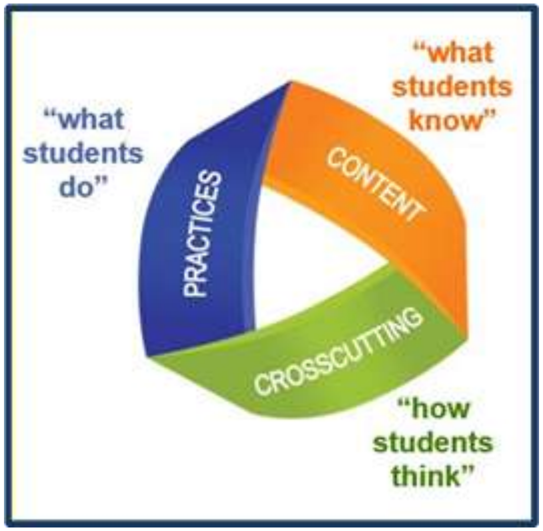
Ledyard Public Schools
Kindergarten NGSS Curriculum



District Science Curriculum Committee	
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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.

NGSS@ NSTA STEM STARTS HERE

www.nsta.org/ngss

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*

Disciplinary Core Ideas Matrix			
Physical Science	**Life Science**	**Earth and Space Science**	**Engineering, Technology, and the Application of Science**
PS1: Matter and Its Interactions PS1.A: Structure and Properties of Matter PS1.B: Chemical Reactions PS1.C: Nuclear Processes **PS2: Motion and Stability: Forces and Interactions** PS2.A: Forces and Motion PS2.B: Types of Interactions **PS3: Energy** 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 **PS4: Waves and Their Applications in Technologies for Information Transfer** PS4.A: Wave Properties PS4.B: Electromagnetic Radiation PS4.C: Information Technologies and Instrumentation	**LS1: From Molecules to Organisms: Structures and Processes** 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 **LS2: Ecosystems: Interactions, Energy, and Dynamics** 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 **LS3: Heredity: Inheritance and Variation of Traits** LS3.A: Inheritance of Traits LS3.B: Variation of Traits **LS4: Biological Evolution: Unity and Diversity** LS4.A: Evidence of Common Ancestry and Diversity LS4.B: Natural Selection LS4.C: Adaptation LS4.D: Biodiversity and Humans	**ESS1: Earth's Place in the Universe** ESS1.A: The Universe and Its Stars ESS1.B: Earth and the Solar System ESS1.C: The History of Planet Earth **ESS2: Earth's Systems** 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 **ESS3: Earth and Human Activity** ESS3.A: Natural Resources ESS3.B: Natural Hazards ESS3.C: Human Impacts on Earth Systems ESS3.D: Global Climate Change	**ETS1: Engineering Design** ETS1.A: Defining and Delimiting an Engineering Problem ETS1.B: Developing Possible Solutions ETS1.C: Optimizing the Design Solution

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*

Crosscutting Concepts Matrix		
Patterns Observed patterns of forms and events guide organization and classification, and they prompt questions about relationships and the factors that influence them. Cause and Effect: Mechanism and Explanation 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.	Scale, Proportion, and Quantity 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. Systems and System Models 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.	Energy and Matter: Flows, Cycles, and Conservation Tracking fluxes of energy and matter into, out of, and within systems helps one understand the systems' possibilities and limitations. Structure and Function The way in which an object or living thing is shaped and its substructure determine many of its properties and functions. Stability and Change 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.

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*

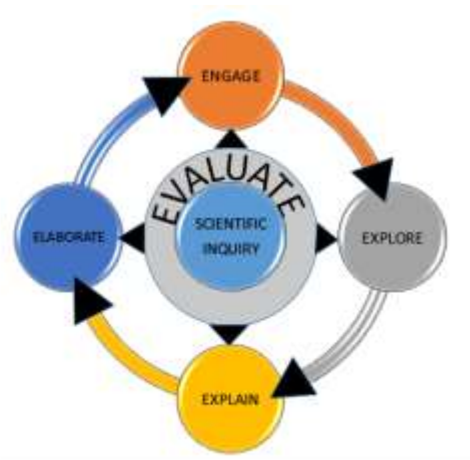
Connections to the Nature of Science

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 Appendix H.	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 Appendix H.
Scientific Investigations Use a Variety of Methods	Science is a Way of Knowing
Science Knowledge is Based on Empirical Evidence	Scientific Knowledge Assumes and Order and Consistency in Natural Systems
Scientific Knowledge is Open to Revision in Light of New Evidence	Science is a Human Endeavor
Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena.	Science Addresses Questions About the Natural and Material World

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.

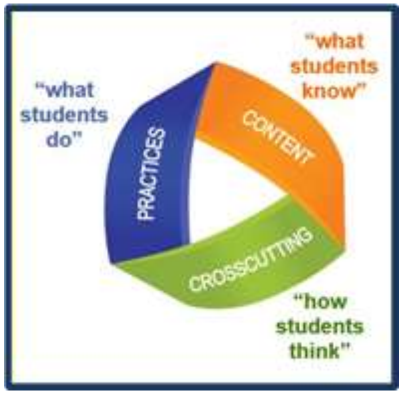
Inquiry 5 Science Teaching Model



Engagement	Object, event or question used to engage students. Connections facilitated between what students know and can do.
Exploration	Objects and phenomena are explored. Hands-on activities, with guidance.
Explanation	Students explain their understanding of concepts and processes. New concepts and skills are introduced as conceptual clarity and cohesion are sought.
Elaboration	Activities allow students to apply concepts in contexts, and build on or extend understanding and skill.
Evaluation	Students assess their knowledge, skills and abilities. Activities permit evaluation of student development and lesson effectiveness.

Ledyard Next Generation Science Standards

Kindergarten



Kindergarten NGSS Storyline

The performance expectations in kindergarten help students formulate answers to questions such as: "What happens if you push or pull an object harder? Where do animals live and why do they live there? What is the weather like today and how is it different from yesterday?" Kindergarten performance expectations include PS2, PS3, LS1, ESS2, ESS3, and ETS1 Disciplinary Core Ideas from the NRC Framework. Students are expected to develop understanding of patterns and variations in local weather and the purpose of weather forecasting to prepare for, and respond to, severe weather. Students are able to apply an understanding of the effects of different strengths or different directions of pushes and pulls on the motion of an object to analyze a design solution. Students are also expected to develop understanding of what plants and animals (including humans) need to survive and the relationship between their needs and where they live. The crosscutting concepts of patterns; cause and effect; systems and system models; interdependence of science, engineering, and technology; 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 kindergarten performance expectations, students are expected to demonstrate grade-appropriate proficiency in asking questions, developing and using models, planning and carrying out investigations, analyzing and interpreting data, designing solutions, engaging in argument from evidence, 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

Kindergarten

Unit 1: PATTERNS AND EFFECTS OF SUNLIGHT

August-October; ongoing to June

Anchoring Phenomenon	
The amount of sunlight changes throughout a day and across days, weeks, months, and a year. **The pavement is hotter to the touch in the sunlight than in the shade.**	
Compelling Questions	**Supporting Questions**
What can we observe about sunlight in Ledyard, Connecticut? **How does sunlight affect our Ledyard climate?** **How does sunlight affect the way we play?**	• *How many sunny, cloudy, rainy, windy, cool, or warm days are there in a week (also month or even year) in Ledyard?* • *When is it warmer or cooler at various times during the day in Ledyard?* • *Does temperature change during the day in Ledyard? Does temperature change during the month (or year) in Ledyard?* • *Which months in Ledyard have warmer temperatures? Which months in Ledyard have cooler temperatures?* • *Why do weather forecasters need to tell us about Ledyard and Connecticut weather patterns?* • *Will we ever experience any severe weather in our state or our town?* • *Can the sunlight warm the Earth's surface? How does sunlight warm the Earth's surface around us?* • *How can we design and build a structure that will reduce the warming of sunlight?*

Unit 1: Patterns and Effects of Sunlight Summary

Performance Expectations	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
• K-ESS2-1 • K-ESS3-2 • K-PS3-1 • K-PS3-2 • K-2 ETS1-2 *Teacher Note: All Science and Engineering Practices and Crosscutting Concepts 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.*	• **1: Asking Questions and Defining Problems** • **2: Developing and Using Models** • **3: Planning and Carrying Out Investigations** • **4: Analyzing and Interpreting Data** • **6: Constructing Explanations and Designing Solutions** • **8: Obtaining, Evaluating, and Communicating Information** • *7: Engaging in Argument from Evidence* • *5: Using Mathematical Computational Thinking*	**EARTH AND SPACE SCIENCE** • **ESS2 Earth's Systems** -ESS2.D: Weather and Climate • **ESS3 Earth and Human Activity** -ESS3.B Natural Hazards **ENGINEERING, TECHNOLOGY AND THE APPLICATION OF SCIENCE** • **ETS1 Engineering Design** -ETS1.A Defining and Delimiting an Engineering Problem -ETS1.B Developing Possible Solutions **PHYSICAL SCIENCE** • **PS3 Energy** -PS3.B: Conservation of Energy and Energy Transfer	• **1: Patterns** • **2: Cause and Effect** • **6: Structure and Function** • *3: Scale, Proportion and Quantity* • *4: Systems and System Models* • *5: Energy and Matter* • *7: Stability and Change*

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<tr><th colspan="2">Unit 1: Patterns and Effects of Sunlight DCI Vocabulary</th></tr>
<tr><th>Disciplinary Core Ideas</th><th>Vocabulary</th></tr>
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<u>EARTH AND SPACE SCIENCE</u>
ESS2 Earth's Systems
-ESS2.D: Weather and Climate
ESS3 Earth and Human Activity
-ESS3.B Natural Hazards

<u>ENGINEERING, TECHNOLOGY AND THE APPLICATION OF SCIENCE</u>
ETS1 Engineering Design
-ETS1.A Defining and Delimiting an Engineering Problem
-ETS1.B Developing Possible Solutions

<u>PHYSICAL SCIENCE</u>
PS3 Energy
-PS3.B: Conservation of Energy and Energy Transfer

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This is a recommendation for domain specific terms taught to Kindergarten students.

<u>Domains are bold</u>:
Earth Systems→Weather and Climate (EES2)
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
Earth and Human Activity→ Natural Hazards (ESS3)
Earth, human, life, severe weather, weather, weather scientist, wind
Engineering (ETS1)
best, design, environment, human, machine, teamwork
Energy→Conservation of Energy and Energy Transfer (PS3)
cold, canopy, cool, environment, heat(v), heat(n), hot, human, ice, life, light, nature, soil, sun, sunlight, temperature, warm

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Performance Expectation
K-ESS2-1 Earth's Systems

Students who demonstrate understanding can:
Use and share observations of local weather conditions to describe patterns over time.

Clarification Statement: Examples of qualitative observations could include descriptions of the weather (such as sunny, cloudy, rainy, and warm); examples of quantitative observations could include numbers of sunny, windy, and rainy days in a month. Examples of patterns could include that it is usually cooler in the morning than in the afternoon and (or counting) the number of sunny days versus cloudy days in different months.

Assessment Boundary: Assessment of quantitative observations limited to whole numbers and relative measures such as warmer/cooler.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data • Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. ***Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.*** - **Connections to Nature of Science:** **Science Knowledge is Based on Empirical Evidence** • Scientists look for patterns and order when making observations about the world.	**ESS2.D: Weather and Climate** • Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region at a particular time. People measure these conditions to describe and record the weather and to notice patterns over time.	**Patterns** • Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.

Performance Expectation
K-ESS2-1 Earth's Systems

Connections to other DCIs in Kindergarten:
N/A

Articulation of DCIs across grade-levels:
2.ESS2.A; 3.ESS2.D; 4.ESS2.A

Common Core State Standards Connections*:*

ELA/Literacy -

W.K.7	Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-ESS2-1)

Mathematics -

MP.2	Reason abstractly and quantitatively. (K-ESS2-1)
MP.4	Model with mathematics. (K-ESS2-1)
K.CC.A	Know number names and the count sequence. (K-ESS2-1)
K.MD.A.1	Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object. (K-ESS2-1)
K.MD.B.3	Classify objects into given categories; count the number of objects in each category and sort the categories by count. (K-ESS2-1)

K-ESS2-1 Suggested Activities	K-ESS2-1 Recommended Formative Assessments
What is Weather? *(TCI: Unit 3, lesson 1, pg.100)* Students learn how to describe weather. **When Does Weather Change?** *(TCI: Unit 3, lesson 2, pg.110)* Students track weather data and share their observations. **Round and Round the Water Cycle"** (*Science and Children February 2017)* Students explore what they already know about water and recognize the importance of water in their lives and the lives of plants and animals.	• Recorded weather data on weather chart • Write about or draw pictures of daily weather • **Match the picture to the weather**

K-ESS2-1 Suggested Activities	K-ESS2-1 Recommended Formative Assessments
Read Aloud Suggestions: **<u>On the Same Day in March: A Tour of the World's Weather</u>** by Marilyn Singer **<u>A Drop Around the World</u>** by Barbara McKinney	

Performance Expectation
K-ESS3-2 Earth and Human Activity

Students who demonstrate understanding can:
Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.

Clarification Statement: Emphasis is on local forms of severe weather.

Assessment Boundary: N/A

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Asking Questions and Defining Problems • Ask questions based on observations to find more information about the designed world. ***Asking questions and defining problems in K–2 builds on prior experiences and progresses to simple descriptive questions that can be tested.*** **Obtaining, Evaluating, and Communicating Information** • Read grade-appropriate texts and/or use media to obtain scientific information to describe patterns in the natural world. ***Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information.***	**ESS3.B: Natural Hazards** • Some kinds of severe weather are more likely than others in a given region. Weather scientists forecast severe weather so that the communities can prepare for and respond to these events.	**Cause and Effect** • Events have causes that generate observable patterns. --- **Connections to Engineering, Technology and Applications of Science** **Interdependence of Science, Engineering, and Technology** • People encounter questions about the natural world every day. **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.

Performance Expectation
K-ESS3-2 Earth and Human Activity

Connections to other DCIs in Kindergarten:
K.ETS1.A

Articulation of DCIs across grade-levels:
2.ESS1.C ; 3.ESS3.B ; 4.ESS3.B

Common Core State Standards Connections:

ELA/Literacy -

RI.K.1	With prompting and support, ask and answer questions about key details in a text. (K-ESS3-2)
SL.K.3	Ask and answer questions in order to seek help, get information, or clarify something that is not understood. (K-ESS3-2)

Mathematics -

MP.4	Model with mathematics. *(K-ESS3-2)*
K.CC	Counting and Cardinality *(K-ESS3-2)*

K-ESS3-2 Suggested Activities	K-ESS3-2 Recommended Formative Assessments
What Makes Storms on Earth? *(TCI: Unit 3, lesson 5, pg.132)* Students learn and share about different types of storms. **How Can People Prepare for Storms?** *(TCI: Unit 3, lesson 6, pg.140)* Students learn and share about preparations for different types of storms. **The Poetry of Science: "Hurricanes"** (*Science and Children October 2016) poem "Hurricane Hideout" by Janet Wong* **Teaching Through Trade Books: "Forecasting Hazardous Conditions"** (*Science and Children October 2016)* Students will learn about different types of severe storms, determine if these storms happen in Connecticut, and discuss preparations for severe storms that may impact them.	• Drawing of preparations for severe storms • Recording data on weather charts • Discuss connections with hurricanes and other powerful storms

K-ESS3-2 Suggested Activities	K-ESS3-2 Recommended Formative Assessments
Have You Ever Watched A Storm? (*Mystery Science Kindergarten Weather Watching (Weather Conditions, Instruments and Seasons Mystery 1: Weather Conditions and Tracking)* Students will learn tracking the weather, describing the weather, and observing the weather. **Read Aloud Suggestions**: **What is Severe Weather?** By Jennifer Boothroyd **The Snowy Day** Ezra Jack Keats	

Performance Expectation
K-PS3-1 Energy

Students who demonstrate understanding can:
Make observations to determine the effect of sunlight on Earth's surface.

Clarification Statement: Examples of Earth's surface could include sand, soil, rocks, and water.

Assessment Boundary: *Assessment of temperature is limited to relative measures such as warmer/cooler.*

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations • Make observations (firsthand or from media) to collect data that can be used to make comparisons. ***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.*** - **Connections to Nature of Science** **Scientific Investigations Use a Variety of Methods** • Scientists use different ways to study the world.	**PS3.B Conservation of Energy and Energy Transfer** • Sunlight warms Earth's surface.	**Cause and Effect** • Events have causes that generate observable patterns.

Performance Expectation
K-PS3-1 Energy

Connections to other DCIs in Kindergarten:
N/A

Articulation of DCIs across grade-levels:
1.PS4.B ; 3.ESS2.D

Common Core State Standards Connections:

ELA/Literacy -

W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-PS3-1)

Mathematics -

K.MD.A.2 Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. (K- PS3-1)

K-PS3-1 Suggested Activities	K-PS3-1 Recommended Formative Assessments
What Keeps Earth Warm? *(TCI: Unit 3, lesson 3, pg.120)* Students learn how sunlight makes things warmer. **Cooler in the Shadows:** This lesson includes several activities where students observe, explore, and analyze shadows. Students will make inferences about the cause of shadows. The lesson is linked to NASA's MESSENGER spacecraft in its voyage to and around Mercury. This lesson is designed to last 4 or more days. There are four different activities within the lesson. The teacher will need to gather some materials prior to beginning the lesson. **"Made for the Shade"** (*Science and Children January 2016) Students will* discuss the sun and explore the effects the sun has on the Earth.	• Students will design and construct a shade structure that shields from the sun. • **Write how a snowman might change on a sunny day**

Performance Expectation
K-PS3-2 Energy

Students who demonstrate understanding can:

Use tools and materials provided to design and build a structure that will reduce the warming effect of sunlight on Earth's surface.

Clarification Statement: Examples of structures could include umbrellas, canopies, and tents that minimize the warming effect of the sun.

Assessment Boundary: N/A

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Constructing Explanations and Designing Solutions • Use tools and materials provided to design and build a device that solves a specific problem or a solution to a specific problem. ***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.***	**PS3.B: Conservation of Energy and Energy Transfer** • Sunlight warms Earth's surface.	**Cause and Effect** • Events have causes that generate observable patterns.

Performance Expectation
K-PS3-2 Energy

Connections to other DCIs in Kindergarten:
K.ETS1.A ; K.ETS1.B

Articulation of DCIs across grade-levels:
1.PS4.B ; 2.ETS1.B ; 4.ETS1.A

Common Core State Standards Connections:

ELA/Literacy -

W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). *(K-PS3-2)*

Mathematics -

K.MD.A.2 Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. (K-PS3-2)

K-PS3-2 Suggested Activities	K-PS3-2 Recommended Formative Assessments
How Can People Stay Cool in Hot Weather? *(TCI: Unit 3, lesson 4, pg.126)* Students learn how sunlight makes things warmer. **"Made for the Shade"** *(Science and Children January 2016)* Students will discuss the sun and explore the effects the sun has on the Earth.	• Students will design and construct a shade structure that shields from the sun. • **Draw/make a shady place for an animal**

Performance Expectation
K-2 ETS1-2 Engineering Design

Students who demonstrate understanding can:

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.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models • Develop a simple model based on evidence to represent a proposed object or tool. ***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.***	**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.	**Structure and Function** • The shape and stability of structures of natural and designed objects are related to their function(s).

Performance Expectation
K-2 ETS1-2 Engineering Design

Connections to K-2-ETS1.B: Developing Possible Solutions to Problems include:

Kindergarten: K-ESS3-3, First Grade: 1-PS4-4, Second Grade: 2-LS2-2

Articulation of DCIs across grade-levels:
3-5.ETS1.A ; 3-5.ETS1.B ; 3-5.ETS1.C

Common Core State Standards Connections:

ELA/Literacy -

W.K.7	Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). *(K-PS3-2)*

Mathematics -

K.MD.A.2	Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. (K-PS3-2)

K-2 ETS1-2 Suggested Activities	K-2 ETS1-2 Recommended Formative Assessments
How Can People Stay Cool in Hot Weather? *(TCI: Unit 3, lesson 4, pg.126)* Students learn how sunlight makes things warmer. **Teaching Through Trade Books: "Recording Scientific Explorations"** (*Science and Children November 2016)* Students will go outside to make observations and ask questions about the natural world, documenting their work using labels and sketches.	• Students will design and construct a shade structure that shields from the sun. • • **Draw/make a shady place for an animal**

Ledyard Next Generation Science Standards

Kindergarten

Unit 2: LIVING THINGS

November-April

Anchoring Phenomenon
Animals dig for food and water. **Beavers make dams.** **Forests don't have a lot of grass.**

Compelling Questions	Supporting Questions
What are the needs of plants and animals in Ledyard, Connecticut? **What is the relationship between our Ledyard climate and the plants and animals that live here?**	• *What do plants and animals need to survive and grow?* • *What different things do plants and animals eat?* • *How can plants and animals change their environment to meet their needs?* • *How do people affect the land, water, air and/or other living things in our Ledyard environment in positive and negative ways?*

Unit 2: Living Things Summary

Performance Expectations	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
• K-LS1-1 • K-ESS2-2 • K-ESS3-1 • K-ESS3-3 • K-2-ETS1-1 *Teacher Note: All Science and Engineering Practices and Crosscutting Concepts in bold are written in the Performance Expectations above. The italicized practices and concepts, although not mentioned specifically, may be incorporated additionally in any science lesson at any time.*	• **1: Asking Questions and Defining Problems** • **2: Developing and Using Models** • **4: Analyzing and Interpreting Data** • **7: Engaging in Argument from Evidence** • **8: Obtaining, Evaluating, and Communicating Information** • *Constructing Explanations and Designing Solutions* • *Planning and Carrying Out Investigations* • *Using Mathematical Computational Thinking*	**EARTH AND SPACE SCIENCE** • **ESS2 Earth's Systems** -ESS2.E: Biogeology • **ESS3 Earth and Human Activity** -ESS3.A Natural Resources -ESS3.C Human Impact on Earth Systems **ENGINEERING, TECHNOLOGY AND APPLICATION OF SCIENCE** • **ETS1 Engineering Design** -ETS1.A Defining and Delimiting an Engineering Problems **LIFE SCIENCE** • **LS1 From Molecules to Organisms: Structures and Processes** -LS1.C Organization for Matter and Energy Flow in Organisms	• **1: Patterns** • **2: Cause and Effect** • **4: Systems and System Models** • *3: Scale, Proportion and Quantity* • *5: Energy and Matter* • *6: Structure and Function* • *7: Stability and Change*

Unit 2: Living Things DCI Vocabulary

Disciplinary Core Ideas	Vocabulary
<u>**EARTH AND SPACE SCIENCE**</u> • **ESS2 Earth's Systems** -ESS2.E: Biogeology • **ESS3 Earth and Human Activity** -ESS3.A Natural Resources -ESS3.C Human Impact on Earth Systems <u>**ENGINEERING, TECHNOLOGY AND APPLICATION OF SCIENCE**</u> • **ETS1 Engineering Design** -ETS1.A Defining and Delimiting an Engineering Problem <u>**LIFE SCIENCE**</u> • **LS1 From Molecules to Organisms: Structures and Processes** -LS1.C Organization for Matter and Energy Flow in Organisms	***This is a recommendation for domain specific terms taught to Kindergarten students.*** <u>**Domains are bold**</u>**:** • **Earth Systems→Biogeology (EES2)** *Earth, environment, food, human, land, life, living thing, plant, root, soil, sunlight, tree* • **Earth and Human Activity→Natural Resources, Human Impact on Earth's Systems (ESS3)** *burn, Earth, environment, food, forested, grass, human, lake, land, living thing, recycle, reuse, river, rock, severe weather, soil, sunlight, temperature, wind* • **Engineering (ETS1)** *best, design, environment, human, machine, teamwork* • **From Molecules to Organisms: Structures and Processes→Organization for Matter and Energy Flow in Organisms (LS1)** *Earth, environment, food, life, plant, recycle, soil, survive*

Performance Expectation
K-LS1-1 From Molecules to Organisms: Structures and Processes

Students who demonstrate understanding can:
Use observations to describe patterns of what plants and animals (including humans) need to survive.

Clarification Statement: Examples of patterns could include that animals need to take in food but plants do not; the different kinds of food needed by different types of animals; the requirement of plants to have light; and, that all living things need water.

Assessment Boundary: N/A

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data • Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. ***Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.*** - **Connections to Nature of Science:** **Science Knowledge is Based on Empirical Evidence** • Scientists look for patterns and order when making observations about the world.	**LS1.C: Organization for Matter and Energy Flow in Organisms** • All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow.	**Patterns** • Patterns in the natural and human designed world can be observed and used as evidence.

Performance Expectation
K-LS1-1 From Molecules to Organisms: Structure and Processes

Connections to other DCIs in Kindergarten:
N/A

Articulation of DCIs across grade-levels:
1.LS1.A; 2.LS2.A; 3.LS2.C; 3.LS4.B; 5.LS1.C ; 5.LS2.A

Common Core State Standards Connections:

ELA/Literacy -

W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-LS1-1)

Mathematics -

K.MD.A.2 Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. *(K-LS1-1)*

K-LS1-1 Suggested Activities	K-LS1-1 Recommended Formative Assessments
What Do Plants Need? *(TCI: Unit 1, lesson 1, pg.4)* Students learn the needs of plants for survival and investigate patterns of needs of other plants. **What Do Animals Need?** *(TCI: Unit 1, lesson 2, pg.10)* Students learn the needs of animals for survival. **What Do People Need?** *(TCI: Unit 1, lesson 3, pg.16)* Students learn the needs of humans for survival, including food sources from plants and animals. **"Learning about Plants with Steam"** (*Science and Children Summer 2016)* Students observe plants growing, use art to make models of plants, label their plant parts, and describe what plants need to survive. **"Ornithologists by Design"** *(Science and Children February 2016)* Students will observe birds and their feeding habits.	• Record data about plants/animals • **Write about what a seeds needs to grow/animals need to survive** • **Identify What a Hermit Crab Needs to Survive.** • Design and construct a bird feeder

Performance Expectation
K-ESS2-2 Earth's Systems

Students who demonstrate understanding can:
Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.

Clarification Statement: Examples of plants and animals changing their environment could include a squirrel digs in the ground to hide its food and tree roots can break concrete.

Assessment Boundary: N/A

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Engaging in Argument from Evidence • Construct an argument with evidence to support a claim. ***Engaging in argument from evidence K-2 builds on prior experiences and progresses to comparing ideas and representations about the natural and designed world(s).***	**ESS2.E: Biogeology** • Plants and animals can change their environment. **ESS3.C: Human Impacts on Earth Systems** • Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on land, water, air, and other living things.	**Systems and System Models** • Systems in the natural and designed world have parts that work together.

Performance Expectation
K-ESS2-2 Earth's Systems

Connections to other DCIs in Kindergarten:
N/A

Articulation of DCIs across grade-levels:
4.ESS2.E ; 5.ESS2.A

Common Core State Standards Connections:
ELA/Literacy -

R.K.1 With prompting and support, ask and answer questions about key details in a text. (K-ESS2-2)

W.K.1 Use a combination of drawing, dictating, and writing to compose opinion pieces in which they tell a reader the topic or the name of the book they are writing about and state an opinion or preference about the topic or book. (K-ESS2-2)

W.K.2 Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic. *(K-ESS2-2)*

K-ESS2-2 Suggested Activities	K-ESS2-2 Recommended Formative Assessments
How Do Plants and Animals Change Earth? *(TCI: Unit 1, lesson 5, pg.32)* Students learn how plants and animals can change Earth's surface to meet their needs. **How Do People Change Earth?** *(TCI: Unit 1, lesson 6, pg.38)* Students learn how people can change Earth's land, air and water. **Teaching Through Trade Books "Wonderful Water"** (*Science and Children October 2015)* Students will discuss where water comes from and how to reduce their water usage. **Read Aloud Suggestions:** **All the Water in the World** by George Ella Lyon and Katherine Tillotson **A Drop in my Drink: The Story of Water on our Planet** by Meredith Hooper	• CER chart • **Animal and plant environments**

Performance Expectation
K-ESS3-1 Earth and Human Activity

Students who demonstrate understanding can:

Use a model to represent the relationship between the needs of different plants and animals (including humans) and the places they live.

Clarification Statement: Examples of relationships could include that deer eat buds and leaves, therefore, they usually live in forested areas; and, grasses need sunlight so they often grow in meadows. Plants, animals, and their surroundings make up a system.

Assessment Boundary: N/A

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models • Use a model to represent relationships in the natural world. ***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.***	**ESS3.A Natural Resources** • Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do.	**Systems and System Models** • Systems in the natural and designed world have parts that work together.

Performance Expectation
K-ESS3-1 Earth and Human Activity

Connections to other DCIs in Kindergarten:
N/A

Articulation of DCIs across grade-levels:
1.LS1.A ; 5.LS2.A ; 5.ESS2.A

Common Core State Standards Connections:

ELA/Literacy -

SL.K.5	Add drawings or other visual displays to descriptions as desired to provide additional detail. *(K-ESS3-1)*

Mathematics -

MP.2	Reason abstractly and quantitatively. *(K-ESS3-1)*
MP.4	Model with mathematics. *(K-ESS3-1)*
K.CC	Counting and Cardinality *(K-ESS3-1)*

K-ESS3-1 Suggested Activities	K-ESS3-1 Recommended Formative Assessments
Where Are Plants and Animals Found? *(TCI: Unit 1, lesson 1, pg.4)* Students learn that plants live where they have things they need to grow and thrive. **"Interactions- How Do Interactions Happen with Living Things"** Students study animals, plants, and their environment through the use of modeling, constructing arguments with evidence, and using observations to describe the ways animals interact with their environments to meet their needs for survival. Students also investigate ways plants and animals can change their environment. The unit culminates in a self-selected project through which students show their understanding.	• **Pond Life: Identifying plants and animals**

Performance Expectation
K-ESS3-3 Earth and Human Activity

Students who demonstrate understanding can:
Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.

Clarification Statement: Examples of human impact on the land could include cutting trees to produce paper and using resources to produce bottles. Examples of solutions could include reusing paper and recycling cans and bottles.

Assessment Boundary: N/A

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Obtaining, Evaluating, and Communicating Information • Communicate solutions with others in oral and/or written forms using models and/or drawings that provide detail about scientific ideas. ***Obtaining, evaluating, and communicating information in K-2 builds on prior experiences and uses observations and texts to communicate new information.***	**ESS3.C: Human Impacts on Earth Systems** • Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impact on the land, water, air, and other living things. **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.	**Cause and Effect** • Events have causes that generate observable patterns.

Performance Expectation
K-ESS3-3 Earth and Human Activity

Connections to other DCIs in Kindergarten:
K.ETS1.A

Articulation of DCIs across grade-levels:
2.ETS1.B ; **4.ESS3.A** ; **5.ESS3.C**

Common Core State Standards Connections:
ELA/Literacy -

W.K.2 Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic. *(K-ESS3-3)*

K-ESS3-3 Suggested Activities	K-ESS3-3 Recommended Formative Assessments
How Can People Take Care of the Earth? *(TCI: Unit 1, lesson 7, pg.46)* Students learn that plants live where they have things they need to grow and thrive. **"Earth's Water: A Drop in Your Cup"** This lesson plan provides visual and hands-on activities provides for learners to gain knowledge about the finite amount of fresh water on Earth and encourages the discussion of the various ways to conserve this resource. **"Humans on Earth"** A short video explaining the use of natural resources to supply the needs of humans, and solutions for preserving them. **"Teaching with Play"** (*Science and Children February 2017)* Students discuss the difference between fresh water and salt water and discuss ways to help or hurt the environment.	• **Reusing objects**

K-ESS3-3 Suggested Activities	K-ESS3-3 Recommended Formative Assessments
Teaching Through Trade Books: "Humans and the Earth" (*Science and Children March 2016)* Students discuss/identify human needs for Earth's natural resources and how to protect Earth's natural resources. **Teaching with Trade Books: "Wonderful Water"** (*Science and Children October 2015)* Students will discuss where water comes from and how to reduce their water usage	

Performance Expectation
K-2 ETS1-1 Engineering Design

Students who demonstrate understanding can:
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.

Clarification Statement: N/A

Assessment Boundary: N/A

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Asking Questions and Defining Problems • Ask questions based on observations to find more information about the natural and/or designed world(s). • Define a simple problem that can be solved through the development of a new or improved object or tool. ***Asking questions and defining problems in K-2 builds on prior experiences and progresses to simple descriptive questions.***	**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. • 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.	**N/A**

Performance Expectation
K-ETS1-1 Engineering Design

Connections to K-2-ETS1.B: Defining and Delimiting Engineering Problems include:
Kindergarten: K-PS2-2, K-ESS3-2

Articulation of DCIs across grade-levels:
3-5.ETS1.A ; 3-5.ETS1.C

Common Core State Standards Connections:

ELA/Literacy -

RI.2.1	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)
W.2.6	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.2.8	Recall information from experiences or gather information from provided sources to answer a question. (K-2-ETS1-1)

Mathematics -

MP.2	Reason abstractly and quantitatively. *(K-2-ETS1-1)*
MP.4	Model with mathematics. *(K-2-ETS1-1)*
MP.5	Use appropriate tools strategically. *(K-2-ETS1-1)*
2.MD.D.10	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
"Water is Wonderful" This resource is based on the book **All the Water in the World** by George Ella Lyon and Katherine Tillotson. In this lesson students describe ways they use water and how they can reduce their water consumption. Suggestions to incorporate an engineering component are in the activity.	

Ledyard Next Generation Science Standards

Kindergarten

Unit 3: PUSHES AND PULLS

May-June

Anchoring Phenomenon	
A swing moves as it is pushed. **A box pushed across a floor moves quickly with a strong push and slows down when the pushing becomes weaker.**	
Compelling Questions	**Supporting Questions**
How do objects move? **What happens when objects interact?**	• *How can pushing and pulling affect an object?* • *What happens to an object when you push or pull with great effort compared to when you push or pull with little effort?* • *Does the direction of your push or pull affect the motion of the object?*

Unit 3: Pushes and Pulls Summary

Performance Expectations	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
• K-PS2-1 • K-PS2-2 • K-2 ETS1-3 *Teacher Note: All Science and Engineering Practices and Crosscutting Concepts in bold are written in the Performance Expectations above. The italicized practices and concepts, although not mentioned specifically, may be incorporated additionally in any science lesson at any time.*	• **3: Planning and Carrying Out Investigations** • **4: Analyzing and Interpreting Data** • Asking Questions and Defining Problems • Constructing Explanations and Designing Solutions • Developing and Using Models • *Engaging in Argument from Evidence* • Obtaining, Evaluating, and Communicating Information • *Using Mathematical Computational Thinking*	**ENGINEERING, TECHNOLOGY AND THE APPLICATION OF SCIENCE** • **ETS1 Engineering Design** -ETS1.C Optimizing the Design Solution **PHYSICAL SCIENCE** • **PS2 Motion and Stability: Forces and Interactions** -PS2.A Forces and Motion -PS2.B Types of Interactions • **PS3 Energy** -PS3.C Relationship Between Energy and Forces	• **2: Cause and Effect** • *1: Patterns* • *3: Scale, Proportion and Quantity* • *4: Systems and System Models* • *5: Energy and Matter* • *6: Structure and Function* • *7: Stability and Change*

Unit 3: Pushes and Pulls DCI Vocabulary

Disciplinary Core Ideas	Vocabulary
ENGINEERING, TECHNOLOGY AND THE APPLICATION OF SCIENCE • **ETS1 Engineering Design** -ETS1.C Optimizing the Design Solution **PHYSICAL SCIENCE** • **PS2 Motion and Stability: Forces and Interactions** -PS2.A Forces and Motion -PS2.B Types of Interactions • **PS3 Energy** -PS3.C Relationship Between Energy and Forces	***This is a recommendation for domain specific terms taught to Kindergarten students.*** **Domains are bold**: • **Engineering (ETS1)** *best, design, environment, human, machine, teamwork* • **Motion and Stability: Forces and Interactions, Types of Interactions→Forces and Motion; Types of Interactions (PS2)** *light, heat(n), heat(v), pull, push, roll, ramp, straight-line motion* • **Energy→Relationships Between Energy and Forces (PS3)** *Earth*

Performance Expectation
K-PS2-1 Motion and Stability: Forces and Interactions

Students who demonstrate understanding can:
Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.

Clarification Statement: Examples of pushes or pulls could include a string attached to an object being pulled, a person pushing an object, a person stopping a rolling ball, and two objects colliding and pushing on each other.

Assessment Boundary: Assessment is limited to different relative strengths or different directions, but not both at the same time. Assessment does not include non-contact pushes or pulls such as those produced by magnets.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations • With guidance, plan and conduct an investigation in collaboration with peers. ***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.*** - **Connections to Nature of Science:** **Scientific Investigations Use a Variety of Methods** • Scientists use different ways to study the world.	**PS2.A: Forces and Motion** • Pushes and pulls can have different strengths and directions. • Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it. **PS2.B: Types of Interactions** • When objects touch or collide, they push on one another and can change motion. **PS3.C: Relationship Between Energy and Forces** • A bigger push or pull makes things speed up or slow down more quickly.	**Cause and Effect** • Simple tests can be designed to gather evidence to support or refute student ideas about causes.

Performance Expectation
K-PS2-1 Motion and Stability: Forces and Interactions

Connections to other DCIs in Kindergarten:
N/A

Articulation of DCIs across grade-levels:
3.PS2.A ; ***3.PS2.B***

Common Core State Standards Connections:

ELA/Literacy -

W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-PS2-1)

Mathematics -

MP.2 Reason abstractly and quantitatively. *(K-PS2-1)*

K.MD.A.1 Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object. *(K-PS2-1)*

K.MD.A.2 Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. (K-PS2-1)

K-PS2-1 Suggested Activities	K-PS2-1 Recommended Formative Assessments
How Do Things Move? *(TCI: Unit 2, lesson 1, pg.58)* Students learn how to describe motion using a speed and a direction. **What Do Pushes and Pulls Do?** *(TCI: Unit 2, lesson 2, pg.66)* Students push and pull a box wagon during an investigation to answer their 'what if' questions. **How Do Pushes and Pulls Move Things?** *(TCI: Unit 2, lesson 3, pg.76)* Students learn how a push or a pull affects an object in motion. **What Happens When Objects Bump?** *(TCI: Unit 2, lesson 4, pg.82)* Students learn how a push or a pull can change an object's direction or speed.	• **Draw pictures showing pushes or pulls** • **"Turn, Turn, Turn- A Simple Assessment"** • **"Force: Push or Pull"**

K-PS2-1 Suggested Activities	K-PS2-1 Recommended Formative Assessments
Marble Roll: Students describe the path of a moving object as it leaves a winding track. **Push Pull-Changing Direction:** Students investigate the interactions between colliding objects using pushes and pulls, play a game of kickball and observe how the ball is pushed, pulled, started, stopped, or collided with other objects and how it changed position and speed. As a group, students will then brainstorm about other objects being pushed, pulled or colliding and then choose one of those objects to investigate. **Roller Coaster:** Students explore ways to change the speed and direction of a rolling object by building roller coasters out of pipe insulation after reading the book, ***Roller Coaster*** by Marla Frazee. In the second part students read ***I Fall Down*** by Vicki Cobb and then investigate the idea that gravity affects all objects equally by conducting dropping races with everyday items. **"Understanding Energy"** (*Science and Children December 2016)* Students observe events and their patterns and use these patterns to explain energy transfer based on their evidence. **"How We Know What We Know"** (*Science and Children January 2016)* Students investigate motion of cars using ramps, collect data, and identify patterns in the data. **"Don't Crush That House"** (*Mystery Science Kindergarten Force Olympics Mystery 2: How can you knock down a wall made of concrete?)* Students investigate the strength and motion of a wrecking ball. **Pushes and Pulls (Brain Pop Jr)**	• CER Activity

Performance Expectation
K-PS2-2 Motion and Stability: Forces and Interactions

Students who demonstrate understanding can:

Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.

Clarification Statement: Examples of problems requiring a solution could include having a marble or other object move a certain distance, follow a particular path, and knock down other objects. Examples of solutions could include tools such as a ramp to increase the speed of an object and a structure that would cause an object such as a marble or ball to turn.

Assessment Boundary: Assessment does not include friction as a mechanism for change in speed.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data • Analyze data from tests of an object or tool to determine if it works as intended. ***Analyzing data in K-2 builds on prior experiences and progresses to collecting, recording, and sharing observations.***	**PS2.A: Forces and Motion** • Pushes and pulls can have different strengths in directions. • Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it. **ETS1.A: Defining Engineering Problems** • A situation that people want to change or create can be approached as a problem to be solved through engineering. Such problems may have many acceptable solutions.	**Cause and Effect** • Simple tests can be designed to gather evidence to support or refute student ideas about causes.

Performance Expectation
K-PS2-2 Motion and Stability: Forces and Interactions

Connections to other DCIs in Kindergarten:
K.ETS1.A ; K.ETS1.B

Articulation of DCIs across grade-levels:
2.ETS1.B; 3.PS2.A ; 4.PS3.A ; 4.EST1.A

Common Core State Standards Connections:
ELA/Literacy -
RI.K.1 With prompting and support, ask and answer questions about key details in a text. *(K-PS2-2)*
SL.K.3 Ask and answer questions in order to seek help, get information, or clarify something that is not understood. *(K-PS2-2)*

K-PS2-2 Suggested Activities	K-PS2-2 Recommended Formative Assessments
How Do People Design Things That Move *(TCI: Unit 2, lesson 5, pg.88)* Students learn how to design and test slides to determine safely. **Ramps 2: Ramp Builder:** Students design, build, and test their own ramps. Students are introduced to a variety of materials and explore putting them together. Students engage in an inquiry-based learning experience to reinforce math, science, and technology. They create plans for ramps by evaluating a variety of materials provided to them. **"How We Know What We Know"** (*Science and Children January 2016)* Students investigate motion of cars using ramps, collect data, and identify patterns in the data.	• **Moving down the slide** • Using straws, pick two objects you can fit in your hand that you can move. Explain why.

Performance Expectation
K-ETS1-3 Engineering Design

Students who demonstrate understanding can:

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

Clarification Statement: N/A

Assessment Boundary: N/A

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data • Analyze data from tests of an object or tool to determine if it works as intended. ***Analyzing data in K-2 builds on prior experiences and progresses to collecting, recording, and sharing observations.***	**ETS1.C Optimizing the Design Solution** • Because there is always more than one possible solution to a problem, it is useful to compare and test designs.	**N/A**

Performance Expectation
K-ETS1-3 Engineering Design

Connections to other DCIs in Kindergarten:
Second Grade: 2-ESS2-1

Articulation of DCIs across grade-levels:
3-5.ETS1.A ; **3-5.ETS1.C**

Common Core State Standards Connections:

ELA/Literacy -

W.2.6	With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers. *(K-2-ETS1-3)*
W.2.8	Recall information from experiences or gather information from provided sources to answer a question. *(K-2-ETS1-3)*

Mathematics -

MP.2	Reason abstractly and quantitatively. *(K-2-ETS1-3)*
MP.4	Model with mathematics. *(K-2-ETS1-3)*
MP.5	Use appropriate tools strategically. *(K-2-ETS1-3)*
2.MD.D.10	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-ETS1-3)

K-ETS1-3 Suggested Activities	K-ETS1-3 Recommended Formative Assessments
How Do People Design Things That Move *(TCI: Unit 2, lesson 5, pg.88)* Students learn how to design and test slides to determine safely. **"Engineering Motion"** Students work collaboratively to define constraints, design, build, test, and redesign derby cars. In addition, an emphasis is placed on building and practicing communication skills. Additional Internet Resource: http://www.nsta.org/elementaryschool/connections.aspx#1601	• **Moving down the slide**

K-ETS1-3 Suggested Activities	K-ETS1-3 Recommended Formative Assessments
“Engineering Encounters: An Engineering Design Process for Early Childhood” *(Science and Children November 2016)* Students design, create, test, and redesign egg packages. **“What’s the Biggest Excavator?”** **(***Mystery Science Kindergarten Force Olympics Mystery 1)* Students learn about pushes and pulls involved in work. **“How Can You Knock Down a Wall of Concrete?”** **(***Mystery Science Kindergarten Force Olympics Mystery 2)* Students investigate the strength and motion of a wrecking ball.	• **Don’t Crush That House**