

Grade 5 | Unit 1

The Nature of Science

RECOMMENDED TIME: SEPTEMBER – OCTOBER (8 WEEKS)

Unit Overview:

This unit provides students with an introduction to the scientific method including inquiry. The purpose of the unit is to practice the steps. Students learn best designing and conducting investigations as an ongoing process that will be practiced throughout the study of all other units.

Essential Questions:
How do scientists gather, use, and share information?
How do scientists think and work?
How do scientists investigate the natural world? Why inquire?
How can we use data to support a claim?

Key Ideas:

SI. Key Idea 1: The central purpose of scientific inquiry is to develop explanations of natural phenomena in a continuing, creative process.

SI. Key Idea 2: Beyond the use of reasoning and consensus, scientific inquiry involves the testing of proposed explanations involving the use of conventional techniques and procedures and usually requiring considerable ingenuity.

SI. Key Idea 3: The observations made while testing proposed explanations, when analyzed using conventional and invented methods, provide new insights into phenomena.

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<p>MAJOR UNDERSTANDINGS:</p> <p><i>Quoted from New York State Performance Indicators (S 1.1 a-c; 1.2a; 1.32.1b-d; 2.2b-e 2.3 b, c; 3.1a, b; 3.2a-e)</i></p> <ul style="list-style-type: none"> Formulate questions about natural phenomena. (S1.1a) Identify appropriate references to investigate a question. (S1.1b) Refine and clarify questions so that they are subject to scientific investigation. (S1.1c) Independently formulate a hypothesis. (S1.2a) Represent, present, and defend their proposed explanations of everyday observations so that they can be understood and assessed by other. (1.3) <p style="text-align: right;"><i>continued</i></p>	<p>Standard 2: Information Systems</p> <p>Key Idea 1: Information technology is used to retrieve process and communicate information as a tool to enhance learning.</p> <p>Standard 6: Interconnectedness: Common Themes</p> <p>Key Idea 1: Through systems thinking, people can recognize the commonalities that exist among all systems and how parts of a system interrelate and combine to perform specific functions.</p> <p>Key Idea 2: Models are simplified representations of objects, structures, or systems, used in analysis, explanation, interpretation, or design.</p> <p style="text-align: right;"><i>continued</i></p>	<p>Patterns:</p> <p>Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.</p> <ul style="list-style-type: none"> Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena and designed products. Patterns of change can be used to make predictions. Patterns can be used as evidence to support an explanation. <p style="text-align: right;"><i>continued</i></p>

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<ul style="list-style-type: none"> ■ Conduct an experiment designed by others. (S2.1b) ■ Design and conduct an experiment to test a hypothesis. (S2.1c) ■ Use appropriate tools and conventional techniques to solve problems about the natural world, including: measuring, observing, describing, classifying and sequencing. (S2.1d) ■ Design scientific investigations (e.g., observing, describing, and comparing; collecting samples, seeking more information, conducting a controlled experiment, discovering new objects or phenomena; making models). (S2.2b)  ■ Design a simple controlled experiment. (S2.2c) ■ Identify independent variables (manipulated), dependent variables (responding), and constant in a simple controlled experiment. (S2.2d) ■ Choose appropriate sample size and number of trials. (S2.2e) ■ Conduct a scientific investigation. (S2.3b) ■ Collect quantitative and qualitative data. (S2.3c) ■ Organize results, using appropriate graphs, diagrams, data tables, and other models to show relationships. (3.1a) 	<p>Key Idea5: Identifying patterns of change is necessary for making predictions about future behavior and conditions.</p> <p>Standard 7: Interdisciplinary Problem Solving</p> <p>Key Idea 1: The knowledge and skills of mathematics, science and technology are used together to make informed decisions and solve problems, especially those relating to issues of science/technology/society, consumer decision making, design, and inquiry into phenomena.</p>	<p>Cause and Effect: Mechanism and Prediction:</p> <p>Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering.</p> <ul style="list-style-type: none"> ■ Cause and effect relationships are routinely identified, tested, and used to explain change. ■ Events that occur together with regularity might or might not be a cause and effect relationship. <p>Systems and System Models:</p> <p>A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.</p> <ul style="list-style-type: none"> ■ Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems. ■ Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy, matter, and information flows within systems. ■ Models are limited in that they only represent certain aspects of the system under study.
<ul style="list-style-type: none"> ■ Generate and use scales, create legends, and appropriately label axes. (3.1b) ■ Accurately describe the procedures used and the data gathered. (S3.2a) ■ Identify sources of error and the limitations of data collected. (S3.2b) 	<ul style="list-style-type: none"> ■ Evaluate the original hypothesis in light of the data. (S3.2c)  ■ Formulate and defend explanations and conclusions as they relate to scientific phenomena. (S3.2d)  ■ Form and defend a logical argument about cause and effect relationships in an investigation. (S3.2e) 	

COMMON CORE STATE STANDARDS

http://www.corestandards.org/wp-content/uploads/ELA_Standards.pdf
http://www.corestandards.org/wp-content/uploads/Math_Standards.pdf

ELA/Literacy

L.5.1: Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

L.5.2: Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

L.5.4: Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on Grade 5 reading and content, choosing flexibly from a range of strategies.

L.5.6: Acquire and use accurately Grade-appropriate general academic and domain-specific words and phrases, including those that signal contrast, addition and other logical relationships (e.g., however, although, nevertheless, similarly, moreover, in addition).

Mathematics

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.

ENVIRONMENTAL GUIDELINES FOR LEARNING

<http://resources.spaces3.com/89c197bf-e630-42b0-ad9a-91f0bc55c72d.pdf>

Strand: Questioning, Analysis, and Interpretation Skills

- Guideline A—Questioning—Learners are able to develop, focus, and explain questions that help them learn about the environment and do environmental investigations.
- Guideline B—Designing investigations—Learners are able to design environmental investigations to answer particular questions—often their own questions.
- Guideline C—Collecting information—Learners are able to locate and collect reliable information about the environment or environmental topics using a variety of methods and sources.
- Guideline D—Evaluating accuracy and reliability—Learners are able to judge the weaknesses and strengths of the information they are using.
- Guideline E—Organizing information—Learners are able to classify and order data, and to organize and display information in ways that help analysis and interpretation.
- Guideline F—Working with models and simulations—Learners understand many of the uses and limitations of models.
- Guideline G—Drawing conclusions and developing explanations—Learners are able to synthesize their observations and findings into coherent explanations.

Grade 5 | Unit 2

Changes in the Surface of the Planet

RECOMMENDED TIME: NOVEMBER – JANUARY (11 WEEKS)

Unit Overview:

The purpose of this unit is to study the components of the lithosphere and the processes by which it will change over time. Through scientific inquiry, students may analyze data, explain using models and draw conclusions about events that change the surface of the Earth, and its consequences.

Essential Questions:

**What are the processes that help shape the land?
What changes affect landforms?
How can we use patterns to predict changes on the surface of the Earth?
How can we model lithospheric events?**

Key Ideas:

PS. Key Idea 2: Many of the phenomena that we observe on Earth involve interactions among components of air, water, and land.

NYS SCIENCE STANDARDS

<http://www.p12.nysed.gov/ciai/mst/pub/intersci.pdf>

MST STANDARDS

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NGSS CROSS-CUTTING CONCEPTS

<http://www.nextgenscience.org/sites/ngss/files/Appendix%20C%20-%20Crosscutting%20Concepts%20FINAL%20edited%204.10.13.pdf>

Major Understandings:

Quoted from New York State Performance Indicators (PS. 2.1e, g-i; 2.2a, c, f-h)

- Rocks are composed of minerals. Only a few rock-forming minerals make up most of the rock on Earth. Minerals are identified on the basis of physical properties such as streak, hardness, and reaction to acid. **(2.1e)**
- Rocks are classified according to their method of formation. The three classes of rocks are sedimentary, metamorphic, and igneous. Most rocks show characteristics that give clues to their formation conditions. **(2.2g)**
- The rock cycle model shows how types of rock or rock material may be transformed from one type of rock to another. **(2.2h)**

continued

Standard 2: Information Systems

Key Idea 1: Information technology is used to retrieve, process, and communicate information as a tool to enhance learning.

Key Idea 2: Knowledge of the impacts and limitations of information systems is essential to its effectiveness and ethical use.

Standard 6: Interconnectedness: Common Themes

Key Idea 1: Through systems thinking, people can recognize the commonalities that exist among all systems and how parts of a system interrelate and combine to perform specific functions.

Key Idea 2: Models are simplified representations of objects, structures, or systems used in analysis, explanation, interpretation, or design.

continued

Cause and Effect: Mechanism and Prediction:

Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering.

- Cause and effect relationships are routinely identified, tested, and used to explain change.
- Events that occur together with regularity might or might not be a cause and effect relationship.

Energy and Matter: Flows, Cycles, and Conservation:

Tracking energy and matter flows into, out of, and within systems helps one understand their system's behavior.

- Matter is made of particles.

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<ul style="list-style-type: none"> ■ The dynamic processes that wear away Earth’s surface include weathering and erosion. (2.1g) ■ The process of weathering breaks down rocks to form sediment. Soil consists of sediment, organic material, water, and air. (2.1h) ■ Erosion is the transport of sediment. Gravity is the driving force behind erosion. Gravity can act directly or through agents such as moving water, wind, and glaciers. (2.1i)  ■ The interior of Earth is hot. Heat flow and movement of material within Earth cause sections of Earth’s crust to move. This may result in earthquakes, volcanic eruption, and the creation of mountains and ocean basins. (2.2a) ■ Folded, tilted, faulted, and displaced rock layers suggest past crustal movement. (2.2c) ■ Plates may collide, move apart, or slide past one another. Most volcanic activity and mountain building occur at the boundaries of these plates, often resulting in earthquakes. (2.2f) 	<p>Key Idea 4: Equilibrium is a state of stability due either to a lack of change (static equilibrium) or a balance between opposing forces (dynamic equilibrium).</p> <p>Standard. 7 - Interdisciplinary Problem Solving - Connections</p> <p>Key Idea 2: Solving interdisciplinary problems involves a variety of skills and strategies, including effective work habits; gathering and processing information; generating and analyzing ideas; realizing ideas; making connections among the common themes of mathematics, science, and technology; and presenting results.</p>	<ul style="list-style-type: none"> ■ Matter flows and cycles can be tracked in terms of the weight of the substances before and after a process occurs. The total weight of the substances does not change. This is what is meant by conservation of matter. Matter is transported into, out of, and within systems. ■ Energy can be transferred in various ways and between objects. <p>Stability and Change:</p> <p>For both designed and natural systems, conditions that affect stability and factors that control rates of change are critical elements to consider and understand.</p> <ul style="list-style-type: none"> ■ Change is measured in terms of differences over time and may occur at different rates. ■ Some systems appear stable, but over long periods of time will eventually change. <p>Systems and System Models:</p> <p>A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.</p> <ul style="list-style-type: none"> ■ Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems. ■ Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy, matter, and information flows within systems. ■ Models are limited in that they only represent certain aspects of the system under study.

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ELA/Literacy

RI.5.3: Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text.

RI.5.4: Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a Grade 5 topic or subject area.

RI.5.6: Analyze multiple accounts of the same event or topic, noting important similarities and differences in the point of view they represent.

W.5.2: Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

W.5.4: Produce clear and coherent writing in which the development and organization are appropriate to task, purpose and audience.

W.5.7: Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic.

SL.5.1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on Grade 5 topics and texts, building on others' ideas and expressing their own clearly.

SL.5.4: Report on a topic or text or present an opinion, sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.

Mathematics

5MD.2: Represent and Interpret Data – Make a line plot to display a data set of measurements in fractions of a unit ($\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$). Use operations on fractions for this Grade to solve problems involving information presented in line plots.

ENVIRONMENTAL GUIDELINES FOR LEARNING

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Strand 2: Knowledge of Environmental Processes and Systems

Strand 2.1: The Earth as a Physical System

- Guideline A—Processes that shape the Earth—Learners have a basic understanding of most of the physical processes that shape the Earth. They are able to explore the origin of differences in physical patterns.

Grade 5 | Unit 3 Food and Nutrition

RECOMMENDED TIME: FEBRUARY – MARCH (7 WEEKS)

Unit Overview:

The purpose of this unit is for students to learn how food, which is the main source of nutrients and energy, affects their growth and development. This unit follows up in the study of healthy foods and nutrition as per the expectations in the *Elementary Level Core Curriculum for Science*.

Essential Questions:
How does nutrition and exercise affect our health?
What is a healthy food choice?

Key Ideas:

LE. Key Idea 4: The continuity of life is sustained through reproduction and development.

LE. Key Idea 5: Organisms maintain a dynamic equilibrium that sustains life.

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<p>Major Understandings:</p> <p><i>Quoted from New York State Elementary Core Curriculum Performance Indicators (LE. 4.2a, b) (Elementary LE. 5.2e, g; 5.3a, b)</i></p> <ul style="list-style-type: none"> Human need a variety of healthy foods, exercise, and rest in order to grow and maintain good health. (5.3a) Good health habits include hand washing and personal cleanliness; avoiding harmful substances (including alcohol, tobacco, illicit drugs); eating a balanced diet; engaging in regular exercise. (5.3b) The health, growth, and development of organisms are affected by environmental conditions such as the availability of food, air, water, space, shelter, heat, and sunlight. (5.2g) Particular animal characteristics are influenced by changing environmental conditions including: fat storage in winter, coat thickness in winter, camouflage, shedding of fur. (5.2e) <p style="text-align: right;"><i>continued</i></p>	<p>Standard 2: Information Systems</p> <p>Key Idea 1: Information technology is used to retrieve, process, and communicate information as a tool to enhance learning.</p> <p>Standard 6: Systems Thinking:</p> <p>Key Idea 1: Through systems thinking, people can recognize the commonalities that exist among all systems and how parts of a system interrelate and combine to perform specific functions.</p> <p>Standard 7: Interdisciplinary Problem Solving</p> <p>Key Idea 2: Solving interdisciplinary problems involves a variety of skills and strategies, including effective work habits; gathering and analyzing ideas; realizing ideas; making connections among the common themes of mathematics, science, and technology; and presenting results.</p>	<p>Cause and Effect: Mechanism and Prediction:</p> <p>Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering.</p> <ul style="list-style-type: none"> Cause and effect relationships are routinely identified, tested, and used to explain change. Events that occur together with regularity might or might not be a cause and effect relationship. <p>Systems and System Models:</p> <p>A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.</p> <ul style="list-style-type: none"> Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems. <p style="text-align: right;"><i>continued</i></p>

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<ul style="list-style-type: none"> ■ Growth is the process by which plants and animals increase in size. (4.2a) ■ Food supplies the energy and materials necessary for growth and repair. (4.2b) 		<ul style="list-style-type: none"> ■ Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy, matter, and information flows within systems. ■ Models are limited in that they only represent certain aspects of the system under study.

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ELA/Literacy

RI.5.4: Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a Grade 5 topic or subject area.

RI.5.5: Compare and contrast the overall structure (e.g., chronology, comparison, cause-effect, problem-solution).

RI.5.7: Draw information from multiple digital or print sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.

W.5.3: Write narratives to develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences.

W.5.5: With guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting or trying a new approach.

SL.5.2: Summarize a written text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally.

Mathematics

5.NBT: Perform operations with multi-digit whole numbers and with decimals to hundredths.

ENVIRONMENTAL GUIDELINES FOR LEARNING

<http://resources.spaces3.com/89c197bf-e630-42b0-ad9a-91f0bc55c72d.pdf>

Strand 2: Knowledge of Environmental Processes and Systems

Strand 2.2: The Living Environment

- Guideline A—Organisms, populations, and communities—Learners understand basic similarities and differences among a wide variety of living organisms. They understand the concept of habitat.

Grade 5 | Unit 4 Exploring Ecosystems

RECOMMENDED TIME: APRIL – JUNE (11 WEEKS)

Unit Overview:

The purpose of this unit is for students to identify components of ecosystems, classify organisms by how they obtain energy, and how living and nonliving things depend upon each other for survival and life processes. Through explorations, students will analyze data, explain using models, and draw conclusions about ecosystems and how human decisions impact life within the ecosystems. [Refer to Appendix A for the Humane Treatment of Animals and Conservation Day]

Essential Question:
How are plants and animals in an ecosystem connected?

Key Ideas:

- LE. Key Idea 5:** Organisms maintain a dynamic equilibrium that sustains life.
- LE. Key Idea 6:** Plants and animals depend on each other and their physical environment.
- LE. Key Idea 7:** Human decisions and activities have had a profound impact on the physical and living environment.

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<p>Major Understandings:</p> <p><i>Quoted from New York State Performance Indicators (3.2a, 5.1c-e; 5.2a, 6.1a,b, 6.2a, 7.1a 7.2b-d)</i></p> <ul style="list-style-type: none"> ■ A population consists of all individuals of a species that are found together at a given place and time. Populations in one place form a community. The community and the physical factors with which it interacts compose an ecosystem. (7.1a) ■ All organisms require energy to survive. The amount of energy needed and the method for obtaining this energy vary among cells. Some cells use oxygen to release the energy stored in food. (5.1c) <p style="text-align: right;"><i>continued</i></p>	<p>Standard 6: Interconnectedness</p> <p>Key Idea 1: Through systems thinking, people can recognize the commonalities that exist among all systems and how parts of a system interrelate and combine to perform specific functions.</p> <p>Key Idea 2: Models are simplified representations of objects, structures, or systems used in analysis, explanation, interpretation, or design.</p> <p>Key Idea 3: The grouping of magnitudes of size, time, frequency, and pressures or other units of measurement into a series of relative order provides a useful way to deal with the immense range and the changes in scale that affect the behavior and design of systems.</p> <p style="text-align: right;"><i>continued</i></p>	<p>Systems and System Models:</p> <p>A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.</p> <ul style="list-style-type: none"> ■ A system is a group of related parts that make up a whole and can carry out functions its individual parts cannot. ■ A system can be described in terms of its components and their interactions. <p style="text-align: right;"><i>continued</i></p>

COMMON CORE STATE STANDARDS

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ELA/Literacy

RI.5.1: Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.

RI.5.4: Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a Grade 5 topic or subject area.

RI.5.9: Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably.

W.5.2: Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

SL.5.1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on Grade 5 topics and texts, building on others' ideas and expressing their own clearly.

Mathematics

5NBT.B.7: Number and Operations in Base Ten. Understand the place value system. Perform operations with multi-digit whole numbers and with decimals to hundredths.

Strand 2: Knowledge of Environmental Processes and Systems

Strand 2.2: The Living Environment

- Guideline A—Organisms, populations, and communities—Learners understand basic similarities and differences among a wide variety of living organisms. They understand the concept of habitat.
- Guideline C—Systems and connections—Learners understand basic ways in which organisms are related to their environments and to other organisms.
- Guideline D—Flow of matter and energy—Learners know that living things need some source of energy to live and grow.