• <b>1: Asking Questions and Defining Problems</b></li> <li>• <b>2: Developing and Using Models</b></li> <li>• <b>3: Planning and Carrying Out Investigations</b></li> <li>• <b>4: Analyzing and Interpreting Data</b></li> <li>• <i>5: Using Mathematical Computational Thinking</i></li> <li>• <b>6: Constructing Explanations and Designing Solutions</b></li> <li>• <i>7: Engaging in Argument from Evidence</i></li> <li>• <b>8: Obtaining, Evaluating, and Communicating Information</b></li> </ul>	<p><b><u>EARTH AND SPACE SCIENCE</u></b></p> <ul style="list-style-type: none"> <li>• <b>ESS1 Earth's Place in the Universe</b> -ESS1.A: The Universe and Its Stars</li> </ul> <p><b><u>ENGINEERING, TECHNOLOGY AND THE APPLICATION OF SCIENCE</u></b></p> <ul style="list-style-type: none"> <li>• <b>ETS1 Engineering Design</b> -ETS1.C Optimizing the Design Solution</li> </ul> <p><b><u>PHYSICAL SCIENCE</u></b></p> <ul style="list-style-type: none"> <li>• <b>PS4 Waves and Their Applications in Technologies for Information Transfer</b> -PS4.A: Wave Properties -PS4.C: Information Technologies and Instrumentation</li> </ul>	<ul style="list-style-type: none"> <li>• <b>1: Patterns</b></li> <li>• <b>2: Cause and Effect</b></li> <li>• <i>3: Scale, Proportion and Quantity</i></li> <li>• <i>4: Systems and System Models</i></li> <li>• <i>5: Energy and Matter</i></li> <li>• <i>6: Structure and Function</i></li> <li>• <i>7: Stability and Change</i></li> </ul>

## Unit 2: Observing Objects with Sight and Hearing

### DCI Vocabulary

Disciplinary Core Ideas	Vocabulary
<p><b><u>EARTH AND SPACE SCIENCE</u></b></p> <ul style="list-style-type: none"> <li><b>ESS1 Earth's Place in the Universe</b> -ESS1.A: The Universe and Its Stars</li> </ul> <p><b><u>ENGINEERING, TECHNOLOGY AND THE APPLICATION OF SCIENCE</u></b></p> <ul style="list-style-type: none"> <li><b>ETS1 Engineering Design</b> -ETS1.C Optimizing the Design Solution</li> </ul> <p><b><u>PHYSICAL SCIENCE</u></b></p> <ul style="list-style-type: none"> <li><b>PS4 Waves and Their Applications in Technologies for Information Transfer</b> -PS4.A: Wave Properties -PS4.C: Information Technologies and Instrumentation</li> </ul>	<p><i>This is a recommendation for domain specific terms taught to First Grade students.</i></p> <p><b>Domains are bold:</b></p> <ul style="list-style-type: none"> <li><b>Earth's Place in the Universe→The Universe and Its Stars (ESS2)</b> <i>cloudy, cool, daily weather pattern, Earth, heat(n), heat(v), ice, land, living thing, rain, snow, sun, rainy, season, sunlight, seasonal changes, seasonal weather pattern, temperature, warm, wind, weather, weather patterns</i></li> <li><b>Engineering (ETS1)</b> <i>best, design, environment, human, machine, teamwork</i></li> <li><b>Waves and Their Applications in Technologies for Information Transfer→Wave Properties, Information Technologies and Instrumentation (PS4)</b> <i>cold, canopy, cool, environment, heat(v), heat(n), hot, human, ice, life, light, nature, soil, sun, sunlight, temperature, warm</i></li> </ul>

Performance Expectation		
1-PS4-1 Waves and Their Applications in Technologies for Information Transfer		
<p><i>Students who demonstrate understanding can:</i></p> <p><u><a href="#">Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.</a></u></p> <p><b>Clarification Statement:</b> 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.</p> <p><b>Assessment Boundary:</b> N/A</p>		
Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p><b>Planning and Carrying Out Investigations</b></p> <ul style="list-style-type: none"> <li>Plan and conduct investigations collaboratively to produce evidence to answer a question.</li> </ul> <p><i>Planning and carrying out investigations to answer questions or test solutions to problems in K-2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.</i></p> <hr/> <p><b>Connections to Nature of Science:</b></p> <p><b>Scientific Investigations Use a Variety of Methods</b></p> <ul style="list-style-type: none"> <li>Science investigations begin with a question.</li> <li>Scientists use different ways to study the world.</li> </ul>	<p><b>PS4.A: Wave Properties</b></p> <ul style="list-style-type: none"> <li>Sound can make matter vibrate, and vibrating matter can make sound.</li> </ul>	<p><b>Cause and Effect</b></p> <ul style="list-style-type: none"> <li>Simple tests can be designed to gather evidence to support or refute student ideas about causes.</li> </ul>



Performance Expectation	
1-PS4-1 Waves and Their Applications in Technologies for Information Transfer	
Connections to other DCIs in First Grade: N/A	
Articulation of DCIs across grade-levels: <b>4.ETS1.A</b>	
<b>Common Core State Standards Connections:</b> <u>ELA/Literacy -</u> <b>W.1.7</b> 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) <b>W.1.8</b> With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question. (1-PS4-1) <b>SL.1.1</b> 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)  <u>Mathematics -</u> <b>N/A</b>	
1-PS4-1 Suggested Activities	1-PS4-1 Recommended Formative Assessments
<p><b><u>How Is Sound Made?</u></b> (TCI: Unit 2, lesson 4, pg.104) Students investigate objects make sounds when they vibrate.</p> <p><b><u>How Does Sound Travel?</u></b> (TCI: Unit 2, lesson 5, pg.112) Students investigate if sound can just travel through air or can sound travel through other materials.</p>	<ul style="list-style-type: none"> <li><b><u>How sound is made</u></b></li> </ul>

1-PS4-1 Suggested Activities	1-PS4-1 Recommended Formative Assessments
<p><a href="#"><u>"Be A Sound Effects Artist"</u></a> (<i>Mystery Science First Grade Lights and Sounds Mystery 1: How Do They Make Silly Sounds In Cartoons?</i>) Students will look at materials and examine how much light the material lets through.</p> <p><a href="#"><u>"The Sounds of Science and Sounds Abound"</u></a> (<i>Science and Children December 2016</i>) Students investigate the characteristics of sound, how vibrating materials make different sounds, and how sounds can make different materials vibrate.</p> <p><a href="#"><u>"The Physics of Sound"</u></a> (<i>Science and Children December 2016</i>) Students observe and investigate different ways to make sounds.</p> <p><a href="#"><u>"The Poetry of Science: Light and Sound"</u></a> (<i>Science and Children December 2016</i>) poem "Sound Waves" by Michael Salinger.</p> <p><b><u>Read Aloud Suggestions:</u></b>  <b><u>What Makes Different Sounds?</u></b> by Lawrence F. Lowery  <b><u>Sounds All Around</u></b> by Wendy Pfeffer</p> <p><b><u>Additional Activities:</u></b>  <a href="#"><u>"Exploring Sounds with a Hanger and a String"</u></a> Students investigate common household materials, using them to make sound. Students have the opportunity watch a linked video showing how sound travels.</p> <p><a href="#"><u>"Speaking of Oobleck.."</u></a> Students have the opportunity watch a video showing how sound (vibrates) travels.</p>	<ul style="list-style-type: none"> <li>• <a href="#"><u>Writing: How People Make Sounds for Cartoons</u></a></li> <li>• CER: Sound Travels by....</li> <li>• <a href="#"><u>Sound Travel Investigation</u></a></li> </ul>

Performance Expectation		
1-PS4-4 Waves and Their Applications in Technologies for Information Transfer		
<p><i>Students who demonstrate understanding can:</i></p> <p><u>Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.</u></p> <p><b>Clarification Statement:</b> Examples of devices could include a light source to send signals, paper cup and string “telephones”, and a pattern of drum beats.</p> <p><b>Assessment Boundary:</b> Assessment does not include technological details for how communication devices work.</p>		
Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p><b>Constructing Explanations and Designing Solutions</b></p> <ul style="list-style-type: none"> <li>Use tools and materials provided to design a device that solves a specific problem.</li> </ul> <p><i>Constructing explanations and designing solutions in K-2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.</i></p>	<p><b>PS4.C: Information Technologies and Instrumentation</b></p> <ul style="list-style-type: none"> <li>People also use a variety of devices to communicate (send and receive information) over long distances.</li> </ul>	<p>N/A</p> <hr/> <p><b>Connections to Engineering, Technology, and Applications of Science</b></p> <p><b>Influence of Engineering, Technology, and Science, on Society and the Natural World</b></p> <ul style="list-style-type: none"> <li>People depend on various technologies in their lives; human life would be very different without technology.</li> </ul>

Performance Expectation	
1-PS4-4 Waves and Their Applications in Technologies for Information Transfer	
Connections to other DCIs in First Grade: N/A	
Articulation of DCIs across grade-levels: K.ETS1.A ; 2.ETS1.B ; 4.PS4.B ; 4.PS4.C	
<p><b>Common Core State Standards Connections:</b></p> <p><u>ELA/Literacy</u> -</p> <p><b>W.1.7</b> 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)</p> <p><u>Mathematics</u> -</p> <p><b>MP.5</b> Use appropriate tools strategically. (1-PS4-4)</p> <p><b>1.MD.A.1</b> Order three objects by length; compare the lengths of two objects indirectly by using a third object. (1-PS4-4)</p> <p><b>1.MD.A.2</b> 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)</p>	
1-PS4-4 Suggested Activities	1-PS4-4 Recommended Formative Assessments
<p><a href="#">How Do People Use Light and Sound to Send Messages?</a> (TCI: Unit 2, lesson 6, pg.122) Students learn that people use light and sound to communicate over a distance.</p> <p><a href="#">“Telephones”</a> Students will work together to construct telephones and figure out how they work.</p>	<ul style="list-style-type: none"> <li><a href="#">Design a way to send a goodnight message.</a></li> </ul>

Performance Expectation 1-ESS1-1 Earth's Place in the Universe		
<p><i>Students who demonstrate understanding can:</i>  <a href="#"><u>Use observations of the sun, moon, and stars to describe patterns that can be predicted.</u></a></p> <p><b>Clarification Statement:</b> 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.</p> <p><b>Assessment Boundary:</b> <i>Assessment of star patterns is limited to stars being seen at night and not during the day.</i></p>		
Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p><b>Analyzing and Interpreting Data</b></p> <ul style="list-style-type: none"> <li>• Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions.</li> </ul> <p><i>Analyzing and interpreting data in K-2 builds on prior experiences and progresses to collecting, recording, and sharing observations.</i></p>	<p><b>ESS1.A: The Universe and its Stars</b></p> <ul style="list-style-type: none"> <li>• Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted.</li> </ul>	<p><b>Patterns</b></p> <ul style="list-style-type: none"> <li>• Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.</li> </ul> <hr/> <p><b>Connections to Nature of Science</b></p> <p><b>Scientific Knowledge Assumes an Order and Consistency in Natural Systems</b></p> <ul style="list-style-type: none"> <li>• Science assumes natural events happen today as they happened in the past.</li> <li>• Many events are repeated.</li> </ul>

Performance Expectation 1-ESS1-1 Earth's Place in the Universe	
Connections to other DCIs in First Grade: N/A	
Articulation of DCIs across grade-levels: <b>3.PS2.A ; 5.PS2.B ; 5.ESS1.B</b>	
<b>Common Core State Standards Connections:</b> <u>ELA/Literacy</u> - <b>W.1.7</b> 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) <b>W.1.8</b> With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question. (1-ESS1-1) <u>Mathematics</u> - <b>N/A</b>	
1-ESS1-1 Suggested Activities	1-ESS1-1 Recommended Formative Assessments
<p><u><a href="#">What Do You See in the Sky?</a></u> (TCI: Unit 3, lesson 1, pg.136) Students describe patterns of the sun, moon and stars during the day and night.</p> <p><u><a href="#">Where is the Sun in the Sky?</a></u> (TCI: Unit 3, lesson 2, pg.142) Students learn the sun has predictable patterns. Students design a playhouse that has a window to let the sun in all day long.</p> <p><u><a href="#">“Moving Shadows”</a></u> (Mystery Science First Grade Spinning Sky Mystery 1: Could a Statue’s Shadow Move?) Students will investigate how shadows from stationary objects move during the day, and interpret what this means to the sun’s relative place in the sky during the day.</p>	<ul style="list-style-type: none"> <li>• <u><a href="#">Draw the sky at day and night for three days, showing the sun, moon, or stars, identifying the pattern of day/night.</a></u></li> <li>• CER: How does a shadow move?</li> <li>• Daily weather conversations/journals</li> </ul>

1-ESS1-1 Suggested Activities	1-ESS1-1 Recommended Formative Assessments
<p><u><a href="#">“Sun Finder”</a></u> (<i>Mystery Science First Grade Spinning Sky Mystery 2: How Can the Sun Help You If You’re Lost?</i>) Students will develop a model of the sun’s daily path across the sky and use this model to navigate/help someone who is lost.</p> <p><u><a href="#">“Sunrise, Sunset and Shadows”, “My Shadow from the Sun”</a></u> (<i>Science and Children December 2015</i>) Students will investigate how the location of a light source affects shadows. Students will track their own shadow at different times in the day to make observations.</p> <p><u><a href="#">“Patterns Are Observable, Predictable, and Explainable”</a></u> (<i>Science and Children October 2014</i>) Students will investigate and discuss daily weather patterns over time.</p>	

Performance Expectation K-ETS1-3 Engineering Design		
<p>Students who demonstrate understanding can:</p> <p><u>Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.</u></p> <p>Clarification Statement: N/A</p> <p>Assessment Boundary: N/A</p>		
Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p><b>Analyzing and Interpreting Data</b></p> <ul style="list-style-type: none"> <li>Analyze data from tests of an object or tool to determine if it works as intended.</li> </ul> <p><i>Analyzing data in K-2 builds on prior experiences and progresses to collecting, recording, and sharing observations.</i></p>	<p><b>ETS1.C Optimizing the Design Solution</b></p> <ul style="list-style-type: none"> <li>Because there is always more than one possible solution to a problem, it is useful to compare and test designs.</li> </ul>	N/A



Performance Expectation K-2-ETS1-3 Engineering Design	
Connections to other DCIs in First Grade: Second Grade: <a href="#">2-ESS2-1</a>	
Articulation of DCIs across grade-levels: <a href="#">3-5.ETS1.A</a> ; <a href="#">3-5.ETS1.C</a>	
<b>Common Core State Standards Connections:</b> <u>ELA/Literacy</u> - <b>W.2.6</b> With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers. ( <i>K-2-ETS1-3</i> ) <b>W.2.8</b> Recall information from experiences or gather information from provided sources to answer a question. ( <i>K-2-ETS1-3</i> ) <u>Mathematics</u> - <b>MP.2</b> Reason abstractly and quantitatively. ( <i>K-2-ETS1-3</i> ) <b>MP.4</b> Model with mathematics. ( <i>K-2-ETS1-3</i> ) <b>MP.5</b> Use appropriate tools strategically. ( <i>K-2-ETS1-3</i> ) <b>2.MD.D.10</b> 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. ( <i>K-2-ETS1-3</i> )	
Suggested Activities	Recommended Formative Assessments
<a href="#">“Can You Solve A Communication Problem Using Sound?”</a> Students will investigate ways to solve a communication problem.	

## Ledyard Next Generation Science Standards

## Grade 1

**Unit 3: PLANT AND ANIMAL STRUCTURES AND BEHAVIORS***May-June*

Anchoring Phenomenon	
<p><b>Almonds have shells that have to be removed before you can eat the nut.</b></p> <p><b>Ducks have webbed feet but people do not.</b></p>	
Essential Questions	Compelling Questions
<p><b>What structures and behaviors help plants and animals survive?</b></p>	<ul style="list-style-type: none"><li>• <i>How do plants and animals sense things?</i></li><li>• <i>How do plants and animals stay safe?</i></li></ul>

## Unit 3: Plant and Animal Structures and Behaviors Summary

Performance Expectations	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<ul style="list-style-type: none"> <li>• <a href="#">1-LS1-1</a></li> <li>• <a href="#">1-LS1-2</a></li> <li>• <a href="#">1-LS3-1</a></li> <li>• <a href="#">K-2 ETS1-2</a></li> </ul> <p><i>Teacher Note: All <u>Science and Engineering Practices</u> and <u>Crosscutting Concepts</u> in bold are written in the Performance Expectations above. The italicized practices and crosscutting concepts, although not mentioned specifically, may be incorporated additionally in any science lesson at any time.</i></p>	<ul style="list-style-type: none"> <li>• <i>1: Asking Questions and Defining Problems</i></li> <li>• <i>2: Developing and Using Models</i></li> <li>• <i>3: Planning and Carrying Out Investigations</i></li> <li>• <i>4: Analyzing and Interpreting Data</i></li> <li>• <i>5: Using Mathematical Computational Thinking</i></li> <li>• <b>6: Constructing Explanations and Designing Solutions</b></li> <li>• <i>7: Engaging in Argument from Evidence</i></li> <li>• <b>8: Obtaining, Evaluating, and Communicating Information</b></li> </ul>	<p><b><u>ENGINEERING, TECHNOLOGY AND THE APPLICATION OF SCIENCE</u></b></p> <ul style="list-style-type: none"> <li>• <b>ETS1 Engineering Design</b> <ul style="list-style-type: none"> <li>-ETS1.B Developing Possible Solutions</li> </ul> </li> </ul> <p><b><u>LIFE SCIENCE</u></b></p> <ul style="list-style-type: none"> <li>• <b>LS1 From Molecules to Organisms: Structures and Processes</b> <ul style="list-style-type: none"> <li>-LS1.A: Structure and Function</li> <li>-LS1.B: Growth and Development of Organisms</li> <li>-LS1.D: Information Processing</li> </ul> </li> <li>• <b>LS3 Heredity: Inheritance and Variation of Traits</b> <ul style="list-style-type: none"> <li>-LS3.A: Inheritance of Traits</li> <li>-LS3.B: Variation of Traits</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• <b>1: Patterns</b></li> <li>• <i>2: Cause and Effect</i></li> <li>• <i>3: Scale, Proportion and Quantity</i></li> <li>• <i>4: Systems and System Models</i></li> <li>• <i>5: Energy and Matter</i></li> <li>• <b>6: Structure and Function</b></li> <li>• <i>7: Stability and Change</i></li> </ul>

Unit 3: Plant and Animal Structures and Behaviors DCI Vocabulary	
Disciplinary Core Ideas	Vocabulary
<p><b><u>ENGINEERING, TECHNOLOGY AND THE APPLICATION OF SCIENCE</u></b></p> <ul style="list-style-type: none"> <li>• <b>ETS1 Engineering Design</b> <ul style="list-style-type: none"> <li>-ETS1.B Developing Possible Solutions</li> </ul> </li> </ul> <p><b><u>LIFE SCIENCE</u></b></p> <ul style="list-style-type: none"> <li>• <b>LS1 From Molecules to Organisms: Structures and Processes</b> <ul style="list-style-type: none"> <li>-LS1.A: Structure and Function</li> <li>-LS1.B: Growth and Development of Organisms</li> <li>-LS1.D: Information Processing</li> </ul> </li> <li>• <b>LS3 Heredity: Inheritance and Variation of Traits</b> <ul style="list-style-type: none"> <li>-LS3.A: Inheritance of Traits</li> <li>-LS3.B: Variation of Traits</li> </ul> </li> </ul>	<p><i>This is a recommendation for domain specific terms taught to First Grade students.</i></p> <p><b><u>Domains are bold:</u></b></p> <ul style="list-style-type: none"> <li>• <b>Engineering (ETS1)</b> <i>best, design, environment, human, machine, teamwork</i></li> <li>• <b>From Molecules to Organisms: Structures and Processes→Structure and Function, Growth and Development of Organisms, Information Processing (LS1)</b> <i>cold, canopy, cool, environment, heat(v), heat(n), hot, human, ice, life, light, nature, soil, sun, sunlight, temperature, warm</i></li> <li>• <b>Heredity: Inheritance and Variation of Traits→Inheritance of Traits, Variation of Traits (LS3)</b> <i>environment, environmental, exact, exist, growth, human, human, individual differences, parent, plant, sibling, similarities and differences among organisms</i></li> </ul>

Performance Expectation 1-LS1-1 From Molecules to Organisms: Structures and Processes		
<p><i>Students who demonstrate understanding can:</i></p> <p><u>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.</u></p> <p><b>Clarification Statement:</b> 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.</p> <p><b>Assessment Boundary:</b> N/A</p>		
Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p><b>Constructing Explanations and Designing Solutions</b></p> <ul style="list-style-type: none"> <li>Use materials to design a device that solves a specific problem or a solution to a specific problem.</li> </ul> <p><i>Constructing explanations and designing solutions in K-2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.</i></p>	<p><b>LS1.A: Structure and Function</b></p> <ul style="list-style-type: none"> <li>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.</li> </ul> <p><b>LS1.D: Information Processing</b></p> <ul style="list-style-type: none"> <li>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.</li> </ul>	<p><b>Structure and Function</b></p> <ul style="list-style-type: none"> <li>The shape and stability of structures of natural and designed objects are related to their function(s).</li> </ul> <p>-----</p> <p><b>Connections to Engineering, Technology, and Applications of Science</b></p> <p><b>Influence of Science, Engineering and Technology on Society and the Natural World</b></p> <ul style="list-style-type: none"> <li>Every human-made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world.</li> </ul>

Performance Expectation	
1-LS1-1 From Molecules to Organisms: Structures and Processes	
Connections to other DCIs in First Grade: N/A	
Articulation of DCIs across grade-levels: <a href="#">K. ETS1.A</a> ; <a href="#">4.LS1.A</a> ; <a href="#">4.LS1.D</a> ; <a href="#">4. ETS1.A</a>	
Common Core State Standards Connections: <u>ELA/Literacy</u> -  <b>W.1.7</b> 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)  <u>Mathematics</u> - N/A	
1-LS1-1 Suggested Activities	1-LS1-1 Recommended Formative Assessments
<p><a href="#">“Find the Best Beak”</a> (<i>Mystery Science First Grade Animal Superpowers Mystery 1: Why Do Birds Have Beaks?</i>) Students will investigate the relationship between different bird beaks and the food each bird eats.</p> <p><a href="#">“Find the Best Beak”</a> (<i>Mystery Science First Grade Animal Superpowers Mystery 1: Why Do Birds Have Beaks?</i>) Students will investigate the relationship between different bird beaks and the food each bird eats.</p>	<ul style="list-style-type: none"> <li>• <a href="#">Writing Prompt: If I Had a Bird Beak I would Choose...</a></li> <li>• <a href="#">Compare and Contrast: Human Tools to Bird Beaks</a></li> </ul>

1-LS1-1 Suggested Activities	1-LS1-1 Recommended Formative Assessments
<p><a href="#"><u>"Teaming Up" and "That Helps Me How?"</u></a> (<i>Science and Children January 2017</i>) Students will explore external structures that help animals survive.</p> <p><a href="#"><u>"The Purpose of Individual Parts and Processes"</u></a> (<i>Science and Children Summer 2016</i>) Students will examine different plant and animal parts, discuss adaptations, and compare and contrast the life cycles of plants and animals.</p> <p><a href="#"><u>"Capturing Insects and Student Interests"</u></a> (<i>Science and Children March 2016</i>) Students investigate carnivorous plants and plant structures used to capture prey.</p> <p><a href="#"><u>"Roly-Poly Pill Bugs"</u></a> (<i>Science and Children March 2016</i>) Students observe the structures and behaviors of the pill bug, determine reasons for pill bug behaviors, and design solutions using these behaviors.</p> <p><b><u>Read Aloud Suggestions:</u></b></p> <p><u>Feathers: Not Just for Flying</u> by Melissa Stewart</p> <p><u>Handle With Care: An Unusual Butterfly Journey</u> by Loree Griffin Burns</p> <p><u>Pill Bugs</u> by Monica Hughes</p> <p><u>Next Time You See a Pill Bug</u> by Emily Morgan</p> <p><u>Creature Features</u> by Steve Jenkins and Robin Page</p> <p><u>Body Actions</u> by Shelley Rotner and David A. White</p>	

<b>Performance Expectation</b> <b>1-LS1-2 From Molecules to Organisms: Structures and Processes</b>		
<p>Students who demonstrate understanding can:</p> <p><a href="#"><u>Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.</u></a></p> <p><b>Clarification Statement:</b> 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).</p> <p><b>Assessment Boundary:</b> N/A.</p>		
Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p><b>Obtaining, Evaluating, and Communicating Information</b></p> <ul style="list-style-type: none"> <li>Read grade-appropriate texts and use media to obtain scientific information to determine patterns in the natural world.</li> </ul> <p><i>Obtaining, evaluating, and communicating information in K-2 builds on prior experiences and uses observations and texts to communicate new information.</i></p> <hr/> <p><b>Connections to Nature of Science:</b></p> <p><b>Scientific Knowledge is Based on Empirical Evidence</b></p> <ul style="list-style-type: none"> <li>Scientists look for patterns and order when making observations about the world.</li> </ul>	<p><b>LS1.B: Growth and Development of Organisms</b></p> <ul style="list-style-type: none"> <li>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.</li> </ul>	<p><b>Patterns</b></p> <ul style="list-style-type: none"> <li>Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.</li> </ul>



Performance Expectation	
1-LS1-2 From Molecules to Organisms: Structures and Processes	
Connections to other DCIs in First Grade: N/A	
Articulation of DCIs across grade-levels: 3.LS2.D	
<b>Common Core State Standards Connections:</b> <u>ELA/Literacy</u> - <b>RI.1.1</b> Ask and answer questions about key details in a text. (1-LS1-2) <b>RI.1.2</b> Identify the main topic and retell key details of a text. (1-LS1-2) <b>RI.1.10</b> With prompting and support, read informational texts appropriately complex for grade. (1-LS1-2)  <u>Mathematics</u> - <b>1.NBT.B.3</b> Compare two two-digit numbers based on the meanings of the tens and one digits, recording the results of comparisons with the symbols >, =, and <. (1-LS1-2) <b>1.NBT.C.4</b> Add within 100, including adding a two-digit number and a one-digit number, and adding a two-digit number and a multiple of 10, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used. Understand that in adding two-digit numbers, one adds tens and tens, ones and ones; and sometimes it is necessary to compose a ten. (1-LS1-2) <b>1.NBT.C.5</b> Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used. (1-LS1-2) <b>1.NBT.C.6</b> Subtract multiples of 10 in the range 10-90 from multiples of 10 in the range 10-90 (positive or zero differences), using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used. (1-LS1-2)	
1-LS1-2 Suggested Activities	1-LS1-2 Recommended Formative Assessments
<a href="#">“Why Do Birds Have Beaks”</a> ( <i>Mystery Science First Grade Animal Superpowers Mystery 1: Structure and Survival</i> ) Students will identify animal ‘superpowers’ and what they are used for.	<ul style="list-style-type: none"> <li>Identify animal, describe how they use their superpower (to survive, protection, get food)</li> </ul>

Performance Expectation 1-LS3-1 Heredity: Inheritance and Variation of Traits		
<p>Students who demonstrate understanding can:</p> <p><u><a href="#">Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.</a></u></p> <p><b>Clarification Statement:</b> Examples of patterns could include features plants or animals share. Examples of observations could include leaves from the same kind of plant are the same shape, but can differ in size; and, a particular breed of dog looks like its parents but is not exactly the same.</p> <p><b>Assessment Boundary:</b> Assessment does not include inheritance or animals that undergo metamorphosis or hybrids.</p>		
Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p><b>Constructing Explanations and Designing Solutions</b></p> <ul style="list-style-type: none"> <li>• Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena.</li> </ul> <p><i>Constructing explanations and designing solutions in K-2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.</i></p>	<p><b>LS3.A: Inheritance of Traits</b></p> <ul style="list-style-type: none"> <li>• Young animals are very much, but not exactly like, their parents. Plants are also very much, but not exactly, like their parents.</li> </ul> <p><b>LS3.B: Variation of Traits</b></p> <ul style="list-style-type: none"> <li>• Individuals of the same kind of plant or animal are recognizable as similar but can also vary in many ways.</li> </ul>	<p><b>Patterns</b></p> <ul style="list-style-type: none"> <li>• Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.</li> </ul>

Performance Expectation	
1-LS3-1 Heredity: Inheritance and Variation of Traits	
Connections to other DCIs in Kindergarten: N/A	
Articulation of DCIs across grade-levels: <b>3.LS3.A; 3.LS3.B</b>	
<b>Common Core State Standards Connections:</b> <u>ELA/Literacy</u> - <b>1.RI.1</b> Ask and answer questions about key details in a text. (1-LS3-1) <b>W.1.7</b> 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-LS3-1) <b>W.1.8</b> With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question. (1-LS3-1)  <u>Mathematics</u> - <b>MP.2</b> Reason abstractly and quantitatively. (1-LS3-1) <b>MP.5</b> Use appropriate tools strategically. (1-LS3-1) <b>1.MD.A.1</b> Order three objects by length; compare the lengths of two objects indirectly by using a third object. (1-LS3-1)	
1-LS3-1 Suggested Activities	1-LS3-1 Recommended Formative Assessments
<p><u><a href="#">How Are Plants and Animals Like Others of the Same Kind?</a></u> (TCI: Unit 1, lesson 1, pg.4 ) Students will recognize plants and animals have different parts that make them alike and different.</p> <p><u><a href="#">How Are Plants and Animals Like Their Parents?</a></u> (TCI: Unit 1, lesson 2, pg.10 ) Students will investigate plant and animal offspring.</p> <p><u><a href="#">“Zooming in on Science”</a></u> (Science and Children January 2017) Students will predict, observe, and compare flowers and fruits grown from seeds to the characteristics of the parent flowers and fruits.</p>	<ul style="list-style-type: none"> <li>• <u><a href="#">How do you know these are the same?</a></u></li> <li>• <u><a href="#">Draw an animal offspring; identify how they are like their parent and how they are different from their parent.</a></u></li> </ul>

Performance Expectation K-2 ETS1-2 Engineering Design		
<p><i>Students who demonstrate understanding can:</i></p> <p><u>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.</u></p>		
Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p><b>Developing and Using Models</b></p> <ul style="list-style-type: none"> <li>Develop a simple model based on evidence to represent a proposed object or tool.</li> </ul> <p><i>Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions.</i></p>	<p><b>ETS1.B Developing Possible Solutions</b></p> <ul style="list-style-type: none"> <li>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.</li> </ul>	<p><b>Structure and Function</b></p> <ul style="list-style-type: none"> <li>The shape and stability of structures of natural and designed objects are related to their function(s).</li> </ul>

Performance Expectation K-2-ETS1-2 Engineering Design	
Connections to other DCIs in First Grade: Second Grade: <a href="#">2-ESS2-1</a>	
Articulation of DCIs across grade-levels: <a href="#">3-5.ETS1.A</a> ; <a href="#">3-5.ETS1.C</a>	
<b>Common Core State Standards Connections:</b> <u>ELA/Literacy</u> - <b>SL.2.5</b> 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. ( <i>K-2-ETS1-2</i> )  <u>Mathematics</u> - <b>N/A</b>	
K-2-ETS1-2 Suggested Activities	K-2-ETS1-2 Recommended Formative Assessments
<a href="#">“Plants and Biomimicry”</a> Students will identify a problem, analyzing and testing the solution(s) to the problem using nature.	<ul style="list-style-type: none"> <li><a href="#">Design a solution to a problem</a></li> </ul>