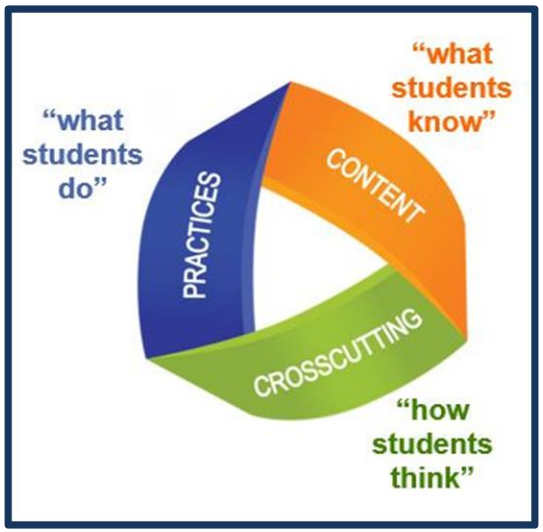
Ledyard Public Schools
Fifth Grade NGSS Curriculum



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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.

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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 Grade 5 Disciplinary Core Ideas are highlighted yellow			
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 (Unit 1) **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.	**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.	**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.
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.	**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.	**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.

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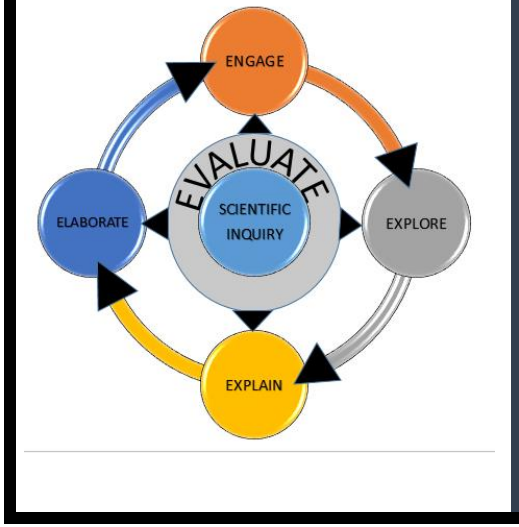
Connections to the Nature of Science

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.

Unit 1: A Study of Energy Flow Through Living Things

(***Instructional Days: 26 days in First Trimester August-November***)

Anchoring Unit Phenomenon	
The Humungous Fungus is one of the largest organisms in the world. A span of Aspen trees named Pando is one of the largest organisms in the world.	
Compelling Question(s)	**Supporting Questions**
• How does energy flow through consumers, producers and decomposers in an ecosystem?	• *What is an ecosystem?* • *What is the role of producers in an ecosystem?* • *What is the role of consumers in an ecosystem?* • *What is the role of decomposers in an ecosystem?* • *How do matter and energy move in an ecosystem?* • *What makes an ecosystem healthy or unhealthy?* • *How do ecosystems change?* • *How do humans change ecosystems?*
Storyline	**Possible Student Misconceptions:**
Fifth grade students will study and use models to show how the components (producers, consumers, decomposers) of an ecosystem interact. They will describe matter and energy movement through an ecosystem, and identify/predict changes in an ecosystem over time.	*Animals do not need energy to move around.* *A food chain is the same as a food web.*
Prior Learning	
4.ESS2.E Biogeology; 4.PS3.A Definitions of Energy; 4.PS3.B Conservation of Energy and Energy Transfer; 4.PS3.D Energy in Chemical Processes and Everyday Life 2.PS1.A Structure and Properties of Matter; 2.LS4.D Biodiversity in Humans; 2.LS2.A Interdependent Relationships in Ecosystems K.LS1.C Organization for Matter and Energy Flow in Organisms	

Unit 1: The Study of Energy Flow Through Living Things Overview

Performance Expectations	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
• **5-LS2-1** • **5-LS1-1** • **5-PS3-1** • **3-5-ETS1-2** *Teacher Note: All the Performance Expectations above will be covered this unit and can be worked on concurrently. 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 • 5: Using Mathematical Computational Thinking • 6: Constructing Explanations and Designing Solutions • **7: Engaging in Argument from Evidence** • 8: Obtaining, Evaluating, and Communicating Information	**ENGINEERING, TECHNOLOGY AND THE APPLICATION OF SCIENCE** • **ETS1 Engineering Design** -ETS1.B Developing Possible Solutions **LIFE SCIENCE** • **LS1 From Molecules to Organisms: Structures and Processes** -LS1-C: Organization for Matter and Energy Flow in Organisms • **LS2 Ecosystems: Interactions, Energy, and Dynamics** -LS2.A: Interdependent Relationships in Ecosystems -LS2.B: Cycles of Matter and Energy Transfer in Ecosystems **PHYSICAL SCIENCE** • **PS3 Energy** -PS3.D: Energy in Chemical Processes and Everyday Life	• 1: Patterns • 2: Cause and Effect • 3: Scale, Proportion and Quantity • **4: Systems and System Models** • **5: Energy and Matter** • 6: Structure and Function • 7: Stability and Change

Formal Assessment Unit 1:	Additional Teacher Resources Unit 1:
Unit 1 Performance Assessment **REQUIRED IAB: Biological Evolution and Ecosystems**	**Google Drive:** Teaching/Planning Unit 1 Materials Unit 1 Science Resources Classroom

Performance Expectation:
5-LS2-1 Ecosystems: Interactions, Energy, and Dynamics

Students who demonstrate understanding can:
Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.
Clarification Statement: *Emphasis is on the idea that matter is not food (air, water, decomposed materials in soil) is changed by plants into matter that is food. Examples of systems could include organisms, ecosystems, and the Earth.*
Assessment Boundary: *Assessment does not include molecular explanations.*

Lesson Level Photo Analysis: Why do you think some species of grasses live in meadows and not in deserts? **(1-1),** How do animals get their food? Why is an animal considered a consumer? **(1-3),** Do you think the orange organisms on the side of the tree stump are plants or animals? **(1-4),** What are possible animals that live in the rainforest? Which organisms eat each other in the rain forest? **(1-5),** What would happen to the heron if it could not find any fish? What can predator and prey relationships tell us about an ecosystem? **(1-6),** What do you think will happen to this ecosystem? How do you think this ecosystem will recover from this fire? **(1-7),** Where did all that trash come from? How do you think the trash will affect that lake ecosystem? **(1-8)**
Lesson Level Phenomenon Videos: All sorts of different animals can meet their needs in the same area. **(1-1),** Pigs grow larger as they eat. **(1-3),** People save food wastes for compost piles. **(1-4),** Some animals eat only animals. Some animals only eat plants. **(1-5),** The wintercreeper plant has taken over this area and toppled some trees. **(1-6),** Wildebeest migrate to find rainier plains. **(1-7), Fish have trouble surviving in polluted rivers. (1-8)**
note: all photo and video above links to suggested activities below

5-LS2-1 Suggested Activities	5-LS2-1 Recommended Formative Assessments
What is an Ecosystem? *(TCI: Unit 1 Living Things in Ecosystems, Lesson 1*) Students will take on the role of an ecologist. Students will visit many different types of ecosystems and record careful observations in their notebooks. **(4 class periods)** What is the Role of Consumers in an Ecosystem? *(TCI: Unit 1 Living Things in Ecosystems, Lesson 3)* Students will Dissect and diagram an owl pellet to identify what owls eat. **(3-4 class periods)** What is the Role of Decomposers in an Ecosystem? *(TCI: Unit 1 Living Things in Ecosystems, lesson 4*) Students will explore what happens when sugar and yeast (a decomposer) are mixed together in water. **(3 class periods)** How Do Matter and Energy Move in an Ecosystem? (*TCI: Unit 1 Living Things in Ecosystems , Lesson 5)* Students will develop a model of a food chain and a food web using pictures of plants and animals. **(3 class periods)** What Makes an Ecosystem Healthy or Unhealthy? (*TCI: Unit 1 Living Things in Ecosystems , Lesson 6*) Students will read text to understand the characteristics of healthy vs. unhealthy ecosystems. **(2 class periods)** How Do Ecosystems Change? (*TCI: Unit 1 Living Things in Ecosystems, Lesson 7*) Students will watch how ecosystems change. **(3 class periods)** How Do Humans Change Ecosystems**?** (*TCI: Unit 1 Living Things in Ecosystems, Lesson 8)* Students will investigate how humans affect ecosystems**. (3 class periods)**	• Collaborate with Matt Smith at LHS for hydroponics demonstration and discussion. • Complete multiple journal entries in the student notebook. • Create a diagram that models the flow of energy from the sun to the owl. • Explain (from student observations) why the sugar and yeast inflated the balloon. • Create a model of an ecosystem including producer, first-stage consumer and second-stage consumer. Describe how matter and energy moves and is recycled through the ecosystem. • Draw a compare and contrast picture of a healthy ecosystem and an unhealthy ecosystem including three plants and animals for each. • Explain the cause and effect of how ecosystems may change. • Identify and discuss three ways that humans and modern ways of life may affect ecosystems.

Performance Expectation: 5-LS2-1 Ecosystems: Interactions, Energy, and Dynamics		
Science and Engineering Practices	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Developing and Using Models • Develop a model to describe phenomena. **Modeling in 3–5 builds on K–2 models and progresses to building and revising simple models and using models to represent events and design solutions.** --- ***Connections to the Nature of Science*** **Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena** • Science explanations describe the mechanisms for natural events.	**LS2.A: Interdependent Relationships in Ecosystems** • The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as "decomposers." Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem. **LS2.B: Cycles of Matter and Energy Transfer in Ecosystems** • Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases, and water, from the environment, and release waste matter (gas, liquid, or solid) back into the environment.	**Systems and System Models** • A system can be described in terms of its components and their interactions.

Performance Expectation:
5-LS2-1 Ecosystems: Interactions, Energy, and Dynamics

Connections to other DCIs in Fifth Grade:
5.ESS2.A ; 5.PS1.A

Articulation of DCIs across grade-levels:
2.PS1.A ; 2.LS4.D ; 4.ESS2.E ; MS.PS3.D ; MS.LS1.C ; MS.LS2.A ; MS.LS2.B

Common Core State Standards Connections:

ELA/Literacy –

RI.5.7	Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. *(5-LS2-1)*
SL.5.5	Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes. *(5-LS2-1)*

Mathematics -

MP.2	Reason abstractly and quantitatively. *(5-LS2-1)*
MP.4	Model with mathematics. *(5-LS2-1)*

Lesson Level Vocabulary:

bacteria, circulation, compost, consumer, decomposer, digestion, disturbance, ecosystem, energy pyramid, food chain, food web, fungi, invasive species, predator, prey, succession

DCI Domain Vocabulary:

Domains are bold:

- **Ecosystems: Interactions, Energy, and Dynamics→Interdependent Relationships in Ecosystems (LS2); Cycles of Matter and Energy Transfer in Ecosystems (LS2)** *algae, atmosphere, atom, bacteria, biosphere, chemical, competitive, composition of matter, conserve, consume, cooperative, cope, cycle, cycle, decompose, decomposer, decomposition, energy transfer, food web, fungi, geosphere, hydrosphere, independent, matter, microbe, organism, plant part, react, relative, reproduce, restore, role, social, store, transfer, waste matter*

Performance Expectation

5-LS1-1 From Molecules to Organisms: Structures and Processes

Students who demonstrate understanding can:

Support an argument that plants get the materials they need for growth chiefly from air and water.

Clarification Statement: Emphasis is on the idea that plant matter comes mostly from air and water, not from soil.

Assessment Boundary: N/A

Lesson Level Photo Analysis: How do the plants in this pond get their food? These plants are considered "producers". Why might that be? **(1-2)**

Lesson Level Phenomenon Video: Plants like these bromeliads grow on tree branches instead of the ground. **(1-2)**

note: all photo and video above links to suggested activities below

5-LS1-1 Suggested Activities	5-LS1-1 Recommended Formative Assessments
What is the Role of Producers in an Ecosystem? *(TCI: Unit 1 Living Things in Ecosystems, Lesson 2*) Students will analyze data from a hypothetical plant experiment to draw conclusions about the importance of producers. **(3 classes)**	• Construct an argument that producers play a critical role in the flow of energy on our planet.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Engaging in Argument from Evidence • Support an argument with evidence, data, or a model. **Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).**	LS1.C: Organization for Matter and Energy Flow in Organisms • Plants acquire their material for growth chiefly from air and water.	Energy and Matter • Matter is transported into, out of, and within systems.

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

Connections to other DCIs in Fifth Grade:
5.PS1.A

Articulation of DCIs across grade-levels:
K.LS1.C ; 2.LS2.A ; MS.LS1.C

Common Core State Standards Connections:

ELA/Literacy -

RI.5.1	Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. *(5-LS1-1)*
RI.5.9	Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (5-LS1-1)
W.5.1	Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (5-LS1-1)

Mathematics –

MP.2	Reason abstractly and quantitatively. *(5-LS1-1)*
MP.4	Model with mathematics. *(5-LS1-1)*
MP.5	Use appropriate tools strategically. *(5-LS1-1)*
5.MD.A.1	Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems. *(5-LS1-1)*

Lesson Level Vocabulary: *carbon dioxide, oxygen, photosynthesis, producer*

DCI Domain Vocabulary

Domains are bold:

- **From Molecules to Organisms: Structure and Processes→Organization for Matter and Energy Flow in Organisms (LS1)**
  algae, atmosphere, atom, backbone, body repair, body warmth, chemical, conservation, conserve, consumer, convert, cycle, decomposer, energy chart, energy flow, food web, independent, matter, organism, organization, photosynthetic plants, plant matter, product, role, store, transfer, transform, transformation, transport

Performance Expectation
5-PS3-1 Energy

Students who demonstrate understanding can:
Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.
Clarification Statement: *Examples of models could include diagrams, and flow charts.*
Assessment Boundary: N/A

Lesson Level Photo Analysis: How do the plants in this pond get their food? These plants are considered "producers". Why might that be? **(1-2),** How do animals get their food? Why is an animal considered a consumer? **(1-3)**
Lesson Level Phenomenon Video: Plants like these bromeliads grow on tree branches instead of the ground. **(1-2),** Pigs grow larger as they eat. **(1-3)**
note: all photo and video above links to suggested activities below

5-PS3-1 Suggested Activities	5-PS3-1 Recommended Formative Assessments
What is the Role of Producers in an Ecosystem? *(TCI: Unit 1 Living Things in Ecosystems , Lesson 2*) Students will analyze data from a hypothetical plant experiment to draw conclusions about the importance of producers. **(3 classes)** **What** is the Role of Consumers in an Ecosystem? *(TCI: Unit 1 Living Things in Ecosystems , Lesson 3)* Students will Dissect and diagram an owl pellet to identify what owls eat. **(3-4 class periods)**	• Construct an argument that producers play a critical role in the flow of energy on our planet. • Create a model of an ecosystem including producer, first-stage consumer and second-stage consumer. Describe how matter and energy moves and is recycled through the ecosystem.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models • Use models to describe phenomena. **Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.**	**PS3.D: Energy in Chemical Processes and Everyday Life** • The energy released [from] food was once energy from the sun that was captured by plants in the chemical process that forms plant matter (from air and water). **LS1.C: Organization for Matter and Energy Flow in Organisms** • Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion. *(secondary)*	**Energy and Matter** • Energy can be transferred in various ways and between objects.

Performance Expectation
5-PS3-1 Energy

Connections to other DCIs in Fifth Grade:
N/A

Articulation of DCIs across grade-levels:
K.LS1.C ; 2.LS2.A ; 4.PS3.A ; 4.PS3.B ; 4.PS3.D ; MS.PS3.D ; MS.PS4.B ; MS.LS1.C ; MS.LS2.B

Common Core State Standards Connections:

ELA/Literacy –

RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. *(5-PS3-1)*

SL.5.5 Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes. *(5-PS3-1)*

Mathematics - N/A

Lesson Level Vocabulary: *carbon dioxide, oxygen, photosynthesis, producer, circulation, consumer, digestion*

DCI Domain Vocabulary

Domains are bold:

- **Energy→Organization for Matter and Energy Flow in Organisms (LS1)**
  algae, atmosphere, atom, backbone, body repair, body warmth, chemical, conservation, conserve, consumer, convert, cycle, decomposer, energy chart, energy flow, food web, independent, matter, organism, organization, photosynthetic plants, plant matter, product, role, store, transfer, transform, transformation, transport

- **Energy→Energy in Chemical Processes and Everyday Life (PS3)**
  Absorb, climate, collision, controlled, graduated cylinder, mixed, product, properties, sum, fuel, natural resource, independent, chemical, microscopic, particle, store, test results, transfer, accuracy, alternative, atom, conserve, dissolve, Kelvin, react, substance

Performance Expectation 3-5-ETS1-2	
Students who demonstrate understanding can: Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem. **Clarification Statement***: N/A* **Assessment Boundary***: N/A*	
Lesson Level Photo Analysis: Where did all that trash come from? How do you think the trash will affect that lake ecosystem? **Lesson Level Phenomenon Video:** Fish have trouble surviving in polluted areas. ***note: all photo and video above links to suggested activities below***	
3-5-ETS1-2 Suggested Activities	**3-5-ETS1-2 Recommended Formative Assessments**
How Do Humans Change Ecosystems**?** *(TCI: Unit 1 Living Things in Ecosystems, Lesson 8*) Students will investigate how humans affect ecosystems**. (3 class periods)**	• Identify and discuss three ways that humans and modern ways of life may affect ecosystems. • Design a soil-less farming system with a group.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Constructing Explanations and Designing Solutions • Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design problem. **Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.**	ETS1.B: Developing Possible Solutions • Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. • At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs.	Influence of Science, Engineering, and Technology on Society and the Natural World • Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands.

Performance Expectation
3-5-ETS1-2 Engineering Design

Connections to 3-5-ETS1.B: Developing Possible Solutions Problems include:
Fourth Grade: 4-ESS3-2

Articulation of DCIs across grade-levels:
K-2.ETS1.A ; K-2.ETS1.B ; K-2.ETS1.C ; MS.ETS1.B ; MS.ETS1.C

Common Core State Standards Connections:

ELA/Literacy -

RI.5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. *(3-5-ETS1-2)*

RI.5.1 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. *(3-5-ETS1-2)*

RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (3-5-ETS1-2)

Mathematics -

MP.2 Reason abstractly and quantitatively. *(3-5-ETS1-2)*

MP.4 Model with mathematics. *(3-5-ETS1-2)*

MP.5 Use appropriate tools strategically. *(3-5-ETS1-2)*

3-5.OA Operations and Algebraic Thinking *(3-ETS1-2)*

Lesson Level Vocabulary: *invasive species*

DCI Domain Vocabulary

Domains are bold:

- **Engineering Design→Developing Possible Solutions (ETS1)**
  diagram, engineer, engineering, physical model, diorama, existing, design problem, design process, design solution, designed, operate, peers, replicable experiment, reproducible result

Unit 2: The Study of Matter, Motion, and Our Universe

(***Instructional Days: 34 days in Second Trimester December-March***)

Anchoring Phenomenon	
Logs burn in a fire pit. Where do the logs go from a burning fire?	
Compelling Questions	**Supporting Questions**
What is the sun's composition and size?	• *What is matter made of?* • *Why are materials different?* • *How do changes in substances affect their weights?* • *How do engineers improve materials?* • *How can substances be identified?* • *How do scientists know when substances change?* • *What causes substances to change?*
Storyline	**Possible Student Misconceptions:**
Fifth graders will build an understanding of matter, its changes in state.	*Matter can be created.* *Matter can be destroyed.*
Prior Student Learning:	
3.PS2.A Forces and Motion; 3.PS2.B Types of Interactions **2.PS1.A Structure and Properties of Matter; 2.PS1.B Chemical Reactions** **1.ESS1.A The Universe and Its Stars; 1.ESS1.B Earth and the Solar System**	

Unit 2: The Study of Matter, Motion and Our Universe Overview

Performance Expectations	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
• **5-PS1-1** • **5-PS1-2** • **5-PS1-3** • **5-PS1-4** • **5-PS2-1** • **5-ESS1-1** • **5-ESS1-2** • **3-5 ETS1-3** *Teacher Note: Teacher Note: All the Performance Expectations above will be covered this unit and can be worked on concurrently. 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* • **5: Using Mathematical Computational Thinking** • *6: Constructing Explanations and Designing Solutions* • **7: Engaging in Argument from Evidence** • *8: Obtaining, Evaluating, and Communicating Information*	**EARTH AND SPACE SCIENCE** • **ESS1 Earth's Place in the Universe** -ESS1.A: The Universe and Its Stars **PHYSICAL SCIENCE** • **PS1 Matter and Its Interactions** -PS1.A: Structure and Properties of Matter -PS1.B: Chemical Reactions • **PS2 Motion and Stability: Forces and Interactions** -PS2.B: Types of Interactions **ENGINEERING, TECHNOLOGY AND THE APPLICATION OF SCIENCE** • **ETS1 Engineering Design** -ETS1.A :Defining and Delimiting Engineering Problems	• *1: Patterns* • **2: Cause and Effect** • **3: Scale, Proportion and Quantity** • *4: Systems and System Models* • *5: Energy and Matter* • *6: Structure and Function* • *7: Stability and Change*

Formal Assessment Unit 2:	Additional Teacher Resources Unit 2:
Performance Assessment: Testing Pancake Ingredients **Possible IAB: Matter and Its Interactions** **TEACHER MODELED IAB: Earth's Systems and Gravitational Forces**	**Google Drive:** Teaching/Planning Unit 2 Materials Unit 2 Science Resources Classroom Is Pluto a Planet?

Performance Expectation
5-PS1-1 Matter and Its Interactions

Students who demonstrate understanding can:
Develop model to describe that matter is made of particles too small to be seen.
Clarification Statement: *Examples of evidence supporting a model could including adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water.*
Assessment Boundary: *Assessment does not include the atomic-scale mechanism of evaporation and condensation or defining the unseen particles.*

Lesson Level Photo Analysis: Is this wood moving? What are the materials that make up the truck?
Lesson Level Phenomenon Video: The balloon changes size and shape when the girl blows into it. This ice looks different after it melts.
note: all photo and video above links to suggested activities below

5-PS1-1 Suggested Activities	5-PS1 -1 Recommended Formative Assessments
What is Matter Made Of? *(TCI: Unit 3 Changes in Matter, lesson 1*) Students will develop a model to explain the concept that matter is made of particles too small to be seen. **(2 class periods)** Why Are Materials Different? *(TCI: Unit 3 Changes in Matter, lesson 2*) Students will continue to develop models to describe that matter is made of particles too small to be seen, now including the label of solid, liquid and gas states. **(2 class periods)**	• Develop and revise models in small groups to make a claim about what will happen when salt is mixed with water. Develop a revised model. • Develop and revise explaining why a balloon stretches and changes in weight. Develop a revised model. • Develop and revise models of the three states of matter (anything that takes up space and weight): solid, liquid and gas.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models • Use models to describe phenomena. **Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.**	PS1.A: Structure and Properties of Matter • Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon and the effects of air on larger particles or objects.	Scale, Proportion, and Quantity • Natural objects exist from the very small to the immensely large.

Performance Expectation
5-PS1-1 Matter and Its Interactions

Connections to other DCIs in Fifth Grade:
N/A

Articulation of DCIs across grade-levels:
2.PS1.A ; MS.PS1.A

Common Core State Standards Connections:

ELA/Literacy -

RI.5.7	*Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.* (5-PS1-1)

Mathematics -

MP.2	Reason abstractly and quantitatively. *(5-PS1-1)*
MP.4	Model with mathematics. *(5-PS1-1)*
5.NBT.A.1	Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10. *(5-PS1-1)*
5.NF.B.7	Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. *(5-PS1-1)*
5.MD.C.3	Recognize volume as an attribute of solid figures and understand concepts of volume measurement. *(5-PS1-1)*
5.MD.C.4	Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units. *(5-PS1-1)*

Lesson Level Vocabulary: *dissolve, matter, particles, solution, state of matter, mixture, property, substance*

DCI Domain Vocabulary

Domains are bold:

- **Matter and Its Interactions→Structure and Properties of Matter (PS1)**
  Absorbency, attraction, electric, electrical, evaporate, force, matter, metal, product, properties, reflectivity, structure, transformation, baking soda, charged, condensation, evaporation, matter particle, particle, pressure, vapor, atom, compress, conduction, conductivity, detect, dissolve, electrical conductivity, mineral, relative, solubility, substance

Performance Expectation
5-PS1-2 Matter and Its Interactions

Students who demonstrate understanding can:
Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.
Clarification Statement: *Examples of reactions or changes could include phase changes, dissolving, and mixing that form new substances.*
Assessment Boundary: *Assessment does not include distinguishing mass and weight.*

Lesson Level Photo Analysis: Weight of ice and ice cube Melting scraps of metal.
Lesson Level Phenomenon Video: When a reaction creates bubbles, the balloon inflates. Concrete makes a stronger floor than dirt.
note: all photo and video above links to suggested activities below

5-PS1-2 Suggested Activities	5-PS1-2 Recommended Formative Assessments
How Do Changes in Substances Affect Their Weights? (*TCI: Unit 3 Changes in Matter, Lesson 6)* Students will measure and analyze the weight of objects before and after a change. **(3 class periods)** How Do Engineers Improve Materials? (*TCI: Unit 3 Changes in Matter, Lesson 7)* Students will create an object mixing sand/pebbles, water, concrete and use the engineering design process to test and identify processes for what makes the best mixture for. **(3 class periods)**	• Compare and contrast the weight of water and ice. • Graph weights of mixing sand/pebbles, water, concrete before and after mixing. • Write a paragraph explaining why your mixture did or did not work and identify ways you could improve your mixture.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Using Mathematics and Computational Thinking • Measure and graph quantities such as weight to address scientific and engineering questions and problems. **Mathematical and computational thinking in 3–5 builds on K–2 experiences and progresses to extending quantitative measurements to a variety of physical properties and using computation and mathematics to analyze data and compare alternative design solutions.**	PS1.A: Structure and Properties of Matter • The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish. PS1.B: Chemical Reactions • No matter what reaction or change in properties occurs, the total weight of the substances does not change. (Boundary: Mass and weight are not distinguished at this grade level.)	Scale, Proportion, and Quantity • Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume. --- ***Connections to Nature of Science*** **Scientific Knowledge Assumes an Order and Consistency in Natural Systems** • Science assumes consistent patterns in natural systems.

Performance Expectation
5-PS1-2 Matter and Its Interactions

Connections to other DCIs in Fifth Grade:
N/A

Articulation of DCIs across grade-levels:
2.PS1.A ; 2.PS1.B ; MS.PS1.A ; MS.PS1.B

Common Core State Standards Connections:

ELA/Literacy –

W.5.7	Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. *(5-PS1-2)*
W.5.8	Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. *(5-PS1-2)*
W.5.9	Draw evidence from literary or informational texts to support analysis, reflection, and research. *(5-PS1-2)*

Mathematics -

MP.2	Reason abstractly and quantitatively. (5-PS1-2)
MP.4	Model with mathematics. (5-PS1-2)
MP.5	Use appropriate tools strategically. (5-PS1-2)
5.MD.A.1	Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real-world problems. *(5-PS1-2)*

Lesson Level Vocabulary: *conserve, constraint, criteria*

DCI Domain Vocabulary

Domains are bold:

- **Matter and Its Interactions→Structure and Properties of Matter; Chemical Reactions (PS1)**
  Absorbency, attraction, electric, electrical, evaporate, force, matter, metal, product, properties, reflectivity, structure, transformation, baking soda, charged, condensation, evaporation, matter particle, particle, pressure, vapor, atom, compress, conduction, conductivity, detect, dissolve, electrical conductivity, mineral, relative, solubility, substance, absorb, climate, collision, controlled, graduated cylinder, mixed, product, properties, sum, fuel, natural resource, independent, chemical, microscopic, particle, store, test results, transfer, accuracy, alternative, atom, conserve, dissolve, Kelvin, react, substance

Performance Expectation
5-PS1-3 Matter and Its Interactions

Students who demonstrate understanding can:
Make observations and measurements to identify materials based on their properties.
Clarification Statement: *Examples of materials to be identified could include baking soda and other powders, metals, minerals and liquids. Examples of properties could include color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, and solubility; density is not intended as an identifiable property.*
Assessment Boundary*: Assessment does not include density or distinguishing mass and weight.*

Lesson Level Photo Analysis: What are some ways to identify substances without touching them or tasting them? Why do you think the egg white has turned from a clear liquid to a white solid? What happens when you activate a glue stick?
Lesson Level Phenomenon Video: A sugar cube starts to disappear when dropped into a cup of water. When wood burns its color changes. Bubbles form when the baking soda in the flask comes into contact with vinegar.
note: all photo and video above links to suggested activities below

5-PS1-3 Suggested Activities	5-PS1-3 Recommended Formative Assessments
How Can Substances Be Identified? (*TCI: Unit 3 Changes in Matter, Lesson 3*) Students observe properties of five different powders and use the properties to identify a mystery powder. **(3 class periods)** How Do Scientists Know When Substances Change? (*TCI: Unit 3 Changes in Matter, Lesson 4*) Students will note when substances change during observations and use these notes to make a claim that a new substance has formed with different properties during a change. **(2 class periods)** What Causes Substances to Change? (*TCI: Unit 3 Changes in Matter, Lesson 5*) Students will plan and investigate the mixing together of given substances to identify which substances react to form new substances. **(3 class periods)**	• Make a written claim for your mystery substance and support your reasoning with data evidence from your experiment. • Make a claim supported by evidence that substances change. • Plan and carry out an investigation using given materials • Test eight mixtures and record your observations. Write explanations that reveal if any properties changed. Do you think a new substance formed? *(pages 7-10 student notebook)*

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations • Make observations and measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. **Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.**	PS1.A: Structure and Properties of Matter • Measurements of a variety of properties can be used to identify materials. (Boundary: At this grade level, mass and weight are not distinguished, and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation.)	Scale, Proportion, and Quantity • Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume.

Performance Expectation
5-PS1-3 Matter and Its Interactions

Connections to other DCIs in Fifth Grade:
N/A

Articulation of DCIs across grade-levels:
2.PS1.A ; MS.PS1.A

Common Core State Standards Connections:

ELA/Literacy –

W.5.7 Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. *(5-PS1-3)*

W.5.8 Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. *(5-PS1-3)*

W.5.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. *(5-PS1-3)*

Mathematics -

MP.2 Reason abstractly and quantitatively. (5-PS1-3)

MP.4 Model with mathematics. (5-PS1-3)

MP.5 Use appropriate tools strategically. (5-PS1-3)

Lesson Level Vocabulary: *electrical conductivity, solubility, thermal conductivity, reaction, state change, mixture, property, substance, contract, expand*

DCI Domain Vocabulary

Domains are bold:

- **Matter and Its Interactions→Structure and Properties of Matter (PS1)**
  Absorbency, attraction, electric, electrical, evaporate, force, matter, metal, product, properties, reflectivity, structure, transformation, baking soda, charged, condensation, evaporation, matter particle, particle, pressure, vapor, atom, compress, conduction, conductivity, detect, dissolve, electrical conductivity, mineral, relative, solubility, substance

Performance Expectation
5-PS1-4 Matter and Its Interactions

Students who demonstrate understanding can:
Conduct an investigation to determine whether the mixing or two or more substances results in new substances.
Clarification Statement: *N/A*
Assessment Boundary*: N/A*

Lesson Level Photo Analysis: What are some ways to identify substances without touching them or tasting them? Why do you think the egg white has turned from a clear liquid to a white solid? What happens when you activate a glue stick?
Lesson Level Phenomenon Video: A sugar cube starts to disappear when dropped into a cup of water. When wood burns its color changes. Bubbles form when the baking soda in the flask comes into contact with vinegar.
note: all photo and video above links to suggested activities below

5-PS1-4 Suggested Activities

How Can Substances Be Identified? (*TCI: Unit 3 Changes in Matter, Lesson 3*) Students observe properties of five different powders and use the properties to identify a mystery powder. **(3 class periods)**

How Do Scientists Know When Substances Change? (*TCI: Unit 3 Changes in Matter, Lesson 4*) Students will note when substances change during observations and use these notes to make a claim that a new substance has formed with different properties during a change. **(2 class periods)**

What Causes Substances to Change? (*TCI: Unit 3 Changes in Matter, Lesson 5*) Students will plan and investigate the mixing together of given substances to identify which substances react to form new substances. **(3 class periods)**

5-PS1-4 Recommended Formative Assessments

- Make a written claim for your mystery substance and support your reasoning with data evidence from your experiment.
- Make a claim supported by evidence that substances change.
- Plan and carry out an investigation using given materials
- Test eight mixtures and record your observations. Write explanations that reveal if any properties changed. Do you think a new substance formed? *(pages 7-10 student notebook)*

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations	PS1.B: Chemical Reactions	Cause and Effect
• Conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. **Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.**	• When two or more different substances are mixed, a new substance with different properties may be formed.	• Cause and effect relationships are routinely identified and used to explain change.

Performance Expectation
5-PS1-4 Matter and Its Interactions

Connections to other DCIs in Fifth Grade:
N/A

Articulation of DCIs across grade-levels:
2.PS1.B ; MS.PS1.A ; MS.PS1.B

Common Core State Standards Connections:
ELA/Literacy – *N/A*

Mathematics -

W.5.7	Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. (5-PS1-4)
W.5.8	Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. (5-PS1-4)
W.5.9	Draw evidence from literary or informational texts to support analysis, reflection, and research. *(5-PS1-4)*

Lesson Level Vocabulary: *electrical conductivity, solubility, thermal conductivity, reaction, state change, mixture, property, substance, contract, expand*

DCI Domain Vocabulary
Domains are bold:

- **Matter and Its Interactions→Chemical Reactions (PS1)**
  substance, absorb, climate, collision, controlled, graduated cylinder, mixed, product, properties, sum, fuel, natural resource, independent, chemical, microscopic, particle, store, test results, transfer, accuracy, alternative, atom, conserve, dissolve, Kelvin, react, substance

Performance Expectation
5-PS2-1 Motion and Stability: Forces and Interaction

Students who demonstrate understanding can:
Support an argument that the gravitational force exerted by Earth on objects is directed down.
Clarification Statement: *"Down" is a local description of the direction that points toward the center of the spherical Earth.*
Assessment Boundary*: Assessment does not include mathematical representation of gravitational force.*

Lesson Level Photo Analysis: What direction is the skydiver moving? How do you know?
Lesson Level Phenomenon Video: No matter where you jump on Earth, you will land on the ground.

note: all photo and video above links to suggested activities below

5-PS2-1 Suggested Activities	5-PS2-1 Recommended Formative Assessments
What Does Gravity Do? *(TCI: Unit 4 Earth, the Moon, and the Stars, Lesson 1)* Students will investigate the effect of gravity and make a claim with this evidence that Earth's gravitational force is directed toward Earth's center. **(2 class periods)**	• Watch Felix Baumgarter video. Write a written claim detailing what you notice and what is causing him to return to Earth.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Engaging in Argument from Evidence • Support an argument with evidence, data, or a model. **Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).**	PS2.B: Types of Interactions • The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center.	Cause and Effect • Cause and effect relationships are routinely identified and used to explain change.

Performance Expectation
5-PS2-1 Motion and Stability: Forces and Interaction

Connections to other DCIs in Fifth Grade:
N/A

Articulation of DCIs across grade-levels:
3.PS2.A ; 3.PS2.B ; MS.PS2.B ; MS.ESS1.B ; MS.ESS2.C

Common Core State Standards Connections:

ELA/Literacy -

RI.5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. *(5-PS2-1)*

RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (5-PS2-1)

W.5.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (5-PS2-1)

Mathematics – N/A

Lesson Level Vocabulary: *gravity, meteor, orbit*

DCI Domain Vocabulary

Domains are bold:

- **Motion and Stability: Forces and Interaction→Types of Interactions (PS2)**
  Applied force, balanced force, climate, collide, collision, controlled, force, force strength, friction, future motion, past motion, position over time, sum, unbalanced force, independent, measurement of motion, natural resource, conservation, electric current, exert, interaction, transfer, mass, relative position

Performance Expectation
5-ESS1-1 Earth's Place in the Universe

Students who demonstrate understanding can:
Support an argument that the apparent brightness of the sun and stars is due to their relative distances from the Earth.
Clarification Statement: *N/A*
Assessment Boundary*: Assessment is limited to relative distances, not sizes, or stars. Assessment does not include other factors that affect apparent brightness (such as stellar masses, age, stage).*

Lesson Level Photo Analysis: Is the sun the only star in the sky? Why does the sun look bigger and brighter than other stars?
Lesson Level Video: You can see the stars at night but not during the day.
note: all photo and video above links to suggested activities below

5-ESS1-1 Suggested Activities	5-ESS1-1 Recommended Formative Assessments
Why is the Sun Brighter Than Other Stars? *(TCI: Unit 4 Earth, the Moon, and the Stars, Lesson 2)* Students will explore how distance affects the brightness a flashlight appears. Students will analyze how some stars may appear from one's perspective on Earth. **(2 class periods)**	• Write an explanation using your activity with the different sized flashlights that some stars are brighter than others.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Engaging in Argument from Evidence • Support an argument with evidence, data, or a model. **Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).**	ESS1.A: The Universe and its Stars • The sun is a star that appears larger and brighter than other stars because it is closer. Stars range greatly in their distance from Earth.	Scale, Proportion, and Quantity • Natural objects exist from the very small to the immensely large.

Performance Expectation
5-ESS1-1 Earth's Place in the Universe

Connections to other DCIs in Fifth Grade:
N/A

Articulation of DCIs across grade-levels:
MS.ESS1.A ; MS.ESS1.B

Common Core State Standards Connections:

ELA/Literacy -

RI.5.1	Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. *(5-ESS1-1)*
RI.5.7	Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. *(5-ESS1-1)*
RI.5.8	Explain how an author uses reasons and evidence to support particular points in a text, identifying which reasons and evidence support which point(s). *(5-ESS1-1)*
RI.5.9	Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (5-ESS1-1)
W.5.1	Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (5-ESS1-1)

Mathematics -

MP.2	Reason abstractly and quantitatively. *(5-ESS1-1)*
MP.4	Model with mathematics. *(5-ESS1-1)*
5.NBT.A.2	Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10. *(5-ESS1-1)*

Lesson Level Vocabulary: *apparent, brightness, light year*

DCI Domain Vocabulary

Domains are bold:

- **Earth's Place in the Universe→The Universe and Its Stars (ESS1)**
  Apparent movement of the stars, apparent movement of the sun, constellation, cycle, galaxy, visible, independent, role, dependent, astronomical, astronomical distance, astronomical object, astronomical size, astronomy, microscopic, transfer, atom, brightness, development, immensely, mass, relative, vast

Performance Expectation
5-ESS1-2 Earth's Place in the Universe

Students who demonstrate understanding can:

Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.

Clarification Statement: Examples of patterns could include the position and motion of Earth with respect to the sun and selected stars that are visible only in particular months

Assessment Boundary*:* Assessment does not include causes of seasons

Lesson Level Photo Analysis: Is the sun the only star in the sky? Why does the sun look bigger and brighter than other stars? Why do we use telescopes?

Lesson Level Phenomenon Video: You can see the stars at night but not during the day. Tools help us see space in greater detail.

note: all photo and video above links to suggested activities below

5-ESS1-1 Suggested Activities	5-ESS1-1 Recommended Formative Assessments
Why is the Sun Brighter Than Other Stars?**(TCI: Unit Earth, the Moon, and the Stars 4, Lesson 2)* Students will explore how distance affects the brightness a flashlight appears. Students will analyze how some stars may appear from one's perspective on Earth. **(2 class periods)** What Tools Do Scientists Use To Observe Space? *(TCI: Unit Earth, the Moon, and the Stars 4 , Lesson 7)* Students will design and build telescopes. **(2 class periods)**	• Write an explanation using your activity with the different sized flashlights that some stars are brighter than others. • Draw a diagram showing how a lens refracts light. • Compare and contrast different tools scientists use to observe space.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data • Represent data in graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships. **Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.**	ESS1.B: Earth and the Solar System • The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the sun, moon, and stars at different times of the day, month, and year.	Patterns • Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena.

Performance Expectation
5-ESS1-2 Earth's Place in the Universe

Connections to other DCIs in Fifth Grade:
N/A

Articulation of DCIs across grade-levels:
1.ESS1.A ; 1.ESS1.B ; 3.PS2.A ; MS.ESS1.A ; MS.ESS1.B

Common Core State Standards Connections:

ELA/Literacy -

SL.5.5	Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes. *(5-ESS1-2)*

Mathematics -

MP.2	Reason abstractly and quantitatively. (5-ESS1-2)
MP.4	Model with mathematics. (5-ESS1-2)
5.G.A.2	Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation. (5-ESS1-2)

Lesson Level Vocabulary: *apparent, brightness, light year, lens, radio telescope, reflecting telescope, refracting telescope, space telescope, telescope*

DCI Domain Vocabulary

Domains are bold:

- **Earth's Place in the Universe→Earth and the Solar System (ESS1)**
  Atmosphere, attraction, collision, cycle, Earth's rotation, feature, force, galaxy, moon's phases, North Pole, pole, properties, rotation, South Pole, sun's size, telescope, tide, visible, apparent movement of the planets, axis, Earth's axis, role, solar system, Earth's orbit, gravitational, gravitational pull, Milky Way, development, orbit, orbital, phase, relative, spacecraft, tilted, lunar phase

Performance Expectation
3-5 ETS1-3 Engineering Design

Students who demonstrate understanding can:
Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.
Clarification Statement: N/A
Assessment Boundary: N/A

Lesson Level Photo Analysis: Melting scraps of metal.
Lesson Level Phenomenon Video: Concrete makes a stronger floor than dirt.
note: all photo and video above links to suggested activities below

3-5 ETS1-3 Suggested Activities	3-5 ETS1-3 Recommended Formative Assessments
How Do Engineers Improve Materials? (*TCI: Unit 3 Changes in Matter, Lesson 7)* Students will create an object mixing sand/pebbles, water, concrete and use the engineering design process to test and identify processes for what makes the best mixture for. **(3 class periods)**	• Write a paragraph explaining why your mixture did or did not work and identify ways you could improve your mixture.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations • Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. **Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.**	ETS1.B: Developing Possible Solutions • Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved. ETS1.C: Optimizing the Design Solution • Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints.	**N/A**

Performance Expectation
3-5-ETS1-3 Engineering Design

Connections to 3-5-ETS1.B: Developing Possible Solutions Problems include:
Fourth Grade: 4-ESS3-2

Articulation of DCIs across grade-levels:
K-2.ETS1.A ; K-2.ETS1.C ; MS.ETS1.B ; MS.ETS1.C

Common Core State Standards Connections:

ELA/Literacy –

W.5.7	Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. (3-5-ETS1-3)
W.5.8	Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. *(3-5-ETS1-3)*
W.5.9	Draw evidence from literary or informational texts to support analysis, reflection, and research. *(3-5-ETS1-3)*

Mathematics -

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

Lesson Level Vocabulary: *conserve, constraint, criteria*

DCI Domain Vocabulary
Domains are bold:

- **Engineering Design→Developing Possible Solutions; Optimizing the Design Solution (ETS1)**
  diorama, existing, design problem, design process, design solution, designed, operate, peers, replicable experiment, reproducible result, independent, societal, flow, cost, difficulty, presentation, successful, failure point, independent, perform, collaboratively, prototype, test results, trial

Unit 3: The Study of Earth's Systems

(Instructional Days: *22 days in Third Trimester April-June*)

Anchoring Phenomenon	
Earth's Systems	
Compelling Questions	**Supporting Questions**
What are Earth's four systems, and how do Earth's systems interact?	• How do Earth's systems produce weather and climate? • How do Earth's systems change Earth's surface? • How do humans affect Earth's systems? • How can humans protect Earth's systems?
Storyline	**Possible Student Misconceptions:**
Fifth graders will build an understanding of Earth's systems and how Earth's systems change and stay the same over time.	Human interactions with Earth's systems are reversible. Human adverse interactions with Earth's systems affect only the local area.
Prior Learning:	
4.ESS2.A Earth Materials and Systems 3.ESS2.D Weather and Climate 2.ESS2.A Earth Materials and Systems; 2.ESS2.C The Roles of Water in Earth's Surface Processes	

Unit 3: The Study of Earth's Systems Overview (22 days April-June)

Performance Expectations	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
• **5-ESS2-1** • **5-ESS2-2** • **5-ESS3-1** • **3-5 ETS1-1** *Teacher Note: Teacher Note: All the Performance Expectations above will be covered this unit and can be worked on concurrently. 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* • **5: Using Mathematical Computational Thinking** • *6: Constructing Explanations and Designing Solutions* • *7: Engaging in Argument from Evidence* • **8: Obtaining, Evaluating, and Communicating Information**	**ENGINEERING, TECHNOLOGY AND THE APPLICATION OF SCIENCE** • **ETS1 Engineering Design** -ETS1.A: Defining and Delimiting Engineering Problems **EARTH SCIENCE** • **ESS2 Earth's Systems** -ESS2.A: Earth Materials and Systems -ESS2.C: The Roles of Water in Earth's Surface Processes • **ESS3 Earth and Human Activity** -ESS3.C: Human Impacts on Earth's Systems	• *1: Patterns* • *2: Cause and Effect* • **3: Scale, Proportion and Quantity** • **4: Systems and System Models** • *5: Energy and Matter* • *6: Structure and Function* • *7: Stability and Change*

Formal Assessment Unit 3:	Additional Teacher References Unit 3:
Performance Assessment: Creating a Public Service Announcement **Possible IAB: Earth's Systems**	**Google Drive:** Teaching/Planning/Materials Unit 3 Science Resources Classroom The Four "Spheres" video Kids Crash Course Geosphere and Biosphere; Kids Crash Course Hydrosphere and Atmosphere

Performance Expectation
5-ESS2-1 Earth's Systems

Students who demonstrate understanding can:

Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.

Clarification Statement: *Examples could include the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere on landforms and ecosystems through weather and climate; and the influence of mountain ranges on winds and clouds in the atmosphere. The geosphere, hydrosphere, atmosphere, and biosphere are each a system.*

Assessment Boundary: *Assessment is limited to the interactions of two systems at a time.*

Lesson Level Photo Analysis: How are Earth's four systems represented in a photo of a Bluff Point? New London Train Station, Fog in New Jersey and Newfoundland

Lesson Level Phenomenon Video: Lakes drain due to years of no rain. How have Earth's systems interacted to change Earth's surface in Long Island Sound?

note: all photo and video above links to suggested activities below

5-ESS2-1 Suggested Activities	5-ESS2-1 Recommended Formative Assessments
What Are Earth's Four Systems? *(TCI: Unit 2 Earth Systems, Lesson 1)* Students will develop and label models demonstrating their understanding that Earth is categorized into four systems: the geosphere, biosphere, hydrosphere and atmosphere. **(5 class periods)** How Do Earth's Systems Produce Weather and Climate? *(TCI: Unit 2 Earth Systems, Lesson 2)* Students will determine how Earth's systems interact to produce weather and climate. **(2 class periods)** How Do Earth's Systems Change Earth's Surface? *(TCI: Unit 2, Earth Systems, Lesson 3)* Students will work in groups to how Earth's surface has changed and how Earth's systems have created this change. **(3 class periods)**	• Draw and label a model of the Earth's four systems and write a detailed paragraph about how two systems would interact. • Research and present different changes in the Earth's environment. • Complete a table identifying what role each of Earth's systems has in changes to Earth's environment. • Record the weather in Ledyard and explain which of Earth's four systems interact to produce the weather in Ledyard.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models • Develop a model using an example to describe a scientific principle. **Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions**	ESS2.A: Earth Materials and Systems • Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather.	Systems and System Models • A system can be described in terms of its components and their interactions.

Performance Expectation
5-ESS2-1 Earth's Systems

Connections to other DCIs in Fifth Grade:
N/A

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

Common Core State Standards Connections:
ELA/Literacy –

RI.5.7	Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. *(5-ESS2-1)*
SL.5.5	Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes. *(5-ESS2-1)*

Mathematics--

MP.2	Reason abstractly and quantitatively. *(5-ESS2-1)*
MP.4	Model with mathematics. *(5-ESS2-1)*
5.G.A.2	Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation. *(5-ESS2-1)*

Lesson Level Vocabulary: *sediments, water vapor, water cycle, atmosphere, biosphere, geosphere, hydrosphere, precipitation, air mass, air pressure, climate, prevailing wind, weather*

DCI Domain Vocabulary

Domains are bold:

- **Earth's Systems→Earth Materials and Systems (ESS2)**
  atmosphere, changes in the Earth's surface, climate, Earth's surface, Earth's temperature, feature, force, gases of the atmosphere, glacial, surface feature, weathering, wind patterns, global, landform, local, mountain range, ocean floor, organism, plate, plateau, sediment, transport, vegetation, continental, microscopic, ocean trench, plate tectonics, wetland, atmospheric composition, atmospheric layers, atmospheric pressure, biosphere, destructive, groundwater, hydrosphere, igneous rock, metamorphic rock, mineral, molten, original, sedimentation, sedimentary rock, water cycle

Performance Expectation
5-ESS2-2 Earth's Systems

Students who demonstrate understanding can:

Describe and graph the amounts of salt water and fresh water in various reservoirs to provide evidence about the distribution of water on the Earth.

Clarification Statement: Examples of motion with a predictable pattern could include a child swinging in a swing, a ball rolling back in forth in a bowl, and two children on a see-saw.

Assessment Boundary: *Assessment does not include technical terms such as a period and frequency.*

Lesson Level Photo Analysis: How are Earth's four systems represented in a photo of a Bluff Point?

Lesson Level Phenomenon Video: The fog in this valley stays low to the ground.

note: all photo and video above links to suggested activities below

5-ESS2-2 Suggested Activities	5-ESS2-2 Recommended Formative Assessments
What Are Earth's Four Systems? (TCI Unit 2, Lesson 1) Students will develop and label models demonstrating their understanding that Earth is categorized into four systems: the geosphere, biosphere, hydrosphere and atmosphere. (**3 class periods**)	• Complete and analyze a graph about types of water on the Earth.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Using Mathematics and Computational Thinking • Describe and graph quantities such as area and volume to address scientific questions. ***Mathematical and computational thinking in 3–5 builds on K–2 experiences and progresses to extending quantitative measurements to a variety of physical properties and using computation and mathematics to analyze data and compare alternative design solutions.***	ESS2.C: The Roles of Water in Earth's Surface Processes • Nearly all of Earth's available water is in the ocean. Most fresh water is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere.	Scale, Proportion, and Quantity • Standard units are used to measure and describe physical quantities such as weight and volume.

Performance Expectation
5-ESS2-2 Earth's Systems

Connections to other DCIs in Fifth Grade:
N/A

Articulation of DCIs across grade-levels:
2.ESS2.C ; MS.ESS2.C ; MS.ESS3.A

Common Core State Standards Connections:
ELA/Literacy

RI.5.7	Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. *(5-ESS2-2)*
W.5.8	Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. *(5-ESS2-2)*
SL.5.5	Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes. *(5-ESS2-2)*

Mathematics -

MP.2	Reason abstractly and quantitatively. (5-ESS2-2)
MP.4	Model with mathematics. (5-ESS2-2)

Lesson Level Vocabulary: *deposition, erosion, landform, weathering*

DCI Domain Vocabulary

Domains are bold:

- **Earth's Systems→The Roles of Water in Earth's Surface Processes (ESS2)**
  atmosphere, changes in the Earth's surface, climate, Earth's surface, Earth's temperature, feature, force, gases of the atmosphere, glacial, surface feature, weathering, wind patterns, global, landform, local, mountain range, ocean floor, organism, plate, plateau, sediment, transport, vegetation, continental, microscopic, ocean trench, plate tectonics, wetland, atmospheric composition, atmospheric layers, atmospheric pressure, biosphere, destructive, groundwater, hydrosphere, igneous rock, metamorphic rock, mineral, molten, original, sedimentation, sedimentary rock, water cycle

Performance Expectation
5-ESS3-1 Earth and Human Activity

Students who demonstrate understanding can:
Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.
Clarification Statement: *N/A*
Assessment Boundary: *N/A*

Lesson Level Photo Analysis: How do factories affect Earth's systems? ; What are some activities people do that affect Earth's systems?; Which form of transportation do you think uses less of Earth's resources?
Lesson Level Phenomenon Video: The miner is digging in the Earth. ; You can't find books in nature, but they come from Earth's systems. ; Pollution can make water undrinkable.

note: all photo and video above links to suggested activities below

5-ESS3-1 Suggested Activities	5-ESS3-1 Recommended Formative Assessments
How Do Farming and Industry Affect Earth's Systems? (TCI Unit 2, Lesson 4) Students will investigate the effects of farming and industry on Earth's systems. (**2 class periods**) How Do People's Everyday Lives Affect Earth's Systems? (TCI Unit 2, Lesson 5) Students will evaluate some of their everyday activities and assess how they affect Earth's systems. Students will then strategize collaboratively how to reduce any negative impacts they may have discovered in their activities. (**2-3 class periods**) What Can People Do to Protect Earth's Systems? (TCI Unit 2, Lesson 6) Students will design and build a water filter and research ways to protect the Earth. (**3 class periods**)	• Write a short essay describing how humans affect Earth's systems after a simulation of "mining" chocolate chips from chocolate chip cookies. • Compose and conduct an interview with a family member to assess their impact on Earth's systems with their daily activity. • Research one method scientists and engineers have come up with to protect Earth's systems. Then write a paragraph about what you learned. Use at least one print and one digital source. Include quotes and provide your sources. • Design a podcast that demonstrates one researched way to protect the Earth.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Obtaining, Evaluating, and Communicating Information Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem. ***Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluating the merit and accuracy of ideas and methods.***	ESS3.C: Human Impacts on Earth Systems • Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments.	Systems and System Models • A system can be described in terms of its components and their interactions. --- ***Connections to Nature of Science*:** **Science Addresses Questions About the Natural and Material World.** • Science findings are limited to questions that can be answered with empirical evidence.

Performance Expectation
5-ESS3-1 Earth and Human Activity

Connections to other DCIs in Fifth Grade:
N/A

Articulation of DCIs across grade-levels:
MS.ESS3.A ; MS.ESS3.C ; MS.ESS3.D

Common Core State Standards Connections:

ELA /Literacy –

RI.5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. *(5-ESS3-1)*

RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (5-ESS3-1)

RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (5-ESS3-1)

W.5.8 Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. (5-ESS3-1)

W.5.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. *(5-ESS3-1)*

Mathematics —

MP.2 Reason abstractly and quantitatively. *(5-ESS3-1)*

MP.4 Model with mathematics. *(5-ESS3-1)*

Lesson Level Vocabulary: *pollution, toxic, decompose, recycling, conservation, scrubbers, wildlife refuge*

DCI Domain Vocabulary

Domains are bold:

- **Earth and Human Activity→Human Impacts on Earth's Systems (ESS3)**
  Atmosphere, climate, fresh water, resource, waste, construction, crops, effort, fossil fuel, global, independent, livestock, local, mining, natural resource, regional, vegetation, diversity, societal, wetland, agriculture, biosphere, development, fertile, groundwater, industry, material world, mineral, river delta

Performance Expectation
3-5-ETS1-1 Engineering Design

Students who demonstrate understanding can:
Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
Clarification Statement: N/A
Assessment Boundary: N/A

Lesson Level Photo Analysis: Which form of transportation do you think uses less of Earth's resources?
Lesson Level Phenomenon Video: Pollution can make water undrinkable.
note: all photo and video above links to suggested activities below

3-5-ETS1-1 Suggested Activities	3-5-ETS1-1 Recommended Formative Assessments
What Can People Do to Protect Earth's Systems? (TCI Unit 2, Lesson 6) Students will design and build a water filter and research ways to protect the Earth. (**3 class periods**)	• Research one method scientists and engineers have come up with to protect Earth's systems. Then write a paragraph about what you learned. Use at least one print and one digital source. Include quotes and provide your sources. • Design a podcast that demonstrates one researched way to protect the Earth.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Asking Questions and Defining Problems • Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost. **Asking questions and defining problems in 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships.**	ETS1.A: Defining and Delimiting Engineering Problems • Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account.	Influence of Science, Engineering, and Technology on Society and the Natural World • People's needs and wants change over time, as do their demands for new and improved technologies.

Performance Expectation
3-5-ETS1-1 Engineering Design

Connections to other DCIs in Fifth Grade:
Fourth Grade: 4-PS3-4

Articulation of DCIs across grade-levels:
K-2.ETS1.A ; MS.ETS1.A ; MS.ETS1.B

Common Core State Standards Connections:

ELA/Literacy -

W.5.7	Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. (3-5-ETS1-1)
W.5.8	Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. *(3-5-ETS1-1)*
W.5.9	Draw evidence from literary or informational texts to support analysis, reflection, and research. *(3-5-ETS1-1)*

Mathematics –

MP.2	Reason abstractly and quantitatively. *(3-5-ETS1-1)*
MP.4	Model with mathematics. *(3-5-ETS1-1)*
MP.5	Use appropriate tools strategically. *(3-5-ETS1-1)*
3-5.OA	Operations and Algebraic Thinking *(3-ETS1-1)*

Lesson Level Vocabulary: *conservation, scrubbers, wildlife refuge*

DCI Domain Vocabulary

Domains are bold:

- **Engineering Design→Defining and Delimiting Engineering Problems (ETS1)**
  engineer, engineering, material, challenge, health, pollution, cost, situation, climate, design problem, design solution, designed world, feature, improved, operate, proposal, question formulation, resource, success, successful, global, local, natural resource, requirement, societal, supply, testable