



Department of
Education

Carmen Fariña, Chancellor



New York City

K-5

2015–2016

Science Scope & Sequence



NYC Department of Education

K–5 Science Scope & Sequence

Carmen Fariña

Chancellor

Phil Weinberg

Deputy Chancellor

Division of Teaching & Learning

Anna Commitante

Senior Executive Director

Curriculum, Instruction & Professional Learning

Linda Curtis-Bey, Ed.D.

Executive Director

STEM

52 Chambers Street

New York, NY 10007

Acknowledgments

Denise McNamara, Ph.D.

Director of Science

Ingrid Buntschuh

Citywide Instructional Lead, High School Science

Adaliz Gonzalez

Citywide Instructional Lead, Middle School Science

Nadya Awadallah

Citywide Instructional Lead, Elementary School Science

Teneika Benn, Ed.D.

Citywide Instructional Lead, MSP Science

Special thanks to George Georgilakis, Tracy Fray-Oliver, and Rosanna Castro.

Supportive services and technical help were given by the Science Common Core Fellows:

Daniel Babauta, Benjy Blatman, Aja Brown, Claudine Conover, Daphne Fequiere, Theresa Gilkes, Rubilyn Gitgano, Diane Kelly, Christie Minjeong Kim, Ingrid Lafalaise, Jite Lark, Mariuxi Luna-Bautista, Christina Luzzi, Amanda McFee, Pamela Mudzingwa-Makina, Nicholas Mullally, Marilyn Orque Claro, Jessica Patron, Kathy Pham, Jeanne Salchli, Miriam Stanford-Cusack, Esther Stark, Jeffrey Utz, Catrina Williams, Michelle Williams

Table of Contents

Introduction Letter – Anna Commitante	2
The Enhanced Science Scope & Sequence	3
Background	3
Next Generation Science Standards	3
Common Core Learning Standards	4
Excellence in Environmental Education: Guidelines for Learning (K–12)	5
NYSED State-Instruction in Science New York State Education Law: Article 17, Sections 809–810	6
Limitations and Expectations – Linda Curtis-Bey	6
Annotated Unit Template/Overview of Document Structure	7
Grade K–2	9
Grades K–2 Units	10
Grades K–2 Cross-Cutting Concepts	39
Grades K–2 Engineering Design	40
Grade 3–5	41
Grades 3–5 Units	42
Grades 3–5 Cross-Cutting Concepts	83
Grades 3–5 Engineering Design	85
Appendix A – NYSED Mandated Instruction in Science – New York State Education Law: Article 17, Sections 809–810	86

The New York City Department of Education

K–5 Science Scope & Sequence 2015–2016

Science is everywhere and our students are naturally curious, which makes them natural scientists. A strong science program helps them make sense of the physical world around them, it can explain the how and why things work, like complex systems, from the human body to our planet Earth. In our science classrooms, students can develop an understanding of the inter-dependency of living things as well as a respect for nature.

We live in a natural learning laboratory made up of a combination of unique ecosystems in which our students can connect to the nature that is all around them in city parks, gardens, green spaces, beaches, and waterways, and the amazing environment of New York City. Through inquiry approaches and project-based learning students can potentially address real-world problems in their communities and take action. Students engaged in scientific inquiry are keen observers and active explorers who pose questions, theorize, hypothesize, predict, conduct experiments, reach conclusions, and communicate their discoveries. These skills will help them develop into scientifically literate and responsible adults.

The **Enhanced NYC Science Scope & Sequence** is a revision of an earlier Scope & Sequence published in 2008. The Enhanced NYC Science Scope & Sequence includes the current NYS MST standards that all schools should continue to follow as well as new resources. The new resources include:

- An alignment to the NGSS Science and Engineering Practices and the Cross-Cutting Concepts.
- An alignment to the Common Core Learning Standards in English Language Arts and the Common Core Learning Standards in Mathematics given the relevance between the skills needed in all three disciplines (ELA, Math, and Science).
- An alignment to the Excellence in Environmental Education: Guidelines for Learning (K–12) published by the North American Association of Environmental Education to support the environmental education of NYC students and to encourage them to find innovative solutions to environmental problems and issues in their communities.
- The New York State Education Law, Article 17, Section 809 (Instructions for the Humane Treatment of Animals) and Section 810 (Conservation Day)
- The Reference Tables that are used most often in Regents science courses are included (in the Grades 6–12 Scope & Sequence only).

Note to Teachers:

The volume of science content in each Grade can present some challenges. Teachers are faced with large amounts of content to be “covered” yet want to provide their students with opportunities for in-depth scientific exploration and inquiry. This issue of “depth versus breadth” will require teachers to accept that not all content is created equal. Teachers will also need to accept that it is often not possible to cover everything. The amount of content covered rarely correlates to the amount of content that students learn because students rarely retain all of the content that is taught. The challenge teachers face is how to teach enough content yet still make time for hands-on, inquiry-driven, extended learning. Teachers will need to decide which content merits deep exploration and which content merits familiarity or exposure. Teachers will need to make these decisions based on their knowledge of the content, assessments, instructional goals and, most importantly, an understanding of students’ learning needs, readiness, and interests. Teachers may need to differentiate and provide additional scaffolding and support based on individual student needs, not limited to but especially for our English language learners, students with special needs, and students who are significantly below or above Grade level. The Scope & Sequence can serve as a valuable resource for teachers in planning appropriate individual, group and whole class instruction. We trust that this resource will provide teachers with useful guidance, help them make important instructional decisions, and help them develop engaging science experiences for their students.

Anna Commitante
Senior Executive Director
Curriculum, Instruction & Professional Learning

The Enhanced Science Scope & Sequence

Background

New York State Learning Standards for Mathematics, Science, and Technology (MST)

In March of 1996 the New York State Board of Regents adopted the New York State Learning Standards for Mathematics, Science, and Technology (MST). This adoption included seven standards with four of the standards comprising the process skills and three of the standards covering specific content. *Currently, all NYC schools follow the New York State Learning Standards for Mathematics, Science, and Technology (MST) and the NYS assessments in science are developed based on these standards.* The standards are as follows:

Standard 1 – Analysis, Inquiry, and Design

Standard 2 – Information Systems

Standard 3 – Mathematics

Standard 4 – Science

Standard 5 – Technology Education

Standard 6 – Interconnectedness: Common Themes

Standard 7 – Interdisciplinary Problem Solving

The New York State Education Department followed with the development of Core Curriculum resource guides in Elementary-level Science (Grades K-4), Intermediate-level Science (Grades 5-8) and Commencement-level Science (Grades 9-12) in Chemistry, Earth Science, Living Environment, and Physics. The core curriculum resource guides consist of the content standards, the key ideas, and the performance indicators with major understandings.

MST Process Skills Standards

The MST Standards 1, 2 and 6, 7 are considered the process standards and are shared across the three content areas of mathematics, science, and technology.

Process skills are vital in understanding the natural phenomena that are science. Scientific discovery is built on such process skills as comparing and contrasting, creating models, using measurement and interpreting data, and making predictions and informed decisions.

NOTE: MST Standard 1 - Analysis, Inquiry and Design, is not listed in any of the units in this Science Scope & Sequence. This standard should be included in all of the units and therefore listing this in each of the individual units would be redundant.

Next Generation Science Standards

In 2012, the National Research Council published Frameworks for K–12 Science Education. This research-based document outlined a plan of action for science education that included the 21st Century skills needed by students. The Next Generation Science Standards were developed from the Frameworks document through the collaboration of Achieve, the National Research Council the National Science Teachers Association and the American Association for the Advancement of Science. After the release of drafts and two public feedbacks, the Next Generation Science Standards were released in April, 2013.

New York State was one of the 26 states that supported the writing of the NGSS. For the adoption of the NGSS, each state must create legislation to adopt and implement the Next Generation Science Standards with state funding. To date, 13 states have adopted the Next Generation Science Standards but New York State has not done so.

In March 2014, the Board of Regents discussed the quantitative feedback that was collected from a statewide survey. Respondents rated the NGSS statistically higher in 11 out of 21 criteria and rated the current New York State Science Learning Standards (NYSSLS) statistically higher in 6 out of 21 criteria. There are four criteria where the differences between the NGSS rating and the NYSSLS rating were not statistically significant. Further analysis of the quantitative data shows that both sets of standards have strengths and weaknesses when compared to the set of criteria used in the survey. *At this time, the NYS Board of Regents has not decided to adopt the NGSS. In anticipation of a NYS adoption of the NGSS or a state version of the NGSS and to help NYC educators develop an awareness of the NGSS, this enhanced version of the Science Scope & Sequence includes an alignment to the NGSS Science and Engineering Practices and the Cross-Cutting Concepts.*

These standards, and several supporting documents explaining the structure of the NGSS and a number of appendices, are accessible online at <http://www.nextgenscience.org/sites/ngss/files/Appendix%20G%20-%20Crosscutting%20Concepts%20FINAL%20edited%204.10.13.pdf>.

Practices in Science and Engineering

Due to the nature of science and its direct real-world applications, it is not possible to assess students' understanding of core ideas separately from their abilities to use the practices of science and engineering. Students must show that they know science concepts through their investigations of the natural world, the practices of science inquiry, and by solving meaningful problems through the practices of engineering design.

The eight practices of science and engineering that the Framework identifies as essential for all students to learn and describes in detail are listed below:

1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

Cross-Cutting Concepts

There are three major components with which science education should be constructed:

- a. scientific and engineering practices
- b. cross-cutting concepts that unify their common application across fields
- c. core ideas in the major disciplines of natural science

Within these dimensions are the cross-cutting practices that connect and unite the core ideas:

1. **Patterns.** Observed patterns of forms and events guide organization and classification, and they prompt questions about relationships and the factors that influence them.
2. **Cause and effect.** 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.
3. **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.
4. **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.

5. 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.

6. Structure and function. The way in which an object or living thing is shaped and its Sub-structure determine many of its properties and functions.

7. 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.

Common Core Learning Standards

National Standards in the areas of Mathematics and English Language Arts did not exist in the United States. In a joint effort, the National Governors Association and the Chief State School Officers partnered with Achieve, ACT, and the College Board to begin work on the Common Core State Initiative. This state-led process involved working with national experts to develop a common core of state standards in English Language Arts and Mathematics for Grades K–12.

In April 2009, New York State Governor David Paterson and former Education Commissioner Richard P. Mills, along with fifty other states and territories, agreed to participate in discussions concerning the development of these voluntary standards. The first draft of the standards was released for public feedback in 2009 and a second round of public feedback was taken in March of 2010. In June 2010, the final version of the Common Core State Standards (CCSS) for Mathematics and English Language Arts & Literacy in History/Social Studies, Science and Technical Subjects were made accessible to the public. The Common Core State Standards were tied to *Race to the Top* funding and many states adopted them immediately. The New York State Board of Regents adopted the CCSS for Mathematics and CCSS for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects in July 2010.

The goal of the English Language Arts & Literacy Common Core Standards is to make certain that students are college- and career-ready in the areas of reading, writing, speaking and listening. In science, students are expected to read the science texts at the Grade-appropriate level. They are also required to create logical argumentative writing based on claims, scientific reasoning, and relevant evidence. Writing can also take the form of long-term, in-depth scientific research. In addition, academic discourse of formal and informal scientific presentations is envisaged at the Grade- appropriate level.

The goal of the Common Core Mathematics Standards is to make certain that students are college-and career-ready in the area of mathematics. Students are expected to solve problems and explain their thinking. Science is the application of the mathematical concepts and skills necessary for the real-world applications as presented in the science content.

This enhanced version of the Science Scope & Sequence includes an alignment to the common core learning standards in English Language Arts and Mathematics that are relevant in science.

Excellence in Environmental Education: Guidelines for Learning (K–12)

There is no exact date to point to when thinking about the history of environmental education. Some may argue that naturalists such as Thoreau and Emerson were the forefathers of the movement. However, a concerted effort to reach international agreement about the protection of the environment began in the years immediately after World War II. The *Conference for the Establishment of the International Union for the Protection of Nature* (IUCN) convened in France in October of 1948. The primary focus of this conference was to ensure the protection of nature and its habitats. The movement was slow to start until the publication of two books in the 1960s which rekindled international attention: Rachel Carson's *Silent Spring* and Steward Udall's *The Quiet Crisis*. These, along with the political climate of the 1960s, sparked United States legislation such as the Wilderness Act (1964), the Clean Air Act (1965), the Solid Waste Disposal Act (1965), and the Species Conservation Act (1966).

In 1970, the Environmental Education Act was passed as a direct result of the highly successful first Earth Day (April 22, 1970), and the office of Environmental Education was established within the U.S. Department of Education.

Excellence in Environmental Education

Environmental education builds from a core of key principles that inform its approach to education. Some of these important foundations are:

Systems: Systems help make sense of a large and complex world. A system is made up of parts. Each part can be understood separately. The whole, however, is understood only by understanding the relationships and interactions among the parts. The human body can be understood as a system; so can galaxies. Organizations, individual cells, communities of animals and plants, and families can all be understood as systems. And systems can be nested within other systems.

Interdependence: Human well-being is inextricably bound with environmental quality. Humans are a part of the natural order. We and the systems we create—our societies, political systems, economies, religions, cultures, technologies—impact the total environment. Since we are a part of nature rather than outside it, we are challenged to recognize the ramifications of our interdependence.

The importance of where one lives: Beginning close to home, learners forge connections with, explore, and understand their immediate surroundings. The sensitivity, knowledge, and skills needed for this local connection provides a base for moving out into larger systems, broader issues, and an expanding understanding of causes, connections, and consequences.

Integration and infusion: Disciplines from the natural sciences to the social sciences to the humanities are connected through the medium of the environment and environmental issues. Environmental education offers opportunities for integration and works best when infused across the curriculum, rather than being treated as a separate discipline or subject area.

Roots in the real world: Learners develop knowledge and skills through direct experience with the environment, environmental issues, and society. Investigation, analysis, and problem solving are essential activities and are most effective when relevant to the real world.

Lifelong learning: Critical and creative thinking, decision making, and communication, as well as collaborative learning, are emphasized. These skills are essential for active and meaningful learning, both in school and over a lifetime.

Environmentally literate students possess the knowledge, intellectual skills, attitudes, experiences, and motivation to make and act upon responsible environmental decisions. Environmentally literate students understand environmental processes and systems, including human systems. They are able to analyze global, social, cultural, political, economic, and environmental relationships, and weigh various sides of environmental issues to make responsible decisions as individuals, as members of their communities, and as citizens of the world. (Adapted from *Maryland Partnership for Children in Nature*, April 2009)

In order to support the environmental education of NYC students and to encourage them to find innovative solutions to environmental problems and issues in their communities this enhanced version of the Science Scope & Sequence includes an alignment to the *Guidelines for Learning (K–12)* published by the North American Association of Environmental Education.

NYSED Instruction in Science

New York State Education Law: Article 17, Sections 809–810

The New York State Legislature passes laws that are directly related to curriculum and instruction in the area of science. Article 17 of the New York State Education Law outlines instruction in certain subject areas. Two of the sections are directly related to science instruction. They are:

Article 17–Section 809 pertains to the humane treatment of live vertebrate animals. Having live animals in the science classroom is encouraged because it sparks students’ interest in the living world around them. The care and respect for animals and all living things must be promoted in the school setting. Section 809 of the New York State Education Law ensures that animals are treated ethically and humanely.

Article 17–Section 810 pertains to Conservation Day, which is celebrated on the last Friday in April. Conservation of the Earth’s natural resources is the focus of this designated day. School communities are encouraged to heighten awareness of the natural world through lectures, tours, and plantings.

NOTE: Conservation Day should not be confused with Earth Day which falls on April 22nd each year.

Limitations and Expectations

In an effort to be concise and acknowledging that there are several options for the inclusion or absence of some of the supporting standards and guidelines, the most appropriate Mathematics Science and Technology (MST) Process Standards, Next Generation Science Standards (NGSS) Cross-Cutting Concept, Common Core Learning Standards (CCLS) in Mathematics and English Language Arts and Environmental Guidelines have been selected. Based on the discretion of the classroom teacher, other standards and tables may be seen as being appropriate for inclusion.

Linda Curtis-Bey, Ed.D.
Executive Director STEM
Curriculum, Instruction & Professional Learning

Bibliography

- Carson, Rachel. *Silent Spring*. New York: Houghton Mifflin, 1962.
- NGSS Lead States. *Next Generation Science Standards: For States, By States*. Washington, DC: National Academies Press, 2013.
- National Governors Association Center for Best Practices, Council of Chief State School Officers. *Common Core State Standards*. Washington, D.C., 2010.
- New York State Education Department. *Learning Standards for Science*. Albany, NY: New York State Education Department, 1996.
- North American Association of Environmental Education. *Excellence in Environmental Education: Guidelines for Learning (K–12)*. Washington, DC: NAAEE Publications, 2010.
- Udall, Stewart L. *The Quiet Crisis*. New York: Avon Books, 1963.

Science Scope & Sequence Template

Grade | **Unit**

#

#

Unit Title

PACING RECOMMENDATION (TIMEFRAME)

Unit Overview:

A brief teacher-friendly blurb that describes the learning in the unit at a high level. (NEW)

Essential Question:
Revised essential question for the unit.
(REVISED)

Key Ideas: The key ideas addressed throughout the unit pulled from the NYSED standards. (REVISED)

NYS SCIENCE STANDARDS

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

State standards to be covered in the unit. Re-written to include more language directly from the standards rather than abbreviated topics in order to support teachers with being able to clearly identify what student should be able to know and do when referring to the Scope & Sequence. Feedback from the field suggests that teachers use the Scope & Sequence as their primary/sole resource when planning and often do not refer to the actual standards. (REVISED)

MST STANDARDS

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

Identifies alignment to Standards 1, 2, 6, and 7 in order to promote consideration of the behaviors and processes students should demonstrate when engaging in scientific inquiry. (NEW)

NGSS CROSS-CUTTING CONCEPTS

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

Identified relevant cross-cutting concepts. Pulled directly from NGSS, the cross-cutting concepts help students deepen their understanding of the content and develop a coherent scientifically based view of the world. (NEW)

COMMON CORE STATE STANDARDS

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

Identifies pre-requisite or connected ELA & Math standards that align to content addressed in the unit. (NEW)

ENVIRONMENTAL GUIDELINES FOR LEARNING

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

Makes clear connections between the content addressed in the unit and the environment. (NEW)

 Leaf indicates a connection to Environmental Science



Grades
K-2

Science Scope & Sequence



Grade **K** | Unit **1** Trees Through the Seasons

RECOMMENDED TIME: SEPTEMBER – NOVEMBER (12 WEEKS)

Unit Overview:

Students observe, compare, and describe the physical properties of trees and their structures throughout the seasons. Students develop a beginning awareness of the characteristics and life cycle of trees and an awareness of trees in their environment. *[Refer to Appendix A for Conservation Day]*

Essential Question:
How do plants respond to environmental changes?

Key Ideas:

- LE. Key Idea 1:** Living things are both similar to and different from each other and from nonliving things.
- LE. Key Idea 3:** Individual organisms and species change over time.
- 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.

NYS SCIENCE STANDARDS

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

Major Understandings:

Quoted from New York State Performance Indicators (LE: 1.1b, 1.2a, 3.1b-c, 4.2a, 5.1a, 5.2a)

- Plants require air, water, nutrients, and light in order to live and thrive **(1.1b)**. 🌱
- Living things grow, take in nutrients, breathe, reproduce, eliminate waste, and die **(1.2a)**. 🌱
- Growth is the process by which plants and animals increase in size **(4.2a)**. 🌱
- All living things grow, take in nutrients, breathe, reproduce, and eliminate waste **(5.1a)**. 🌱
- Each plant has different structures that serve different functions in growth, survival, and reproduction **(3.1b)**. 🌱

continued

MST STANDARDS

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

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 effective 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

NGSS CROSS-CUTTING CONCEPTS

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

Patterns:

Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.

- Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.

Scale, Proportion, and Quantity:

In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change.

- Relative scales allow objects and events to be compared and described (e.g., bigger and smaller; hotter and colder; faster and slower).

continued

NYS SCIENCE STANDARDS

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

- In order to survive in their environment, plants and animals must be adapted to that environment **(3.1c)**. 
 - Seeds disperse by a plant's own mechanism and/or in a variety of ways that can include wind, water, and animals.
 - Leaf, flower, stem, and root adaptations may include variations in size, shape, thickness, color, smell, and texture.
- Plants respond to changes in their environment. For example, the leaves of some green plants change position as the direction of light changes; the parts of some plants undergo seasonal changes that enable the plant to grow; seeds germinate, and leaves form and grow **(5.2a)**. 

MST STANDARDS

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

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.

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).

Key Idea 5: Identifying patterns of change is necessary for making predictions about future behavior and conditions.

Key Idea 6: In order to arrive at the best solution that meets criteria within constraints, it is often necessary to make trade-offs.

Standard 7: Interdisciplinary Problem Solving

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.

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.

NGSS CROSS-CUTTING CONCEPTS

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

- Standard units are used to measure length.

Systems and System Models:

A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.

- Objects and organisms can be described in terms of their parts.
- Systems in the natural and designed world have parts that work together.

Structure and Function:

The way an object is shaped or structured determines many of its properties and functions.

- The shape and stability of structures of natural and designed objects are related to their function(s).

Stability and Change:

For both designed and natural systems, conditions that affect stability and factors that control rates of change are critical elements to consider and understand.

- Some things stay the same while other things change.
- Things may change slowly or rapidly.

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

RI.K.1: With prompting and support, ask and answer questions about key details in a text.

RI.K.2: With prompting and support, identify the main topic and retell key details of a text.

RI.K.4: With prompting and support, ask and answer questions about unknown words in a text.

RI.K.7: With prompting and support, describe the relationship between illustrations & the text in which they appear.

RI.K.10: Actively engage in group reading activities with purpose and understanding.

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

SL.K.3: Ask and answer questions in order to seek help, get information, or clarify something that is not understood.

SL.K.5: Add drawings or other visual displays to descriptions as desired to provide additional detail.

SL.K.6: Speak audibly and express thoughts, feelings, and ideas clearly.

Mathematics

MP.2: Reason abstractly and quantitatively.

MP.4: Model with mathematics.

K.CC.A: Know number names and the count sequence.

K.MD.A.1: Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object.

K.MD.B.3: Classify objects into given categories; count the number of objects in each category and sort the categories by count.

ENVIRONMENTAL GUIDELINES FOR LEARNING

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

Strand 1: Questioning, Analysis, and Interpretation Skills

- Guideline E—Organizing information—Learners are able to describe data and organize information to search for relationships and patterns concerning the environment and environmental topics.

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 B—Heredity and evolution—Learners understand that plants and animals have different characteristics and that many of the characteristics are inherited.
- 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.

Grade **K** | Unit **2** Exploring Properties

RECOMMENDED TIME: DECEMBER – FEBRUARY (10 WEEKS)

Unit Overview:

Students describe, categorize, compare, and measure observable physical properties of matter and objects. Appropriate tools are a necessary component to describe some physical properties of objects.

Essential Question:
How do we observe and describe objects and the physical properties of objects?

Key Ideas:

PS. Key Idea 3: Matter is made up of particles whose properties determine the observable characteristics of matter and its reactivity.

NYS SCIENCE STANDARDS

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

Major Understandings:

Quoted from New York State Performance Indicators: (PS 3.1b-g)

- Matter has properties that can be observed through the senses. **(3.1b)**
- Objects have properties that can be observed, described, and/or measured: length, width, volume, size, shape, mass or weight, temperature, texture, flexibility, reflectiveness of light. **(3.1c)**
- Measurements can be made with standard metric units and nonstandard units. **(3.1d)**
- The material(s) an object is made up of determine some specific properties of the object. Properties can be observed or measured with tools such as hand lenses, metric rulers, thermometers, balances, magnets, circuit testers, and graduated cylinders. **(3.1e)**

continued

MST STANDARDS

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

Standard 2: Information Systems

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

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.

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.

Key Idea 5: Identifying patterns of change is necessary for making predictions about future behavior and conditions.

continued

NGSS CROSS-CUTTING CONCEPTS

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

Patterns:

Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.

- Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.

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.

- Events have causes that generate observable patterns.
- Simple tests can be designed to gather evidence to support or refute student ideas about causes.

continued

<p style="text-align: center;">NYS SCIENCE STANDARDS http://www.p12.nysed.gov/ciai/mst/pub/elecoresci.pdf</p>	<p style="text-align: center;">MST STANDARDS http://www.p12.nysed.gov/ciai/mst/pub/elecoresci.pdf</p>	<p style="text-align: center;">NGSS CROSS-CUTTING CONCEPTS http://www.nextgenscience.org/sites/ngss/files/Appendix%20G%20-%20Crosscutting%20Concepts%20FINAL%20edited%204.10.13.pdf</p>
<ul style="list-style-type: none"> ■ Some properties of an object are dependent on the conditions of the present surroundings in which the object exists (3.1g). <ul style="list-style-type: none"> — temperature: hot or cold — lighting: shadows, color — moisture: wet or dry ■ Objects and/or materials can be sorted or classified according to their properties (3.1f). 	<p>Standard 7: Interdisciplinary Problem Solving</p> <p>Key Idea 2: Solving interdisciplinary problems involves a variety of skill and strategies including effective work habits; gathering and processing of information; generating and analyzing ideas; realizing ideas; making connections among the common themes of mathematics, science, and technology; and presenting results.</p>	<p>Scale, Proportion, and Quantity:</p> <p>In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change.</p> <ul style="list-style-type: none"> ■ Relative scales allow objects and events to be compared and described (e.g., bigger and smaller; hotter and colder; faster and slower). ■ Standard units are used to measure length.
	<p>Structure and Function:</p> <p>The way an object is shaped or structured determines many of its properties and functions.</p> <ul style="list-style-type: none"> ■ The shape and stability of structures of natural and designed objects are related to their function(s). <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"> ■ Some things stay the same while other things change. ■ Things may change slowly or rapidly. 	<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"> ■ Objects and organisms can be described in terms of their parts. ■ Systems in the natural and designed world have parts that work together. <p>Energy and Matter: Flows, Cycles, and Conservation:</p> <p>Tracking energy and matter flows into, out of, and within systems helps one understand their system’s behavior.</p> <ul style="list-style-type: none"> ■ Objects may break into smaller pieces, be put together into larger pieces, or change shapes.

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

RI.K.1: With prompting and support, ask and answer questions about key details in a text.

RI.K.2: With prompting and support, identify the main topic and retell key details of a text.

RI.K.4: With prompting and support, ask and answer questions about unknown words in a text.

RI.K.7: With prompting and support, describe the relationship between illustrations and the text in which they appear.

RI.K.10: Actively engage in group reading activities with purpose and understanding.

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

SL.K.3: Ask and answer questions in order to seek help, get information, or clarify something that is not understood.

SL.K.5: Add drawings or other visual displays to descriptions as desired to provide additional detail.

SL.K.6: Speak audibly and express thoughts, feelings, and ideas clearly.

Mathematics

MP.2: Reason abstractly and quantitatively.

K.MD.A.1: Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object.

K.MD.A.2: Directly compare two objects with a measurable attribute in common, to see which object has “more of”/“less of” the attribute, and describe the difference.

ENVIRONMENTAL GUIDELINES FOR LEARNING

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

Strand 1: Questioning, Analysis, and Interpretation Skills

- Guideline B—Designing investigations—Learners are able to design simple investigations.
- Guideline E—Organizing information—Learners are able to describe data and organize information to search for relationships and patterns concerning the environment and environmental topics.

Strand 2: Knowledge of Environmental Processes Systems

Strand 2.1: The Earth as a Physical System

- Guideline B—Changes in matter—Learners are able to identify basic characteristics of and changes in matter.

Grade **K** | Unit **3** Animals

RECOMMENDED TIME: MARCH – JUNE (14 WEEKS)

Unit Overview:

As students investigate the continuity of life, emphasis should be placed on how animals reproduce their own kind. They should begin to recognize how differences among individuals within a species can help an organism or population to survive. Students at this level will identify the behaviors and physical adaptations that allow organisms to survive in their environment. The characteristics of the cycle of life vary from organism to organism.

Students need many opportunities to observe a variety of organisms for the patterns of similarities and differences of the life functions used to sustain life. All organisms carry out basic life functions in order to sustain life.

[Refer to Appendix A for the Humane Treatment of Animals]

Essential Question:
How can we compare and contrast animals and nonliving things?

Key Ideas:

LE. Key Idea 1: Living things are both similar to and different from each other and from nonliving things.

LE. Key Idea 2: Organisms inherit genetic information in a variety of ways that result in continuity of structure and function between parents and offspring.

LE. Key Idea 3: Individual organisms and species change over time.

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.

NYS SCIENCE STANDARDS

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

Major Understandings:

Quoted from New York State Performance Indicators

(LE: 1.1a, 1.1c, 1.1d, 1.2a, 2.2a, 3.1a, 4.1g, 4.2a, 5.1a, 5.2e, 5.2f)

- Animals need air, water, and food in order to live and thrive. **(1.1a)** 
- Nonliving things do not live and thrive. **(1.1c)** 
- Nonliving things can be human-created or naturally occurring. **(1.1d)** 

continued

MST STANDARDS

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

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 effective and ethical use.

continued

NGSS CROSS-CUTTING CONCEPTS

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

Patterns:

Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.

- Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.

continued

NYS SCIENCE STANDARDS

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

- Living things grow, take in nutrients, breathe, reproduce, eliminate waste, and die. **(1.2a)** 
- Plants and animals closely resemble their parents and other individuals in their species. **(2.2a)**
- Each animal has different structures that serve different functions in growth, survival, and reproduction. **(3.1a)** 
 - wings, legs, or fins enable some animals to seek shelter and escape predators
 - the mouth, including teeth, jaws, and tongue, enables some animals to eat and drink
 - eyes, nose, ears, tongue, and skin of some animals enable the animals to sense their surroundings
 - claws, shells, spines, feathers, fur, scales, and color of body covering enable some animals to protect themselves from predators and other environmental conditions, or enable them to obtain food
 - some animals have parts that are used to produce sounds and smells to help the animal meet its needs
 - the characteristics of some animals change as seasonal conditions change (e.g., fur grows and is shed to help regulate body heat; body fat is a form of stored energy and it changes as the seasons change)
- The length of time from an animal's birth to its death is called its life span. Life spans of different animals vary. **(4.1g)** 
- Growth is the process by which plants and animals increase in size. **(4.2a)** 
- All living things grow, take in nutrients, breathe, reproduce, and eliminate waste. **(5.1a)** 

MST STANDARDS

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

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.

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.

- Particular animal characteristics are influenced by changing environmental conditions including: fat storage in winter, coat thickness in winter, camouflage, shedding of fur. **(5.2e)** 
- Some animal behaviors are influenced by environmental conditions. These behaviors may include: nest building, hibernating, hunting, migrating, and communicating. **(5.2f)** 

NGSS CROSS-CUTTING CONCEPTS

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

Scale, Proportion, and Quantity:

In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change.

- Relative scales allow objects and events to be compared and described (e.g., bigger and smaller; hotter and colder; faster and slower).
- Standard units are used to measure length.

Structure and Function:

The way an object is shaped or structured determines many of its properties and functions.

- The shape and stability of structures of natural and designed objects are related to their function(s).

Stability and Change:

For both designed and natural systems, conditions that affect stability and factors that control rates of change are critical elements to consider and understand.

- Some things stay the same while other things change.
- Things may change slowly or rapidly.

COMMON CORE STATE STANDARDS

<http://www.corestandards.org/ELA-Literacy/>
http://www.corestandards.org/wp-content/uploads/Math_Standards.pdf

ELA/Literacy

RI.K.1 With prompting and support, ask and answer questions about key details in a text.

RI.K.2 With prompting and support, identify the main topic and retell key details of a text.

RI.K.4 With prompting and support, ask and answer questions about unknown words in a text.

RI.K.7 With prompting and support, describe the relationship between illustrations & the text in which they appear.

RI.K.10 Actively engage in group reading activities with purpose and understanding.

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

SL.K.3 Ask and answer questions in order to seek help, get information, or clarify something that is not understood.

SL.K.5 Add drawings or other visual displays to descriptions as desired to provide additional detail.

SL.K.6 Speak audibly and express thoughts, feelings, and ideas clearly.

Mathematics

MP.2 Reason abstractly and quantitatively.

MP.4 Model with mathematics.

K.CC Counting and Cardinality

ENVIRONMENTAL GUIDELINES FOR LEARNING

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

Strand 1: Questioning, Analysis, and Interpretation Skills

- Guideline E—Organizing information—Learners are able to describe data and organize information to search for relationships and patterns concerning the environment and environmental topics.

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 D—Flow of matter and energy—Learners know that living things need some source of energy to live and grow.

Grade 1 | Unit 1

Animal Diversity

RECOMMENDED TIME: SEPTEMBER – NOVEMBER (12 WEEKS)

Unit Overview:

Students' ideas about the characteristics of organisms develop from their basic concepts of living and nonliving things. As students investigate the continuity of life, emphasis should be placed on how animals reproduce their own kind. Teachers should lead students to make observations about how the offspring of familiar animals compare to one another and to their parents.

Throughout time, animals have changed depending on their environment. In learning how organisms have been successful in their habitats, students should observe and record information about animals. They should begin to recognize how differences among individuals within a species can help an organism or population to survive. Students at this level will identify the behaviors and physical adaptations that allow organisms to survive in their environment. Students describe animal life cycles and life spans. *[Refer to Appendix A for the Humane Treatment of Animals]*

Essential Question:
How are animals alike and different?

Key Ideas:

LE. Key Idea 1: Living things are both similar to and different from each other and from nonliving things.

LE. Key Idea 2: Organisms inherit genetic information in a variety of ways that result in continuity of structure and function between parents and offspring.

LE. Key Idea 3: Individual organisms and species change over time.

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

NYS SCIENCE STANDARDS

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

MST STANDARDS

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

NGSS CROSS-CUTTING CONCEPTS

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

Major Understandings:

*Quoted from New York State Performance Indicators
(LE: 1.1a, 2.1a, 2.2a-b, 3.1a, c, 4.1a, e-g)*

- Each animal has different structures that serve different functions in growth, survival, and reproduction. **(3.1a)** 
- Wings, legs, or fins enable some animals to seek shelter and escape predators
- The mouth, including teeth, jaws, and tongue, enables some animals to eat and drink. *continued*

Standard 2: Information Systems

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

Patterns:

Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.

- Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence. *continued*

NYS SCIENCE STANDARDS

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

- Eyes, nose, ears, tongue, and skin of some animals enable the animals to sense their surroundings.
- Claws, shells, spines, feathers, fur, scales, and color of body covering enable some animals to protect themselves from predators and other environmental conditions, or enable them to obtain food.
- Some animals have parts that are used to produce sounds and smells to help the animal meet its needs.
- The characteristics of some animals change as seasonal conditions change (e.g., fur grows and is shed to help regulate body heat; body fat is a form of stored energy and it changes as the seasons change).
- Animals need air, water, and food in order to live and thrive. **(1.1a)** 
- In order to survive in their environment, plants and animals must be adapted to that environment. **(3.1c)** 
 - Seeds disperse by a plant’s own mechanism and/or in a variety of ways that can include wind, water, and animals.
 - Animal adaptations include coloration for warning or attraction, camouflage, defense mechanisms, movement, hibernation, and migration.
- Plants and animals closely resemble their parents and other individuals in their species. **(2.2a)**
- Some traits of living things have been inherited (e.g., color of flowers and number of limbs of animals). **(2.1a)**
- Plants and animals can transfer specific traits to their offspring when they reproduce. **(2.2b)**
- Plants and animals have life cycles. These may include beginning of a life, development into an adult, reproduction as an adult, and eventually death. **(4.1a)** 

MST STANDARDS

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

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.

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).

Key Idea 5: Identifying patterns of change is necessary for making predictions about future behavior and conditions.

Key Idea 6: In order to arrive at the best solution that meets criteria within constraints, it is often necessary to make trade-offs.

- Each generation of animals goes through changes in form from young to adult. This completed sequence of changes in form is called a life cycle. Some insects change from egg to larva to pupa to adult. **(4.1e)**
- Each kind of animal goes through its own stages of growth and development during its life span. **(4.1f)**
- The length of time from an animal’s birth to its death is called its life span. Life spans of different animals vary. **(4.1g)**

NGSS CROSS-CUTTING CONCEPTS

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

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.

- Events have causes that generate observable patterns.
- Simple tests can be designed to gather evidence to support or refute student ideas about causes.

Systems and System Models:

A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.

- Objects and organisms can be described in terms of their parts.
- Systems in the natural and designed world have parts that work together.

Structure and Function:

The way an object is shaped or structured determines many of its properties and functions.

- The shape and stability of structures of natural and designed objects are related to their function(s).

Stability and Change:

For both designed and natural systems, conditions that affect stability and factors that control rates of change are critical elements to consider and understand.

- Some things stay the same while other things change.
- Things may change slowly or rapidly.

COMMON CORE STATE STANDARDS

<http://www.corestandards.org/ELA-Literacy/>
http://www.corestandards.org/wp-content/uploads/Math_Standards.pdf

ELA/Literacy

RI.1.1: Ask and answer questions about key details in a text.

RI.1.2: Identify the main topic and retell key details of a text.

RI.1.4: Ask and answer questions to help determine or clarify the meaning of words and phrases in a text.

RI.1.6: Distinguish between information provided by pictures or other illustrations & information provided by words in a text.

RI 1.7: Use the illustrations and details in a text to describe the key ideas.

RI.1.10: With prompting and support, read informational texts appropriately complex for Grade 1.

W.1.2: Write informative/explanatory texts in which they name a topic, supply some facts about the topic and provide some sense of closure.

L.1.4: Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on Grade 1 reading and content, choosing flexibility from an array of strategies.

L.1.4A: Use sentence-level context as a clue to the meaning of a word or phrase.

L.1.5.A: Sort words into categories (e.g., colors, clothing) to gain a sense of the concepts the category represents.

L1.5.B: Define words by category and by one or more key attributes (e.g., a duck is a bird that swims; a tiger is a large cat with stripes).

SL.1.1: Participate in collaborative conversations with diverse partners about Grade 1 topics and texts with peers and adults in small and larger groups.

SL.1.2: Ask and answer questions about key details in a text read aloud or information presented orally or through other media.

SL.1.3: Ask and answer questions about what a speaker says in order to gather additional information or clarify something that is not understood.

Mathematics

MP.2: Reason abstractly and quantitatively.

MP.5: Use appropriate tools strategically.

1.MD.A.1: Order three objects by length; compare the lengths of two objects indirectly by using a third object.

ENVIRONMENTAL GUIDELINES FOR LEARNING

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

Strand 1: Questioning, Analysis, and Interpretation Skills

1.C. Collecting information

- Learners are able to locate and collect information about the environment and environmental topics.

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 B—Heredity and evolution—Learners understand that plants and animals have different characteristics and that many of the characteristics are inherited.
- 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.

Grade 1 | Unit 2 Properties of Matter

RECOMMENDED TIME: DECEMBER – FEBRUARY (10 WEEKS)

Unit Overview:

Students observe and describe the three states of matter. Students describe, categorize, compare, and measure observable physical properties of matter and objects. Students' initial efforts in performing these processes may yield simple descriptions and sketches, which may lead to increasingly more detailed drawings and richer verbal descriptions. Appropriate tools can aid students in their efforts.

Essential Question:
How do we describe the properties of matter?

Key Ideas:

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

PS. Key Idea 3: Matter is made up of particles whose properties determine the observable characteristics of matter and its reactivity.

NYS SCIENCE STANDARDS

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

Major Understandings:

Quoted from New York State Performance Indicators (PS: 2.1c, 3.1c-g, 3.1g, 3.2a, c)

- Matter exists in three states: solid, liquid, gas. **(3.2a)**
 - Solids have a definite shape and volume.
 - Liquids do not have a definite shape but have a definite volume.
 - Gases do not hold their shape or volume.
- Water is recycled by natural processes on Earth. **(2.1c)** 
 - evaporation: changing of water (liquid) into water vapor (gas)
 - condensation: changing of water vapor (gas) into water (liquid)
 - precipitation: rain, sleet, snow, hail

continued

MST STANDARDS

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

Standard 2: Information Systems

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

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

NGSS CROSS-CUTTING CONCEPTS

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

Patterns:

Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.

- Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.

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.

- Events have causes that generate observable patterns.
- Simple tests can be designed to gather evidence to support or refute student ideas about causes.

continued

NYS SCIENCE STANDARDS

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

- runoff: water flowing on Earth’s surface
- groundwater: water that moves downward into the ground
- Changes in the properties or materials of objects can be observed and described. **(3.2c)**
- The material(s) an object is made up of determine some specific properties of the object (sink/float, conductivity, magnetism). Properties can be observed or measured with tools such as hand lenses, metric rulers, thermometers, balances, magnets, circuit testers, and graduated cylinders. **(3.1e)**
- Objects and/or materials can be sorted or classified according to their properties. **(3.1f)** 
- Objects have properties that can be observed, described, and/or measured: length, width, volume, size, shape, mass or weight, temperature, texture, flexibility, reflectiveness of light. **(3.1c)**
- Measurements can be made with standard metric units and nonstandard units. (*Note: Exceptions to the metric system usage are found in meteorology.*) **(3.1d)**
- Some properties of an object are dependent on the conditions of the present surroundings in which the object exists. **(3.1g)**

For example:

- temperature: hot or cold
- lighting: shadows, color
- moisture: wet or dry

MST STANDARDS

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

- 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.
- 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).
- Key Idea 5:** Identifying patterns of change is necessary for making predictions about future behavior and conditions.
- Key Idea 6:** In order to arrive at the best solution that meets criteria within constraints, it is often necessary to make trade-offs.
- Standard 7: Interdisciplinary Problem Solving**
- 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.
- 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.

- Some things stay the same while other things change.
- Things may change slowly or rapidly.

NGSS CROSS-CUTTING CONCEPTS

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

Scale, Proportion, and Quantity:

In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change.

- Relative scales allow objects and events to be compared and described (e.g., bigger and smaller; hotter and colder; faster and slower).
- Standard units are used to measure length.

Systems and System Models:

A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.

- Objects and organisms can be described in terms of their parts.
- Systems in the natural and designed world have parts that work together.

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.

- Objects may break into smaller pieces, be put together into larger pieces, or change shapes.

Structure and Function:

The way an object is shaped or structured determines many of its properties and functions.

- The shape and stability of structures of natural and designed objects are related to their function(s).

Stability and Change:

For both designed and natural systems, conditions that affect stability and factors that control rates of change are critical elements to consider and understand.

COMMON CORE STATE STANDARDS

<http://www.corestandards.org/ELA-Literacy/>
http://www.corestandards.org/wp-content/uploads/Math_Standards.pdf

ELA/Literacy

- RI.1.1:** Ask and answer questions about key details in a text.
- RI.1.2:** Identify the main topic and retell key details of a text.
- RI.1.4:** Ask and answer questions to help determine or clarify the meaning of words and phrases in a text.
- RI.1.6:** Distinguish between information provided by pictures or other illustrations & information provided by words in a text.
- RI 1.7:** Use the illustrations and details in a text to describe the key ideas.
- RI.1.10:** With prompting and support, read informational texts appropriately complex for Grade 1.
- W.1.2:** Write informative/explanatory texts in which they name a topic, supply some facts about the topic and provide some sense of closure.
- L.1.4:** Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on Grade 1 reading and content, choosing flexibility from an array of strategies.
- L.1.5.A:** Sort words into categories (e.g., colors, clothing) to gain a sense of the concepts the category represents.
- L1.5.B:** Define words by category and by one or more key attributes (e.g., a duck is a bird that swims; a tiger is a large cat with stripes).
- SL.1.1:** Participate in collaborative conversations with diverse partners about Grade 1 topics and texts with peers and adults in small and larger groups.
- SL.1.2:** Ask and answer questions about key details in a text read aloud or information presented orally or through other media.
- SL.1.3:** Ask and answer questions about what a speaker says in order to gather additional information or clarify something that is not understood.

ENVIRONMENTAL GUIDELINES FOR LEARNING

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

Strand 1: Questioning, Analysis, and Interpretation Skills

- Guideline B—Designing investigations—Learners are able to design simple investigations.

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 are able to identify changes and differences in the physical environment.
- Guideline B—Changes in matter—Learners are able to identify basic characteristics of and changes in matter.
- Guideline C—Energy—While they may have little understanding of formal concepts associated with energy, learners are familiar with the basic behavior of some different forms of energy.

Mathematics

MP.2: Reason abstractly and quantitatively.

MP.5: Use appropriate tools strategically.

1.MD.A.1: Order three objects by length; compare the lengths of two objects indirectly by using a third object.

1.MD.4: Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.

Grade 1 | Unit 3 Weather and Seasons

RECOMMENDED TIME: MARCH – JUNE (14 WEEKS)

Unit Overview:

Weather involves interactions among air, water, and land. Students should observe and describe weather conditions that occur during each season. They can observe, measure, record and compare data throughout the year by using science tools.

Students should compare temperatures in different locations and compare day and night temperature. Students should illustrate and describe how the sun appears to move during the day. Illustrate and describe how the moon changes appearance over time. Describe the 24-hour day/night cycle. Students should understand that energy exists in a variety of forms. Students should observe and record the changes in the sun's and other star's position, and the moon's appearance relative to time of day and month, and note the pattern of this change. Recognize that the sun's energy warms the air.

Essential Question:
How does seasonal change affect temperature and weather conditions over a period of time?

Key Ideas:

PS. Key Idea 1: The Earth and celestial phenomena can be described by principles of relative motion and perspective.

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

PS. Key Idea 3: Matter is made up of particles whose properties determine the observable characteristics of matter and its reactivity.

PS. Key Idea 4: Energy exists in many forms, and when these forms change energy is conserved.

NYS SCIENCE STANDARDS

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

MST STANDARDS

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

NGSS CROSS-CUTTING CONCEPTS

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

Major Understandings:

Quoted from New York State Performance Indicators (PS: 1.1a-c, 2.1a-b, 3.1g, 4.2a)

- Natural cycles and patterns include: **(1.1a)** 
 - Earth spinning around once every 24 hours (rotation), resulting in day and night
 - Earth moving in a path around the Sun (revolution), resulting in one Earth year
 - the length of daylight and darkness varying with the seasons.

continued

Standard 2: Information Systems

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

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.

continued

Patterns:

Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.

- Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.

continued

NYS SCIENCE STANDARDS

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

- weather changing from day to day and through the seasons
- the appearance of the Moon changing as it moves in a path around Earth to complete a single cycle
- Weather is the condition of the outside air at a particular moment. **(2.1a)** 
- Weather can be described and measured by: **(2.1b)** 
 - temperature
 - wind speed and direction
 - form and amount of precipitation
 - general sky conditions (cloudy, sunny, partly cloudy)
- Some properties of an object are dependent on the conditions of the present surroundings in which the object exists. **(3.1g)**
 - temperature: hot or cold
 - lighting: shadows, color
 - moisture: wet or dry
- Humans organize time into units based on natural motions of Earth: **(1.1b)**
 - second, minute, hour
 - week, month
- The Sun and other stars appear to move in a recognizable pattern both daily and seasonally. **(1.1c)** 
- Everyday events involve one form of energy being changed to another. **(4.2a)** 

MST STANDARDS

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

- Key Idea 2:** Models are simplified representations of objects, structures, or systems used in analysis, explanation, interpretation, or design.
- 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.
- 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).
- Key Idea 5:** Identifying patterns of change is necessary for making predictions about future behavior and conditions.
- Key Idea 6:** In order to arrive at the best solution that meets criteria within constraints, it is often necessary to make trade-offs.
- Standard 7: Interdisciplinary Problem Solving**
- 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.
- 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.

NGSS CROSS-CUTTING CONCEPTS

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

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.

- Events have causes that generate observable patterns.
- Simple tests can be designed to gather evidence to support or refute student ideas about causes.

Scale, Proportion, and Quantity:

In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change.

- Relative scales allow objects and events to be compared and described (e.g., bigger and smaller; hotter and colder; faster and slower).
- Standard units are used to measure length.

Systems and System Models:

A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.

- Objects and organisms can be described in terms of their parts.
- Systems in the natural and designed world have parts that work together.

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.

- Objects may break into smaller pieces, be put together into larger pieces, or change shapes.

continued

NGSS CROSS-CUTTING CONCEPTS

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

Structure and Function:

The way an object is shaped or structured determines many of its properties and functions.

- The shape and stability of structures of natural and designed objects are related to their function(s).

Stability and Change:

For both designed and natural systems, conditions that affect stability and factors that control rates of change are critical elements to consider and understand.

- Some things stay the same while other things change.
- Things may change slowly or rapidly.

COMMON CORE STATE STANDARDS

<http://www.corestandards.org/ELA-Literacy/>
http://www.corestandards.org/wp-content/uploads/Math_Standards.pdf

ELA/Literacy

- RI.1.1:** Ask and answer questions about key details in a text.
- RI.1.2:** Identify the main topic and retell key details of a text.
- RI.1.4:** Ask and answer questions to help determine or clarify the meaning of words and phrases in a text.
- RI.1.6:** Distinguish between information provided by pictures or other illustrations & information provided by words in a text.
- RI.1.7:** Use the illustrations and details in a text to describe the key ideas.
- RI.1.10:** With prompting and support, read informational texts appropriately complex for Grade 1.
- W.1.2:** Write informative/explanatory texts in which they name a topic, supply some facts about the topic and provide some sense of closure.
- L.1.4:** Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on Grade 1 reading and content, choosing flexibility from an array of strategies.
- L.1.5.A:** Sort words into categories (e.g., colors, clothing) to gain a sense of the concepts the category represents.
- L1.5.B:** Define words by category and by one or more key attributes (e.g., a duck is a bird that swims; a tiger is a large cat with stripes).
- SL.1.1:** Participate in collaborative conversations with diverse partners about Grade 1 topics and texts with peers and adults in small and larger groups.
- SL.1.2:** Ask and answer questions about key details in a text read aloud or information presented orally or through other media.

ENVIRONMENTAL GUIDELINES FOR LEARNING

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

Strand 1: Questioning, Analysis, and Interpretation Skills

- Guideline C—Collecting information—Learners are able to locate and collect information about the environment and environmental topics.
- Guideline F—Working with models and simulations—Learners understand that relationships, patterns, and processes can be represented by models.

Strand 2: Knowledge of Environmental Processes and Systems

Strand 2.4: Environment and Society

- Guideline A—Human/environment interactions—Learners understand that people depend on, change, and are affected by the environment.

SL.1.3: Ask and answer questions about what a speaker says in order to gather additional information or clarify something that is not understood.

Mathematics

MP.2: Reason abstractly and quantitatively.

MP.5: Use appropriate tools strategically.

1.MD.A.1: Order three objects by length; compare the lengths of two objects indirectly by using a third object.

1.MD.4: Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.

Grade 2 | Unit 1 Earth Materials

RECOMMENDED TIME: SEPTEMBER – NOVEMBER (12 WEEKS)

Unit Overview:

Many of the phenomena that we observe on Earth involve interactions among components of air, water, and land. Students should be engaged in observing, describing, and investigating the basic properties and components of soil. Students should explore how erosion and deposition are the results of interactions between air, water, and land. Students should observe and describe the physical properties of rocks. Compare and sort rocks by size, color, luster, texture, patterns, hardness/softness. Students should understand that nonliving things can be human-created or naturally occurring.

Essential Question:
How do different materials affect the makeup of the Earth?

Key Ideas:

LE. Key Idea 1: Living things are both similar to and different from each other and from nonliving things.

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

PS. Key Idea 3: Matter is made up of particles whose properties determine the observable characteristics of matter and its reactivity.

NYS SCIENCE STANDARDS

Quoted from New York State Performance Indicators (PS: 2.1d, 3.1b-g, 3.1c, 3.1d, 3.1e, 3.1f, 3.1g) (LE: 1.1d)

Major Understandings:

Quoted from New York State Performance Indicators (PS: 2.1d, 3.1b-g, 3.1c, 3.1d, 3.1e, 3.1f, 3.1g) (LE: 1.1d)

- Erosion and deposition result from the interaction among air, water, and land. **(2.1d)** 
 - Interaction between air and water breaks down Earth materials.
 - Pieces of Earth material may be moved by air, water, wind, and gravity.
 - Pieces of Earth material will settle or deposit on land or in the water in different places.
 - Soil is composed of broken-down pieces of living and nonliving Earth material.

continued

MST STANDARDS

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

Standard 2: Information Systems

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

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

NGSS CROSS-CUTTING CONCEPTS

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

Patterns:

Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.

- Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.

Scale, Proportion, and Quantity:

In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change.

continued

NYS SCIENCE STANDARDS

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

- Matter has properties (color, hardness, odor, sound, taste, etc.) that can be observed through the senses. **(3.1b)**
- Objects have properties that can be observed, described, and/or measured: length, width, volume, size, shape, mass or weight, temperature, texture, flexibility, reflectiveness of light. **(3.1c)**
- Measurements can be made with standard metric units and nonstandard units (Note: Exceptions to the metric system usage are found in meteorology.) **(3.1d)**
- The material(s) an object is made up of determine some specific properties of the object (sink/float, conductivity, magnetism). Properties can be observed or measured with tools such as hand lenses, metric rulers, thermometers, balances, magnets, circuit testers, and graduated cylinders. **(3.1e)**
- Objects and/or materials can be sorted or classified according to their properties. **(3.1f)** 
- Some properties of an object are dependent on the conditions of the present surroundings in which the object exists. **(3.1g)**
For Example:
 - temperature: hot or cold
 - lighting: shadows, color
 - moisture: wet or dry
- Nonliving things can be human-created or naturally occurring. **(LE 1.1d)** 

MST STANDARDS

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

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.

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).

Key Idea 5: Identifying patterns of change is necessary for making predictions about future behavior and conditions.

Key Idea 6: In order to arrive at the best solution that meets criteria within constraints, it is often necessary to make trade-offs.

Standard 7: Interdisciplinary Problem Solving

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.

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.

NGSS CROSS-CUTTING CONCEPTS

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

- Relative scales allow objects and events to be compared and described (e.g., bigger and smaller; hotter and colder; faster and slower).
- Standard units are used to measure length.

Systems and System Models:

A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.

- Objects and organisms can be described in terms of their parts.
- Systems in the natural and designed world have parts that work together.

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.

- Objects may break into smaller pieces, be put together into larger pieces, or change shapes.

Stability and Change:

For both designed and natural systems, conditions that affect stability and factors that control rates of change are critical elements to consider and understand.

- Some things stay the same while other things change.
- Things may change slowly or rapidly.

COMMON CORE STATE STANDARDS

<http://www.corestandards.org/ELA-Literacy/>
http://www.corestandards.org/wp-content/uploads/Math_Standards.pdf

ELA/Literacy

RI.2.3: Describe the connections between a series of historical events, scientific ideas or concepts or steps in technical procedures in a text.

RI.2.4: Determine the meaning of words and phrases in a text relevant to a Grade 2 topic or subject area.

RI.2.7: Explain how specific images (e.g., a diagram showing how a machine works) contribute to and clarify a text.

RI.2.10: Read and comprehend informational texts.

W.2.2: Write informative/explanatory texts in which they introduce a topic, use facts and definitions to develop points, and provide a concluding statement or section.

W.2.8: Recall information from experiences or gather information from provided sources to answer a question.

SL.2.1: Participate in collaborative conversations with diverse partners about Grade 2 topics and texts with peers and adults in small and larger groups.

SL.2.3: Ask and answer questions about what a speaker says in order to clarify comprehension, gather additional information, or deepen understanding of a topic or issue.

L.2.3: Use knowledge of language and its conventions when writing, speaking, reading or listening.

L.2.4: Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on Grade 2 reading and content, choosing flexibility from an array of strategies.

Mathematics

MP.2: Reason abstractly and quantitatively.

MP.4: Model with mathematics.

MP.5: Use appropriate tools strategically.

2.NBT.A: Understand place value.

2.MD.B.5: Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units, e.g., by using drawings (such as drawings of rulers) and equations with a symbol for the unknown number to represent the problem.

2.MD.1 Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.

ENVIRONMENTAL GUIDELINES FOR LEARNING

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

Strand 1: Questioning, Analysis, and Interpretation Skills

- Guideline C—Collecting information—Learners are able to locate and collect information about the environment and environmental topics.
- Guideline E—Organizing information—Learners are able to describe data and organize information to search for relationships and patterns concerning the environment and environmental topics.

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 are able to identify changes and differences in the physical environment.

Grade 2 | Unit 2 Forces and Motion

RECOMMENDED TIME: DECEMBER – FEBRUARY (10 WEEKS)

Unit Overview:

Energy and matter interact through forces that result in changes in motion. Students should be able to observe and describe relative positions between objects in their world. Exploring the observable effects of gravity and magnetism may help students develop an understanding of the reason for the direction of an object's motion. Manipulation and application of simple tools and machines may help students learn about the relationships between forces and motion.

Essential Question:
What causes objects to move?

Key Ideas:

PS. Key Idea 5: Energy and matter interact through forces that result in changes in motion.

NYS SCIENCE STANDARDS http://www.p12.nysed.gov/ciai/mst/pub/elecoresci.pdf	MST STANDARDS http://www.p12.nysed.gov/ciai/mst/pub/elecoresci.pdf	NGSS CROSS-CUTTING CONCEPTS http://www.nextgenscience.org/sites/ngss/files/Appendix%20G%20-%20Crosscutting%20Concepts%20FINAL%20edited%204.10.13.pdf
<p>Major Understandings:</p> <p><i>Quoted from New York State Performance Indicators (PS: 5.1, 5.1 a-c, 5.2a)</i></p> <ul style="list-style-type: none"> ■ The position of an object can be described by locating it relative to another object or the background. (5.1a) ■ Describe the effects of common forces (pushes and pulls) of objects, such as those caused by gravity, magnetism and mechanical forces. (5.1) ■ The position or direction of motion of an object can be changed by pushing or pulling. (5.1b) ■ The force of gravity pulls objects toward the center of Earth. (5.1c) ■ The forces of gravity and magnetism can affect objects through gases, liquids, and solids. (5.2a) 	<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 2: Models are simplified representations of objects, structures, or systems, used in analysis, explanation, or design.</p> <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>Key Idea 5: Identifying patterns of change is necessary for making predictions about future behavior and conditions.</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"> ■ Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence. <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"> ■ Events have causes that generate observable patterns. ■ Simple tests can be designed to gather evidence to support or refute student ideas about causes.

continued

		<p align="center">NGSS CROSS-CUTTING CONCEPTS</p> <p align="center">http://www.nextgenscience.org/sites/ngss/files/Appendix%20G%20-%20Crosscutting%20Concepts%20FINAL%20edited%204.10.13.pdf</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"> ■ Objects and organisms can be described in terms of their parts. ■ Systems in the natural and designed world have parts that work together. <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"> ■ Some things stay the same while other things change. ■ Things may change slowly or rapidly.

COMMON CORE STATE STANDARDS

<http://www.corestandards.org/ELA-Literacy/>
http://www.corestandards.org/wp-content/uploads/Math_Standards.pdf

ELA/Literacy

RI.2.7: Explain how specific images (e.g., a diagram showing how a machine works) contribute to and clarify a text.

RI.2.10: Read and comprehend informational texts.

W.2.2: Write informative/explanatory texts in which they introduce a topic, use facts and definitions to develop points, and provide a concluding statement or section.

W.2.8: Recall information from experiences or gather information from provided sources to answer a question.

SL.2.1: Participate in collaborative conversations with diverse partners about Grade 2 topics and texts with peers and adults in small and larger groups.

SL.2.3: Ask and answer questions about what a speaker says in order to clarify comprehension, gather additional information, or deepen understanding of a topic or issue.

L.2.3: Use knowledge of language and its conventions when writing, speaking, reading or listening.

L.2.4: Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on Grade 2 reading and content, choosing flexibility from an array of strategies.

Mathematics

MP.2: Reason abstractly and quantitatively.

MP.4: Model with mathematics.

MP.5: Use appropriate tools strategically.

2.MD.D.10: Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph.

ENVIRONMENTAL GUIDELINES FOR LEARNING

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

Strand 1: Questioning, Analysis, and Interpretation Skills

- Guideline B—Designing investigations—Learners are able to design simple investigations.
- Guideline F—Working with models and simulations—Learners understand that relationships, patterns, and processes can be represented by models.
- Guideline G—Drawing conclusions and developing explanations —Learners can develop simple explanations that address their questions about the environment.

Strand 2.4: Environment and Society

- Guideline D—Technology—Learners understand that technology is an integral part of human existence and culture.

Grade 2 | Unit 3 Plant Diversity

RECOMMENDED TIME: MARCH – JUNE (14 WEEKS)

Unit Overview:

Living things are both similar to and different from each other and from nonliving things. There are basic characteristics, needs, and functions common to all living things. Nonliving things are present in nature or are made by living things. Understanding the variety and complexity of life and its processes can help students develop respect for their own and for all life. It should also lead them to better realize the value of all life on this fragile planet. As students investigate the continuity of life, emphasis should be placed on how plants reproduce their own kind. Throughout time, plants changed depending on their environment. In learning how organisms have been successful in their habitats, students should observe and record information about plants. The continuity of life is sustained through reproduction and development. *[Refer to Appendix A for Conservation Day]*

Essential Question:
How are plants alike and different?

Key Ideas:

- LE. Key Idea 1:** Living things are both similar to and different from each other and from nonliving things.
- LE. Key Idea 2:** Organisms inherit genetic information in a variety of ways that result in continuity of structure and function between parents and offspring.
- LE. Key Idea 3:** Individual organisms and species change over time.
- 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.

NYS SCIENCE STANDARDS

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

MST STANDARDS

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

NGSS CROSS-CUTTING CONCEPTS

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

Major Understandings:

Quoted from New York State Performance Indicators (LE: 1.1b, 1.2a, 2.1a, 2.2a, b, 3.1b, 4.1a-d, 5.1a, 5.2a)

- Each plant has different structures that serve different functions in growth, survival, and reproduction. **(3.1b)** 
 - Roots help support the plant and take in water and nutrients.
 - Leaves help plants utilize sunlight to make food for the plant.

continued

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

Patterns:

Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.

- Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.

continued

NYS SCIENCE STANDARDS

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

- Stems, stalks, trunks, and other similar structures provide support for the plant.
- Some plants have flowers.
- Flowers are reproductive structures of plants that produce fruit which contains seeds.
- Seeds contain stored food that aids in germination and the growth of young plants.
- Some traits of living things have been inherited. **(2.1a)**
- Plants and animals closely resemble their parents and other individuals in the species. **(2.2a)**
- Plants and animals can transfer specific traits to their offspring when they reproduce. **(2.2b)**
- Plants and animals have life cycles. These may include beginning of a life, development into an adult, reproduction as an adult, and eventually death. **(4.1a)** 🌱
- Each kind of plant goes through its own stages of growth and development that may include seed, young plant, and mature plant. **(4.1b)**
- The length of time from beginning of development to death of the plant is called its life span. **(4.1c)**
- Life cycles of some plants include changes from seed to mature plant. **(4.1d)** 🌱
- Plants require air, water, and food in order to live and thrive. **(1.1b)** 🌱
- Living things grow, take in nutrients, breathe, reproduce, eliminate waste, and die. **(1.2a)** 🌱
- All living things grow, take in nutrients, breathe, reproduce, and eliminate waste. **(5.1a)** 🌱

continued

MST STANDARDS

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

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.

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).

Key Idea 5: Identifying patterns of change is necessary for making predictions about future behavior and conditions.

Key Idea 6: In order to arrive at the best solution that meets criteria within constraints, it is often necessary to make trade-offs.

Standard 7: Interdisciplinary Problem Solving

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.

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.

NGSS CROSS-CUTTING CONCEPTS

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

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.

- Events have causes that generate observable patterns.
- Simple tests can be designed to gather evidence to support or refute student ideas about causes.

Scale, Proportion, and Quantity:

In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change.

- Relative scales allow objects and events to be compared and described (e.g., bigger and smaller; hotter and colder; faster and slower).
- Standard units are used to measure length.

Systems and System Models:

A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.

- Objects and organisms can be described in terms of their parts.
- Systems in the natural and designed world have parts that work together.

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.

- Objects may break into smaller pieces, be put together into larger pieces, or change shapes.

continued

<p style="text-align: center;">NYS SCIENCE STANDARDS</p> <p style="text-align: center;">http://www.p12.nysed.gov/ciai/mst/pub/intersci.pdf</p>		<p style="text-align: center;">NGSS CROSS-CUTTING CONCEPTS</p> <p style="text-align: center;">http://www.nextgenscience.org/sites/ngss/files/Appendix%20G%20-%20Crosscutting%20Concepts%20FINAL%20edited%204.10.13.pdf</p>
<ul style="list-style-type: none"> ■ Plants respond to changes in their environment. For example, the leaves of some green plants change position as the direction of light changes; the parts of some plants undergo seasonal changes that enable plants to grow; seeds germinate, and leaves form and grow. (5.2a)  		<p>Structure and Function:</p> <p>The way an object is shaped or structured determines many of its properties and functions.</p> <ul style="list-style-type: none"> ■ The shape and stability of structures of natural and designed objects are related to their function(s). <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"> ■ Some things stay the same while other things change. ■ Things may change slowly or rapidly.

COMMON CORE STATE STANDARDS

<http://www.corestandards.org/ELA-Literacy/>
http://www.corestandards.org/wp-content/uploads/Math_Standards.pdf

ELA/Literacy

RI.2.3: Describe the connections between a series of historical events, scientific ideas or concepts or steps in technical procedures in a text.

RI.2.4: Determine the meaning of words and phrases in a text relevant to a Grade 2 topic or subject area.

RI.2.7: Explain how specific images (e.g., a diagram showing how a machine works) contribute to and clarify a text.

RI.2.10: Read and comprehend informational texts.

W.2.2: Write informative/explanatory texts in which they introduce a topic, use facts and definitions to develop points, and provide a concluding statement or section.

W.2.7: Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations).

W.2.8: Recall information from experiences or gather information from provided sources to answer a question.

SL.2.1: Participate in collaborative conversations with diverse partners about Grade 2 topics and texts with peers and adults in small and larger groups.

SL.2.3: Ask and answer questions about what a speaker says in order to clarify comprehension, gather additional information, or deepen understanding of a topic or issue.

L.2.3: Use knowledge of language and its conventions when writing, speaking, reading or listening.

L.2.4: Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on Grade 2 reading and content, choosing flexibility from an array of strategies.

Mathematics

MP.2: Reason abstractly and quantitatively.

MP.4: Model with mathematics.

2.MD.D.10: Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph.

ENVIRONMENTAL GUIDELINES FOR LEARNING

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

Strand 1: Questioning, Analysis, and Interpretation Skills

- Guideline A—Questioning—Learners are able to develop questions that help them learn about the environment and do simple investigations.
- Guideline B—Designing investigations—Learners are able to design simple investigations.
- Guideline C—Collecting information—Learners are able to locate and collect information about the environment and environmental topics.
- Guideline E—Organizing information—Learners are able to describe data and organize information to search for relationships and patterns concerning the environment and environmental topics.
- Guideline G—Drawing conclusions and developing explanations—Learners can develop simple explanations that address their questions about the environment.

Strand 2: Knowing 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 B—Heredity and evolution—Learners understand that plants and animals have different characteristics and that many of the characteristics are inherited.
- Guideline C—Systems and connections—Learners understand basic ways in which organisms are related to their environments and other organisms.
- Guideline D—Flow of matter and energy—Learners know that living things need some source of energy to live and grow.

Strand 2.4: Environment and Society

- Guideline A—Human/environment interactions—Learners understand that people depend on, change, and are affected by the environment.
- Guideline C—Resources—Learners understand the basic concepts of resource and resource distribution.

Grades

K-2 Cross-Cutting Concepts

<p>Patterns: Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.</p>	<ul style="list-style-type: none"> Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.
<p>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.</p>	<ul style="list-style-type: none"> Events have causes that generate observable patterns. Simple tests can be designed to gather evidence to support or refute student ideas about causes.
<p>Scale, Proportion, and Quantity: In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change.</p>	<ul style="list-style-type: none"> Relative scales allow objects and events to be compared and described (e.g., bigger and smaller; hotter and colder; faster and slower). Standard units are used to measure length.
<p>Systems and System Models: 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"> Objects and organisms can be described in terms of their parts. Systems in the natural and designed world have parts that work together.
<p>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.</p>	<ul style="list-style-type: none"> Objects may break into smaller pieces, be put together into larger pieces, or change shapes.
<p>Structure and Function: The way an object is shaped or structured determines many of its properties and functions.</p>	<ul style="list-style-type: none"> The shape and stability of structures of natural and designed objects are related to their function(s).
<p>Stability and Change: 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"> Some things stay the same while other things change. Things may change slowly or rapidly.

Developed by NSTA using information from Appendix G of the Next Generation Science Standards © 2011, 2012, 2013 Achieve, Inc.

Adapted from: National Research Council. “Chapter 4: Crosscutting Concepts”. A Framework for K–12 Science Education: Practices, Crosscutting Concepts, and Core Ideas. Committee on a Conceptual Framework for New K–12 Science Education Standards. National Research Council of the National Academies, Board on Science Education, Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press, 2011.

Grades K-2 Engineering Design

Asking Questions and Defining Problems	Developing and Using Models	Planning and Carrying Out an Investigation	Analyzing and Interpreting Data	Using Mathematics and Computational Thinking	Constructing Explanations and Defining Solutions	Engaging in Argument From Evidence	Obtaining, Evaluating and Communicating Information
<p>Asking questions and defining problems in K–2 builds on prior experiences and progresses to simple descriptive questions that can be tested.</p> <p>Ask questions based on observations to find more information about the natural and/or designed world(s).</p> <p>Ask and/or identify questions that can be answered by an investigation. Define a simple problem that can be solved through the development of a new or improved object or tool.</p>	<p>Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions.</p> <p>Distinguish between a model and the actual object, process, and/or events the model represents.</p> <p>Compare models to identify common features and differences.</p> <p>Develop and/or use a model to represent amounts, relationships, relative scales (bigger, smaller), and/or patterns in the natural and designed world(s).</p> <p>Develop a simple model based on evidence to represent a proposed object or tool.</p>	<p>Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.</p> <p>With guidance, plan and conduct an investigation in collaboration with peers (for K).</p> <p>Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question.</p> <p>Evaluate different ways of observing and/or measuring a phenomenon to determine which way can answer a question.</p> <p>Make observations (firsthand or from media) and/or measurements to collect data that can be used to make comparisons.</p> <p>Make observations (firsthand or from media) and/or measurements of a proposed object or tool or solution to determine if it solves a problem or meets a goal.</p> <p>Make predictions based on prior experiences.</p>	<p>Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.</p> <p>Record information (observations, thoughts, and ideas). Use and share pictures, drawings, and/or writings of observations.</p> <p>Use observations (firsthand or from media) to describe patterns and/or relationships in the natural and designed world(s) in order to answer scientific questions and solve problems.</p> <p>Compare predictions (based on prior experiences) to what occurred (observable events).</p> <p>Analyze data from tests of an object or tool to determine if it works as intended.</p>	<p>Mathematical and computational thinking in K–2 builds on prior experience and progresses to recognizing that mathematics can be used to describe the natural and designed world(s).</p> <p>Decide when to use qualitative vs. quantitative data. Use counting and numbers to identify and describe patterns in the natural and designed world(s).</p> <p>Describe, measure, and/or compare quantitative attributes of different objects and display the data using simple graphs.</p> <p>Use quantitative data to compare two alternative solutions to a problem.</p>	<p>Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence based accounts of natural phenomena and designing solutions.</p> <p>Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena.</p> <p>Use tools and/or materials to design and/or build a device that solves a specific problem or a solution to a specific problem.</p> <p>Generate and/or compare multiple solutions to a problem.</p>	<p>Engaging in argument from evidence in K–2 builds on prior experiences and progresses to comparing ideas and representations about the natural and designed world(s).</p> <p>Identify arguments that are supported by evidence.</p> <p>Distinguish between explanations that account for all gathered evidence and those that do not.</p> <p>Analyze why some evidence is relevant to a scientific question and some is not.</p> <p>Distinguish between opinions and evidence in one’s own explanations.</p> <p>Listen actively to arguments to indicate agreement or disagreement based on evidence, and/or to retell the main points of the argument.</p> <p>Construct an argument with evidence to support a claim.</p> <p>Make a claim about the effectiveness of an object, tool, or solution that is supported by relevant evidence.</p>	<p>Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information.</p> <p>Read Grade-appropriate texts and/or use media to obtain scientific and/or technical information to determine patterns in and/or evidence about the natural and designed world(s).</p> <p>Describe how specific images (e.g., a diagram showing how a machine works) support a scientific or engineering idea.</p> <p>Obtain information using various texts, text features (e.g., headings, tables of contents, glossaries, electronic menus, icons), and other media that will be useful in answering a scientific question and/or supporting a scientific claim.</p> <p>Communicate information or design ideas and/or solutions with others in oral and/or written forms using models, drawings, writing, or numbers that provide detail about scientific ideas, practices, and/or design ideas.</p>



Grades

3-5

Science Scope & Sequence



Grade 3 | Unit 1 Matter

RECOMMENDED TIME: SEPTEMBER – OCTOBER (8 WEEKS)

Unit Overview:

Students should describe, categorize, compare, and measure observable physical properties of matter and objects. Things can be done to materials to change their properties, but not all materials respond in the same way to what is done to them. Younger students emphasize physical properties while older students will recognize chemical changes. Appropriate tools are a necessary component to describe some physical properties of objects.

Essential Question:
How can we accurately describe the physical properties of matter?

Key Ideas:

PS. Key Idea 3: Matter is made up of particles whose properties determine the observable characteristics of matter and its reactivity.

NYS SCIENCE STANDARDS http://www.p12.nysed.gov/ciai/mst/pub/elecoresci.pdf	MST STANDARDS http://www.p12.nysed.gov/ciai/mst/pub/elecoresci.pdf	NGSS CROSS-CUTTING CONCEPTS http://www.nextgenscience.org/sites/ngss/files/Appendix%20G%20-%20Crosscutting%20Concepts%20FINAL%20edited%204.10.13.pdf
<p>Major Understandings: <i>Quoted from New York State Performance Indicators (PS: 3.1b-e)</i></p> <ul style="list-style-type: none"> ■ Matter has properties (color, hardness, odor, sound, taste, etc.) that can be observed through the senses. (3.1b) ■ Objects have properties that can be observed, described, and/or measured: length, width, volume, size, shape, mass or weight, temperature, texture, flexibility, reflectiveness of light. (3.1c) ■ Measurements can be made with standard metric units and nonstandard units (Note: Exceptions to the metric system usage are found in meteorology.) (3.1d) ■ The material(s) an object is made up of determine some specific properties of the object (sink/float, conductivity, magnetism). Properties can be observed or measured with tools such as hand lenses, metric rulers, thermometers, balances, magnets, circuit testers, and graduated cylinders. (3.1e) 	<p>Standard 6: Interconnectedness: Common Themes</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 systems.</p>	<p>Scale, Proportion, and Quantity:</p> <p>In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change.</p> <ul style="list-style-type: none"> ■ Natural objects and/or observable phenomena exist from the very small to the immensely large or from very short to very long time periods. ■ Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume. <p>Structure and Function:</p> <p>The way an object is shaped or structured determines many of its properties and functions.</p> <ul style="list-style-type: none"> ■ Different materials have different substructures, which can sometimes be observed. ■ Substructures have shapes and parts that serve functions.

COMMON CORE STATE STANDARDS

<http://www.corestandards.org/ELA-Literacy/>
http://www.corestandards.org/wp-content/uploads/Math_Standards.pdf

ELA/Literacy

RI.3.3: Describe the relationship between a series of historical events, scientific ideas or concepts or steps in technical procedures in a text using language that pertains to time, sequence, and cause/effect.

RI.3.4: Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a Grade 3 topic or subject area.

RI.3.7: Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur).

RI.3.10: Read and comprehend informational text.

W.3.2: Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

W.3.5: With guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, and editing.

W.3.6: With guidance and support from adults, use technology to produce and publish writing (using keyboarding skills) as well as to interact and collaborate with others.

SL.3.1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on Grade 3 topics and texts, building on others' ideas and expressing their own clearly.

SL.3.3: Ask and answer questions about information from a speaker, offering appropriate elaboration and detail.

L.3.3: Use knowledge of language and its conventions when writing, speaking, reading or listening.

L.3.4: Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on Grade 3 reading and content, choosing flexibility from an array of strategies.

ENVIRONMENTAL GUIDELINES FOR LEARNING

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

Strand 1: Questioning, Analysis, and Interpretation Skills

- Guideline B—Designing investigations—Learners are able to design simple investigations.
- Guideline C—Collecting information—Learners are able to locate and collect information about the environment or environmental topics.
- Guideline D—Evaluating accuracy and reliability—Learners understand the need to use reliable information to answer questions. They are familiar with some basic factors to consider in judging the merits of information.
- Guideline E—Organizing information—Learners are able to describe data and organize information to search for relationships and patterns concerning the environment and environmental topics.
- Guideline F—Working with models and simulations—Learners understand that relationships, patterns, and processes can be represented by models.

Strand 2: Knowledge of Environmental Processes and Systems

Strand 2.1: The Earth as a Physical System

- Guideline B—Changes in matter—Learners are able to identify basic characteristics of and changes in matter.

Mathematics

MP.2: Reason abstractly and quantitatively.

MP.5: Use appropriate tools strategically.

3.MD.A.2: Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem.

Grade 3 | Unit 2 Energy

RECOMMENDED TIME: NOVEMBER – JANUARY (11 WEEKS)

Unit Overview:

Students should understand that energy exists in a variety of forms. Students should observe the results of simple energy transformations from one form to another in their physical environment. The safe use and respect of various energy forms must be stressed in the classroom. Describe a variety of forms of energy (e.g., heat, chemical, light) and the changes that occur in objects when they interact with those forms of energy.

Essential Question:
How does the use of various forms of energy affect our world?

Key Ideas:

PS. Key Idea 4: Energy exists in many forms, and when these forms change energy is conserved.

NYS SCIENCE STANDARDS

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

MST STANDARDS

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

NGSS CROSS-CUTTING CONCEPTS

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

Major Understandings:

Quoted from New York State Performance Indicators (PS: 4.1a-d, f, g, 4.2a, b)

- Energy exists in various forms: heat, electric, sound, chemical, mechanical, light. **(4.1a)**
- Everyday events involve one form of energy being changed to another. **(4.2a)**
 - Animals convert food to heat and motion.
 - The Sun's energy warms the air and water.
- Humans utilize interactions between matter and energy. **(4.2b)**
 - Chemical to electrical, light, and heat: battery and bulb.
 - Electrical to sound (e.g., doorbell buzzer).
 - Mechanical to sound (e.g., musical instruments, clapping)
 - Light to electrical (e.g., solar-powered calculator).

continued

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.

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.

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).

continued

Patterns:

Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.

- 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.

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.

continued

NYS SCIENCE STANDARDS

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

- Energy can be transferred from one place to another. **(4.1b)** 
- Some materials transfer energy better than others (heat and electricity). **(4.1c)**
- Energy and matter interact: water is evaporated by the Sun's heat; a bulb is lighted by means of electrical current; a musical instrument is played to produce sound; dark colors may absorb light, light colors may reflect light. **(4.1d)** 
- Heat can be released in many ways, for example, by burning, rubbing (friction), or combining one substance with another. **(4.1f)**
- Interactions with forms of energy can be either helpful or harmful. **(4.1g)** 

MST STANDARDS

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

- Key Idea 5:** Identifying patterns of change is necessary for making predictions about future behavior and conditions.
- Key Idea 6:** In order to arrive at the best solution that meets criteria within constraints, it is often necessary to make trade-offs.

NGSS CROSS-CUTTING CONCEPTS

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

- Events that occur together with regularity might or might not be a cause and effect relationship.

Scale, Proportion, and Quantity:

In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change.

- Natural objects and/or observable phenomena exist from the very small to the immensely large or from very short to very long time periods.
- Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume.

Systems and System Models:

A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.

- 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.

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.
- 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.

Structure and Function:

The way an object is shaped or structured determines many of its properties and functions.

- Different materials have different substructures, which can sometimes be observed.
- Substructures have shapes and parts that serve functions.

Stability and Change:

For both designed and natural systems, conditions that affect stability and factors that control rates of change are critical elements to consider and understand.

- 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.

COMMON CORE STATE STANDARDS

<http://www.corestandards.org/ELA-Literacy/>
http://www.corestandards.org/wp-content/uploads/Math_Standards.pdf

ELA/Literacy

RI.3.3: Describe the relationship between a series of historical events, scientific ideas or concepts or steps in technical procedures in a text using language that pertains to time, sequence, and cause/effect.

RI.3.4: Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a Grade 3 topic or subject area.

RI.3.7: Use information gained from illustrations (e.g., maps, photographs) and the words in a text (e.g., comparison, cause/effect, first/second/third in a sequence).

RI.3.10: Read and comprehend informational text.

W.3.2: Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

W.3.5: With guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, and editing.

W.3.6: With guidance and support from adults, use technology to produce and publish writing.

SL.3.1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on Grade 4 topics and texts, building on others' ideas and expressing their own clearly.

SL.3.3: Ask and answer questions about information from a speaker, offering appropriate elaboration and detail.

L.3.3: Use knowledge of language and its conventions when writing, speaking, reading or listening.

L.3.4: Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on Grade 3 reading and content, choosing flexibility from an array of strategies.

Mathematics

MP.2: Reason abstractly and quantitatively.

MP.4: Model with mathematics.

MP.5: Use appropriate tools strategically.

3.MD.B.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step “how many more” and “how many less” problems using information presented in bar graphs.

ENVIRONMENTAL GUIDELINES FOR LEARNING

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

Strand 1: Questioning, Analysis, and Interpretation Skills

- Guideline A—Questioning—Learners are able to develop questions that help them learn about the environment and do simple investigations.
- Guideline B—Designing investigations—Learners are able to design simple investigations.
- Guideline C—Collecting information—Learners are able to locate and collect information about the environment and environmental topics.
- Guideline D—Evaluating accuracy and reliability—Learners understand the need to use reliable information to answer their questions. They are familiar with some basic factors to consider in judging the merits of information.
- Guideline E—Organizing information—Learners are able to describe data and organize information to search for relationships and patterns concerning the environment and environmental topics.
- Guideline F—Working with models and simulations—Learners understand that relationships, patterns, and processes can be represented by models.
- Guideline G—Drawing conclusions and developing explanations—Learners can develop simple explanations that address their questions about the environment.

Strand 2.0: Knowledge of Environmental Processes and Systems

Strand 2.1: The Earth as a Physical System

- Guideline C—Energy—While they may have little understanding of formal concepts associated with energy, learners are familiar with the basic behavior of some different forms of energy.

Strand 2.4: Environment and Society

- Guideline A—Human/environment interactions—Learners understand that people depend on, change, and are affected by the environment.
- Guideline C—Resources—Learners understand the basic concepts of resource and resource distribution.
- Guideline E—Environmental issues—Learners are familiar with some local environmental issues and understand that people in other places experience environmental issues as well.

continued

ENVIRONMENTAL GUIDELINES FOR LEARNING

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

Strand 3: Skills for Understanding and Addressing Environmental Issues

Strand 3.1: Skills for Analyzing and Investigating Environmental Issues

- Guideline C—Identifying and evaluating alternative solutions and courses of action—Learners understand there are many approaches to resolving issues.

Strand 4: Personal and Civic Responsibility

- Guideline D—Accepting personal responsibility—Learners understand that they have responsibility for the effects of their actions.

Grade 3 | Unit 3 Simple Machines

RECOMMENDED TIME: FEBRUARY – MARCH (7 WEEKS)

Unit Overview:

Students will observe and describe the ease and difficulty of the movement of objects in their world. Exploring the observable effects of gravity helps students develop an understanding of the reason for the direction of an object's motion. Manipulation and application of simple tools and machines may help students learn about the relationships between forces and motion. Describe the effects of common forces (pushes and pulls) of objects, such as those caused by gravity, and mechanical forces.

Essential Question:
How do simple machines help us in our daily lives?

Key Ideas:

PS. Key Idea 5: Energy and matter interact through forces that result in changes in motion.

NYS SCIENCE STANDARDS

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

Major Understandings:

Quoted from New York State Performance Indicators (PS: 5.1b-d, f)

- Mechanical energy may cause change in motion through the application of force and through the use of simple machines such as pulleys, levers, and inclined planes. **(5.1f)**
- The amount of change in the motion of an object is affected by friction. **(5.1d)**
- The position or direction of motion of an object can be changed by pushing or pulling. **(5.1b)**
- The force of gravity pulls objects toward the center of Earth. **(5.1c)**

MST STANDARDS

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

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.
- 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.
- 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).

continued

NGSS CROSS-CUTTING CONCEPTS

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

Patterns:

Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.

- 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.

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.

continued

	<p style="text-align: center;">MST STANDARDS</p> <p style="text-align: center;">http://www.p12.nysed.gov/ciai/mst/pub/elecoresci.pdf</p>	<p style="text-align: center;">NGSS CROSS-CUTTING CONCEPTS</p> <p style="text-align: center;">http://www.nextgenscience.org/sites/ngss/files/Appendix%20G%20-%20Crosscutting%20Concepts%20FINAL%20edited%204.10.13.pdf</p>
	<p>Key Idea 5: Identifying patterns of change is necessary for making predictions about future behavior and conditions.</p> <p>Key Idea 6: In order to arrive at the best solution that meets criteria within constraints, it is often necessary to make trade-offs.</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>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"> ■ Events that occur together with regularity might or might not be a cause and effect relationship. <p>Scale, Proportion, and Quantity:</p> <p>In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change.</p> <ul style="list-style-type: none"> ■ Natural objects and/or observable phenomena exist from the very small to the immensely large or from very short to very long time periods. ■ Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume. <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.

Structure and Function:

The way an object is shaped or structured determines many of its properties and functions.

- Different materials have different substructures, which can sometimes be observed.
- Substructures have shapes and parts that serve functions.

Stability and Change:

For both designed and natural systems, conditions that affect stability and factors that control rates of change are critical elements to consider and understand.

- 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.

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.
- 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.

COMMON CORE STATE STANDARDS

<http://www.corestandards.org/ELA-Literacy/>
http://www.corestandards.org/wpcontent/uploads/Math_Standards.pdf

ELA/Literacy

RI.3.3: Describe the relationship between a series of historical events, scientific ideas or concepts or steps in technical procedures in a text using language that pertains to time, sequence, and cause/effect.

RI.3.4: Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a Grade 3 topic or subject area.

RI.3.7: Use information gained from illustrations (e.g., maps, photographs) and the words in a text (e.g., comparison, cause/effect, first/second/third in a sequence).

RI.3.10: Read and comprehend informational text.

W.3.2: Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

W.3.5: With guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, and editing.

W.3.6: With guidance and support from adults, use technology to produce and publish writing.

SL.3.1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on Grade 3 topics and texts, building on others' ideas and expressing their own clearly.

SL.3.3: Ask and answer questions about information from a speaker, offering appropriate elaboration and detail.

L.3.3: Use knowledge of language and its conventions when writing, speaking, reading or listening.

L.3.4: Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on Grade 3 reading and content, choosing flexibility from an array of strategies.

Mathematics

MP.2: Reason abstractly and quantitatively.

MP.5: Use appropriate tools strategically.

ENVIRONMENTAL GUIDELINES FOR LEARNING

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

Strand 1: Questioning, Analysis, and Interpretation Skills

- Guideline A—Questioning—Learners are able to develop questions that help them learn about the environment and do simple investigations.
- Guideline B—Designing investigations—Learners are able to design simple investigations.
- Guideline C—Collecting information—Learners are able to locate and collect information about the environment and environmental topics.
- Guideline D—Evaluating accuracy and reliability—Learners understand the need to use reliable information to answer their questions. They are familiar with some basic factors to consider in judging the merits of information.
- Guideline E—Organizing information—Learners are able to describe data and organize information to search for relationships and patterns concerning the environment and environmental topics.
- Guideline F—Working with models and simulations—Learners understand that relationships, patterns, and processes can be represented by models.
- Guideline G—Drawing conclusions and developing explanations—Learners can develop simple explanations that address their questions about the environment.

Strand 2: Knowledge of Environmental Processes and Systems

Strand 2.1: The Earth as a Physical System

- Guideline C—Energy—While they may have little understanding of formal concepts associated with energy, learners are familiar with the basic behavior of some different forms of energy.

Strand 2.4: Environment and Society

- Guideline A—Human/environment interactions—Learners understand that people depend on, change, and are affected by the environment.
- Guideline C—Resources—Learners understand the basic concepts of resource and resource distribution.
- Guideline D—Technology—Learners understand that technology is an integral part of human existence and culture.

Strand 3.2: Decision-Making and Citizenship Skills

- Guideline C—Planning and taking action—By participating in issues of their choosing—mostly close to home—they learn the basics of individual and collective action.

Grade 3 | Unit 4 Plant and Animal Adaptations

RECOMMENDED TIME: APRIL – JUNE (11 WEEKS)

Unit Overview:

Recognize that for humans and other living things there is genetic continuity between generations. Describe how the structures of plants and animals are appropriate for the environment of that plant or animal. Describe basic life functions of common living organisms (e.g., guppies, mealworms, gerbils). Describe some survival behaviors of common living organisms. Describe how plants and animals, including humans, depend upon each other and the nonliving environment. *[Refer to Appendix A for the Humane Treatment of Animals and for Conservation Day]*

Essential Question:
How can we best inform the community about creating and sustaining wildlife, pollinator, and food habitats in urban and suburban NYC communities?

Key Ideas:

- LE. Key Idea 2:** Organisms inherit genetic information in a variety of ways that result in continuity of structure and function between parents and offspring.
- LE. Key Idea 3:** Individual organisms and species change over time.
- 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 environment.

NYS SCIENCE STANDARDS

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

MST STANDARDS

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

NGSS CROSS-CUTTING CONCEPTS

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

Major Understandings:

Quoted from New York State Performance Indicators (LE: 2.1a, b, 3.1 a-c, 5.1a, b, 5.2a, b, d-f and 6.1f)

- All living things grow, take in nutrients, breathe, reproduce, and eliminate waste. **(5.1a)** 
- An organism's external physical features can enable it to carry out life functions in its particular environment. **(5.1b)** 
- Each plant has different structures that serve different functions in growth, survival, and reproduction. **(3.1b)** 
 - Roots help support the plant and take in water and nutrients.
 - Leaves help plants utilize sunlight to make food for the plant.

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 effective 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.

continued

Patterns:

- Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.
- 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.

continued

NYS SCIENCE STANDARDS

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

- Stems, stalks, trunks, and other similar structures provide support for the plant.
- Some plants have flowers.
- Flowers are reproductive structures of plants that produce fruit which contains seeds.
- Seeds contain stored food that aids in germination and the growth of young plants.
- In order to survive in their environment, plants and animals must be adapted to that environment. **(3.1c)** 
 - Seeds disperse by a plant's own mechanism and/or in a variety of ways that can include wind, water, and animals.
 - Leaf, flower, stem, and root adaptations may include variations in size, shape, thickness, color, smell, and texture.
 - Animal adaptations include coloration for warning or attraction, camouflage, defense mechanisms, movement, hibernation, and migration.
- Plants respond to changes in their environment. For example, the leaves of some green plants change position as the direction of light changes; the parts of some plants undergo seasonal changes that enable the plant to grow; seeds germinate, and leaves form and grow. **(5.2a)** 
- When the environment changes, some plants and animals survive and reproduce, and others die or move to new locations. **(6.1f)** 
- Each animal has different structures that serve different functions in growth, survival, and reproduction. **(3.1a)** 
 - Wings, legs, or fins enable some animals to seek shelter and escape predators.

continued

MST STANDARDS

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

- Key Idea 2:** Models are simplified representations of objects, structures, or systems used in analysis, explanation, interpretation, or design.
- 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.
- 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).
- Key Idea 5:** Identifying patterns of change is necessary for making predictions about future behavior and conditions.
- Key Idea 6:** In order to arrive at the best solution that meets criteria within constraints, it is often necessary to make trade-offs.
- Standard 7: Interdisciplinary Problem Solving**
- 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.
- 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.

NGSS CROSS-CUTTING CONCEPTS

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

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.

Scale, Proportion, and Quantity:

In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change.

- Natural objects and/or observable phenomena exist from the very small to the immensely large or from very short to very long time periods.
- Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume.

Systems and System Models:

A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.

- 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.

continued

NYS SCIENCE STANDARDS

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

- The mouth, including teeth, jaws, and tongue, enables some animals to eat and drink.
- Eyes, nose, ears, tongue, and skin of some animals enable the animals to sense their surroundings.
- Claws, shells, spines, feathers, fur, scales, and color of body covering enable some animals to protect themselves from predators and other environmental conditions, or enable them to obtain food.
- Some animals have parts that are used to produce sounds and smells to help the animal meet its needs.
- The characteristics of some animals change as seasonal conditions change (e.g., fur grows and is shed to help regulate body heat; body fat is a form of stored energy and it changes as the seasons change).
- Animals respond to change in their environment, (e.g., perspiration, heart rate, breathing rate, eye blinking, shivering, and salivating). **(5.2b)**
- Some animals, including humans, move from place to place to meet their needs. **(5.2d)** 
- Particular animal characteristics are influenced by changing environmental conditions including: fat storage in winter, coat thickness in winter, camouflage, shedding of fur. **(5.2e)** 
- Some animal behaviors are influenced by environmental conditions. These behaviors may include: nest building, hibernating, hunting, migrating, and communicating. **(5.2f)** 
- Some traits of living things have been inherited (e.g., color of flowers and number of limbs of animals). **(2.1a)**
- Some characteristics result from an individual's interactions with the environment and cannot be inherited by the next generation (e.g., having scars; riding a bicycle). **(2.1b)**

NGSS CROSS-CUTTING CONCEPTS

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

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.
- 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.

Structure and Function:

The way an object is shaped or structured determines many of its properties and functions.

- Different materials have different substructures, which can sometimes be observed.
- Substructures have shapes and parts that serve functions.

Stability and Change:

For both designed and natural systems, conditions that affect stability and factors that control rates of change are critical elements to consider and understand.

- 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.

COMMON CORE STATE STANDARDS

<http://www.corestandards.org/ELA-Literacy/>
http://www.corestandards.org/wp-content/uploads/Math_Standards.pdf

ELA/Literacy

RI.3.3: Describe the relationship between a series of historical events, scientific ideas or concepts or steps in technical procedures in a text using language that pertains to time, sequence, and cause/effect.

RI.3.4: Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a Grade 3 topic or subject area.

RI.3.7: Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur).

W.3.2: Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

W.3.5: With guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, and editing.

W.3.6: With guidance and support from adults, use technology to produce and publish writing.

W.3.7: Conduct short research projects that build knowledge about a topic.

SL.3.1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on Grade 3 topics and texts, building on others' ideas and expressing their own clearly.

SL.3.3: Ask and answer questions about information from a speaker, offering appropriate elaboration and detail.

L.3.3: Use knowledge of language and its conventions when writing, speaking, reading or listening.

L.3.4: Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on Grade 3 reading and content, choosing flexibility from an array of strategies.

Mathematics

MP.2: Reason abstractly and quantitatively.

MP.4: Model with mathematics.

MP.5: Use appropriate tools strategically.

3.NBT: Number and Operations in Base Ten

continued

ENVIRONMENTAL GUIDELINES FOR LEARNING

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

Strand 1: Questioning, Analysis, and Interpretation Skills

- Guideline A—Questioning—Learners are able to develop questions that help them learn about the environment and do simple investigations.
- Guideline B—Designing investigations—Learners are able to design simple investigations.
- Guideline C—Collecting information—Learners are able to locate and collect information about the environment and environmental topics.
- Guideline D—Evaluating accuracy and reliability—Learners understand the need to use reliable information to answer their questions. They are familiar with some basic factors to consider in judging the merits of information.
- Guideline E—Organizing information—Learners are able to describe data and organize information to search for relationships and patterns concerning the environment and environmental topics.
- Guideline F—Working with models and simulations—Learners understand that relationships, patterns, and processes can be represented by models.
- Guideline G—Drawing conclusions and developing explanations—Learners can develop simple explanations that address their questions about the environment.

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 B—Heredity and evolution—Learners understand that plants and animals have different characteristics and that many of the characteristics are inherited.
- Guideline C—Systems and connections—Learners understand basic ways in which organisms are related to their environments and other organisms.
- Guideline D—Flow of matter and energy—Learners know that living things need some source of energy to live and grow.

Strand 2.4: Environment and Society

- Guideline A—Human/environment interactions—Learners understand that people depend on, change, and are affected by the environment.

continued

COMMON CORE STATE STANDARDS

<http://www.corestandards.org/ELA-Literacy/>
http://www.corestandards.org/wp-content/uploads/Math_Standards.pdf

3.MD.B.3: Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step “how many more” and “how many less” problems using information presented in scaled bar graphs.

3.MD.B.4: Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters.

ENVIRONMENTAL GUIDELINES FOR LEARNING

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

- Guideline E—Environmental issues—Learners are familiar with some local environmental issues and understand that people in other places experience environmental issues as well.

Strand 3: Skills for Understanding and Addressing Environmental Issues

Strand 3.1: Skills for Analyzing and Investigating Environmental Issues

- Guideline A—Identifying and investigating issues—Learners are able to identify and investigate issues in their local environments and communities.
- Guideline B—Sorting out the consequences of issues—As learners come to understand that environmental and social phenomena are linked, they are able to explore the consequences of issues.

Strand 4: Personal and Civic Responsibility

- Guideline A—Understanding societal values and principles – Learners can identify fundamental principles of U.S. society and explain their importance in the context of environmental issues.
- Guideline D—Accepting personal responsibility—Learners understand that they have responsibility for the effects of their actions.

Grade 4 | Unit 1

Animals and Plants in their Environment

RECOMMENDED TIME: SEPTEMBER – OCTOBER (8 WEEKS)

Unit Overview:

Plants, animals and their environment are interdependent. Plants and animals interact in a number of ways that affect their survival. The survival of plants and animals varies, in response to their particular environment. As the physical environment changes over time, plants and animals adapt. *[Refer to Appendix A for the Humane Treatment of Animals and for Conservation Day]*

Essential Question:
What are the interactions of animals and plants within an ecosystem?

Key Ideas:

- LE. Key Idea 3:** Individual organisms and species change over time.
- 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.
- LE. Key Idea 6:** Plants and animals depend on each other and their environment.
- LE. Key Idea 7:** Identify ways in which humans have changed their environment and the effects of those changes.

NYS SCIENCE STANDARDS

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

MST STANDARDS

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

NGSS CROSS-CUTTING CONCEPTS

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

Major Understandings:

Quoted from New York State Performance Indicators (LE: 3.2a, b, 4.2b, 5.2c, g, 6.1a, f, 6.2a, b, 7.1a-c)

- Green plants are producers because they provide the basic food supply for themselves and animals. **(6.1a)** 
- All animals depend on plants. Some animals (predators) eat other animals (prey). **(6.1b)** 
- Animals that eat plants for food may in turn become food for other animals. This sequence is called a food chain. **(6.1c)** 
- Decomposers are living things that play a vital role in recycling nutrients. **(6.1d)** 

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 effective 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.

continued

Patterns:

Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.

- 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.

continued

NYS SCIENCE STANDARDS

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

- Plants manufacture food by utilizing air, water, and energy from the Sun. **(6.2a)** 
- The Sun's energy is transferred on Earth from plants to animals through the food chain. **(6.2b)** 
- Food supplies the energy and materials necessary for growth and repair. **(4.2b)** 
- An organism's pattern of behavior is related to the nature of that organism's environment, including the kinds and numbers of other organisms present, the availability of food and other resources, and the physical characteristics of the environment. **(6.1e)** 
- Individuals within a species may compete with each other for food, mates, space, water, and shelter in their environment. **(3.2a)** 
- All individuals have variations, and because of these variations, individuals of a species may have an advantage in surviving and reproducing. **(3.2b)** 
- 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)** 
- Senses can provide essential information (regarding danger, food, mates, etc.) to animals about their environment. **(5.2c)** 
- When the environment changes, some plants and animals survive and reproduce, and others die or move to new locations. **(6.1f)** 
- Humans depend on their natural and constructed environments. **(7.1a)** 

continued

MST STANDARDS

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

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

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.

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).

Key Idea 5: Identifying patterns of change is necessary for making predictions about future behavior and conditions.

Key Idea 6: In order to arrive at the best solution that meets criteria within constraints, it is often necessary to make trade-offs.

Standard 7: Interdisciplinary Problem Solving

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.

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.

NGSS CROSS-CUTTING CONCEPTS

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

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.

Scale, Proportion, and Quantity:

In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change.

- Natural objects and/or observable phenomena exist from the very small to the immensely large or from very short to very long time periods.
- Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume.

Systems and System Models:

A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.

- 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.

continued

NYS SCIENCE STANDARDS

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

- Over time humans have changed their environment by cultivating crops and raising animals, creating shelter, using energy, manufacturing goods, developing means of transportation, changing populations, and carrying out other activities. **(7.1b)** 
- Humans, as individuals or communities, change environments in ways that can be either helpful or harmful for themselves and other organisms. **(7.1c)** 

NGSS CROSS-CUTTING CONCEPTS

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

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.
- 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.

Structure and Function:

- The way an object is shaped or structured determines many of its properties and functions.
- Different materials have different substructures, which can sometimes be observed.
- Substructures have shapes and parts that serve functions.

Stability and Change:

For both designed and natural systems, conditions that affect stability and factors that control rates of change are critical elements to consider and understand.

- 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.

COMMON CORE STATE STANDARDS

<http://www.corestandards.org/ELA-Literacy/>
http://www.corestandards.org/wp-content/uploads/Math_Standards.pdf

ELA/Literacy

RI.4.3: Explain events, procedures, ideas, or concepts in a historical, scientific or technical text, including what happened and why, based on specific information in the text.

RI.4.4: Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a Grade 4 topic or subject area.

RI.4.5: Describe the overall structure (e.g., chronology, comparison, cause/effect, problem/solution) of events, ideas, concepts or information in a text or part of a text.

RI.4.7: Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.

W.4.2: Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

W.4.4: Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience.

W.4.6: With some guidance and support from adults, use technology, including the Internet, to produce and publish writing as well as to interact and collaborate with others; demonstrate sufficient command of keyboarding skills to type a minimum of one page in a single sitting.

SL.4.1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on Grade 4 topics and texts, building on others' ideas and expressing their own clearly.

SL.4.3: Identify the reasons and evidence a speaker provides to support particular points.

Mathematics

MP.2: Reason abstractly and quantitatively.

MP.4: Model with mathematics.

MP.5: Use appropriate tools strategically.

4.MD.4: Make a line plot to display a data set of measurements in fractions of a unit ($\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$). Solve problems involving addition and subtraction of fractions by using information presented in line plots. For example, from a line plot find and interpret the difference in length between the longest and shortest specimens in an insect collection.

ENVIRONMENTAL GUIDELINES FOR LEARNING

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

Strand 1: Questioning, Analysis, and Interpretation Skills

- Guideline E—Organizing information —Learners are able to describe data and organize information to search for relationships and patterns concerning the environment and environmental topics.
- Guideline F—Working with models and simulations—Learners understand that relationships, patterns, and processes can be represented by models.
- Guideline G—Drawing conclusions and developing explanations—Learners can develop simple explanations that address their questions about the environment.

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 other organisms.

Strand 2.4: Environment and Society

- Guideline A—Human/environment interactions—Learners understand that people depend on, change, and are affected by the environment.
- Guideline B—Places—Learners understand that places differ in their physical and human characteristics.
- Guideline E—Environmental issues—Learners are familiar with some local environmental issues and understand that people in other places experience environmental issues as well.

Strand 3: Skills for Understanding and Addressing Environmental Issues

Strand 3.1: Skills for Analyzing and Investigating Environmental Issues

- Guideline A—Identifying and investigating issues—Learners are able to identify and investigate issues in their local environments and communities.

Grade 4 | Unit 2 Electricity and Magnetism

RECOMMENDED TIME: NOVEMBER – JANUARY (11 WEEKS)

Unit Overview:

Students will understand characteristics and properties of electricity and magnetism. They will also understand the relationship between electricity and magnetism. The focus will be on simple circuits, conductivity and magnetic force.

Essential Question:
How does the use of electricity and magnetism affect our world?

Key Ideas:

PE. Key Idea 3: Matter is made up of particles whose properties determine the observable characteristics of matter and its reactivity.

PE. Key Idea 4: Energy exists in many forms, and when these forms change energy is conserved.

PE. Key Idea 5 (PE): Energy and matter interact through forces that result in changes in motion.

NYS SCIENCE STANDARDS

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

MST STANDARDS

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

NGSS CROSS-CUTTING CONCEPTS

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

Major Understandings:

Quoted from New York State Performance Indicators (PE: 3.1c, e, f, 4.1a-e, g, 5.1e, 5.2a, b)

- Energy exists in various forms: heat, electric, sound, chemical, mechanical, light. **(4.1a)**
- Energy can be transferred from one place to another. **(4.1b)** 
- Some materials transfer energy better than others (heat and electricity). **(4.1c)**
- Energy and matter interact: water is evaporated by the Sun's heat; a bulb is lighted by means of electrical current; a musical instrument is played to produce sound; dark colors may absorb light, light colors may reflect light. **(4.1d)** 

continued

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.

Key Idea 6: In order to arrive at the best solution that meets criteria within constraints, it is often necessary to make trade-offs.

Standard 7: Interdisciplinary Problem Solving

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.

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.

Systems and System Models:

A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.

- A system is a group of related parts that make up a whole and can carry out functions its individual parts cannot.

continued

NYS SCIENCE STANDARDS

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

- Electricity travels in a closed circuit. **(4.1e)**
- Objects have properties that can be observed, described, and/or measured: length, width, volume, size, shape, mass or weight, temperature, texture, flexibility, reflectiveness of light. **(3.1c)**
- The material(s) an object is made up of determine some specific properties of the object (sink/float, conductivity, magnetism). Properties can be observed or measured with tools such as hand lenses, metric rulers, thermometers, balances, magnets, circuit testers, and graduated cylinders. **(3.1e)**
- Objects and/or materials can be sorted or classified according to their properties. **(3.1f)** 
- Magnetism is a force that may attract or repel certain materials. **(5.1e)**
- The forces of gravity and magnetism can affect objects through gases, liquids, and solids. **(5.2a)**
- The force of magnetism on objects decreases as distance increases. **(5.2b)**
- Interactions with forms of energy can be either helpful or harmful. **(4.1g)** 

MST STANDARDS

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

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.

NGSS CROSS-CUTTING CONCEPTS

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

- A system can be described in terms of its components and their interactions.

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.
- 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.

Structure and Function:

The way an object is shaped or structured determines many of its properties and functions.

- Different materials have different substructures, which can sometimes be observed.
- Substructures have shapes and parts that serve functions.

Stability and Change:

For both designed and natural systems, conditions that affect stability and factors that control rates of change are critical elements to consider and understand.

- 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.

COMMON CORE STATE STANDARDS:

<http://www.corestandards.org/ELA-Literacy/>
http://www.corestandards.org/wp-content/uploads/Math_Standards.pdf

ELA/Literacy

RI.4.3: Explain events, procedures, ideas, or concepts in a historical, scientific or technical text, including what happened and why, based on specific information in the text.

RI.4.4: Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a Grade 4 topic or subject area.

RI.4.5: Describe the overall structure (e.g., chronology, comparison, cause/effect, problem/solution) of events, ideas, concepts or information in a text or part of a text.

RI.4.7: Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.

W.4.2: Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

W.4.4: Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience.

W.4.6: With some guidance and support from adults, use technology, including the Internet, to produce and publish writing as well as to interact and collaborate with others; demonstrate sufficient command of keyboarding skills to type a minimum of one page in a single sitting.

SL.4.1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on Grade 4 topics and texts, building on others' ideas and expressing their own clearly.

SL.4.3: Identify the reasons and evidence a speaker provides to support particular points.

Mathematics

MP.2: Reason abstractly and quantitatively.

MP.5: Use appropriate tools strategically.

ENVIRONMENTAL GUIDELINES FOR LEARNING

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

Strand 1: Questioning, Analysis, and Interpretation Skills

- Guideline A—Questioning—Learners are able to develop questions that help them learn about the environment and do simple investigations.
- Guideline B—Designing investigations—Learners are able to design simple investigations.
- Guideline C—Collecting information—Learners are able to locate and collect information about the environment and environmental topics.
- Guideline F—Working with models and simulations—Learners understand that relationships, patterns, and processes can be represented by models.
- Guideline G—Drawing conclusions and developing explanations—Learners can develop simple explanations that address their questions about the environment.

Strand 2: Knowing of Environmental Processes and Systems

Strand 2.3: Humans and Their Societies

- Guideline A—Individuals and groups—Learners understand that people act as individuals and as group members and that groups can influence individual actions.
- Guideline D—Global connections—Learners understand how people are connected at many levels -including the global level-by actions and common responsibilities that concern the environment.
- Guideline E—Change and conflict—Learners recognize that change is a normal part of individual and societal life. They understand that conflict is rooted in different points of view.

Strand 3: Skills for Understanding and Addressing Environmental Issues

Strand 3.1: Skills for Analyzing and Investigating Environmental Issues

- Guideline A—Identifying and investigating issues—Learners are able to identify and investigate issues in their local environments and communities.
- Guideline B—Sorting out the consequences of issues—As learners come to understand that environmental and social phenomena are linked, they are able to explore the consequences of issues.
- Guideline C—Identifying and evaluating alternative solutions and courses of action—Learners understand there are many approaches to resolving issues.

continued

ENVIRONMENTAL GUIDELINES FOR LEARNING

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

- Guideline D—Working with flexibility, creativity, and openness—Learners understand the importance of sharing ideas and hearing other points of view.

Strand 3.2: Decision-Making and Citizenship Skills

- Guideline A—Forming and evaluating personal views—Learners are able to examine and express their own views on environmental issues.
- Guideline B—Evaluating the need for citizen action—Learners are able to think critically about whether they believe action is needed in particular situations and whether they believe they should be involved.
- Guideline C—Planning and taking action—By participating in issues of their choosing—mostly close to home—they learn the basics of individual and collective action.
- Guideline D—Evaluating the results of actions—Learners understand that civic actions have consequences.

Strand 4: Personal and Civic Responsibility

- Guideline A—Understanding societal values and principles—Learners can identify fundamental principles of U.S. society and explain their importance in the context of environmental issues.
- Guideline B—Recognizing citizens' rights and responsibilities—Learners understand the basic rights and responsibilities of citizenship.
- Guideline C—Recognizing efficacy—Learners possess a realistic self-confidence in their effectiveness as citizens.
- Guideline D—Accepting personal responsibility—Learners understand that they have responsibility for the effects of their actions.

Grade 4 | Unit 3 Properties of Water

RECOMMENDED TIME: FEBRUARY – MARCH (7 WEEKS)

Unit Overview:

Students observe and describe properties of materials, using appropriate tools. Students describe chemical and physical changes, including changes in states of matter with an emphasis on water.

Essential Question:

How do the properties of water affect living things and the natural environment?

Key Ideas:

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

PE. Key Idea 3: Matter is made up of particles whose properties determine the observable characteristics of matter and its reactivity.

PE. Key Idea 4: Energy exists in many forms, and when these forms change energy is conserved.

LE. Key Idea 6: Plants and animals depend on each other and their physical environment.

NYS SCIENCE STANDARDS

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

MST STANDARDS

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

NGSS CROSS-CUTTING CONCEPTS

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

MAJOR UNDERSTANDINGS:

Quoted from New York State Performance Indicators (PE: 2.1c, 3.1a-f, 3.2a-c, 4.1d, LE:6.2c)

- Matter takes up space and has mass. Two objects cannot occupy the same place at the same time. **(3.1a)**
- Matter has properties (color, hardness, odor, sound, taste, etc.) that can be observed through the senses. **(3.1b)**
- Objects have properties that can be observed, described, and/or measured: length, width, volume, size, shape, mass or weight, temperature, texture, flexibility, reflectiveness of light. **(3.1c)**
- Measurements can be made with standard metric units and nonstandard units. (Note: Exceptions to the metric system usage are found in meteorology.) **(3.1d)**

continued

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.

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.

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).

continued

Patterns:

Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.

- 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.

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.

continued

NYS SCIENCE STANDARDS

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

- The material(s) an object is made up of determine some specific properties of the object (sink/float, conductivity, magnetism). Properties can be observed or measured with tools such as hand lenses, metric rulers, thermometers, balances, magnets, circuit testers, and graduated cylinders. **(3.1e)**
- Water is recycled by natural processes on Earth. **(2.1c)** 
 - evaporation: changing of water (liquid) into water vapor (gas)
 - condensation: changing of water vapor (gas) into water (liquid)
 - precipitation: rain, sleet, snow, hail
 - runoff: water flowing on Earth's surface
 - groundwater: water that moves downward into the ground
- Matter exists in three states: solid, liquid, gas. **(3.2a)**
 - Solids have a definite shape and volume.
 - Liquids do not have a definite shape but have a definite volume.
 - Gases do not hold their shape or volume.
- Temperature can affect the state of matter of a substance. **(3.2b)**
- Changes in the properties or materials of objects can be observed and described. **(3.2c)**
- Heat energy from the Sun powers the water cycle (See Physical Science Key Idea 2.) **(LE: 6.2c)** 
- Objects and/or materials can be sorted or classified according to their properties. **(3.1f)** 
- Energy and matter interact: water is evaporated by the Sun's heat; a bulb is lighted by means of electrical current; a musical instrument is played to produce sound; dark colors may absorb light, light colors may reflect light. **(4.1d)** 

MST STANDARDS

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

- Key Idea 5:** Identifying patterns of change is necessary for making predictions about future behavior and conditions.
- Key Idea 6:** In order to arrive at the best solution that meets criteria within constraints, it is often necessary to make trade-offs.
- Standard 7: Interdisciplinary Problem Solving**
- 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.
- 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.

Structure and Function:

The way an object is shaped or structured determines many of its properties and functions.

- Different materials have different substructures, which can sometimes be observed.
- Substructures have shapes and parts that serve functions.

Stability and Change:

For both designed and natural systems, conditions that affect stability and factors that control rates of change are critical elements to consider and understand.

- 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.

NGSS CROSS-CUTTING CONCEPTS

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

- 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.

Scale, Proportion, and Quantity:

In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change.

- Natural objects and/or observable phenomena exist from the very small to the immensely large or from very short to very long time periods.
- Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume.

Systems and System Models:

A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.

- 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.

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.
- 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.

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

RI.4.3: Explain events, procedures, ideas, or concepts in a historical, scientific or technical text, including what happened and why, based on specific information in the text.

RI.4.4: Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a Grade 4 topic or subject area.

RI.4.5: Describe the overall structure (e.g., chronology, comparison, cause/effect, problem/solution) of events, ideas, concepts or information in a text or part of a text.

RI.4.7: Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.

W.4.2: Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

W.4.4: Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience.

W.4.6: With some guidance and support from adults, use technology, including the Internet, to produce and publish writing as well as to interact and collaborate with others; demonstrate sufficient command of keyboarding skills to type a minimum of one page in a single sitting.

SL.4.1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on Grade 4 topics and texts, building on others' ideas and expressing their own clearly.

SL.4.3: Identify the reasons and evidence a speaker provides to support particular points.

Mathematics

MP.2 : Reason abstractly and quantitatively.

MP.5 : Use appropriate tools strategically.

ENVIRONMENTAL GUIDELINES FOR LEARNING

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

Strand 1: Questioning, Analysis, and Interpretation Skills

- Guideline A—Questioning—Learners are able to develop questions that help them learn about the environment and do simple investigations.
- Guideline B—Designing investigations—Learners are able to design simple investigations.
- Guideline C—Collecting information—Learners are able to locate and collect information about the environment and environmental topics.
- Guideline D—Evaluating accuracy and reliability—Learners understand the need to use reliable information to answer their questions. They are familiar with some basic factors to consider in judging the merits of information.
- Guideline F—Working with models and simulations—Learners understand that relationships, patterns, and processes can be represented by models.
- Guideline G—Drawing conclusions and developing explanations—Learners can develop simple explanations that address their questions about the environment.

Strand 2: Knowing of Environmental Processes and Systems

Strand 2.1: The Earth as a Physical System

- Guideline A—Processes that shape the Earth—Learners are able to identify changes and differences in the physical environment.
- Guideline B—Changes in matter—Learners are able to identify basic characteristics of and changes in matter.
- Guideline C—Energy—While they may have little understanding of formal concepts associated with energy, learners are familiar with the basic behavior of some different forms of energy.

Strand 2.2: The Living Environment

- 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.

Strand 2.4: Environment and Society

- Guideline D—Technology—Learners understand that technology is an integral part of human existence and culture.

Grade 4 | Unit 4 Interactions of Air, Water, and Land

RECOMMENDED TIME: APRIL – JUNE (11 WEEKS)

Unit Overview:

The water cycle, weather, erosion, deposition, and extreme natural events involve interactions among air, water, and land.

Essential Question:
How do natural events affect our world?

Key Ideas:

PE. 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/elecoresci.pdf	MST STANDARDS http://www.p12.nysed.gov/ciai/mst/pub/elecoresci.pdf	NGSS CROSS-CUTTING CONCEPTS http://www.nextgenscience.org/sites/ngss/files/Appendix%20G%20-%20Crosscutting%20Concepts%20FINAL%20edited%204.10.13.pdf
<p>MAJOR UNDERSTANDINGS:</p> <p><i>Quoted from New York State Performance Indicators (PE: 2.1c-e)</i></p> <ul style="list-style-type: none"> ■ Erosion and deposition result from the interaction among air, water, and land. (2.1d)  — Interaction between air and water breaks down Earth materials. — Pieces of Earth material may be moved by air, water, wind, and gravity. — Pieces of Earth material will settle or deposit on land or in the water in different places. — Soil is composed of broken-down pieces of living and nonliving Earth material. ■ Water is recycled by natural processes on Earth. (2.1c)  — Evaporation: changing of water (liquid) into water vapor (gas) — Condensation: changing of water vapor (gas) into water (liquid). <i>continued</i> 	<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>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>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>Key Idea 5: Identifying patterns of change is necessary for making predictions about future behavior and conditions. <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>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. <i>continued</i>

NYS SCIENCE STANDARDS

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

- precipitation: rain, sleet, snow, hail
- runoff: water flowing on Earth's surface
- groundwater: water that moves downward into the ground
- Extreme natural events (floods, fires, earthquakes, volcanic eruptions, hurricanes, tornadoes, and other severe storms) may have positive or negative impacts on living things. **(2.1e)** 

MST STANDARDS

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

Key Idea 6: In order to arrive at the best solution that meets criteria within constraints, it is often necessary to make trade-offs.

Standard 7: Interdisciplinary Problem Solving

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.

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.

Stability and Change:

For both designed and natural systems, conditions that affect stability and factors that control rates of change are critical elements to consider and understand.

- 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.

NGSS CROSS-CUTTING CONCEPTS

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

Scale, Proportion, and Quantity:

In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change.

- Natural objects and/or observable phenomena exist from the very small to the immensely large or from very short to very long time periods.
- Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume.

Systems and System Models:

A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.

- 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.

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.
- 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.

COMMON CORE STATE STANDARDS

<http://www.corestandards.org/ELA-Literacy/>
http://www.corestandards.org/wp-content/uploads/Math_Standards.pdf

ELA/Literacy

RI.4.3: Explain events, procedures, ideas, or concepts in a historical, scientific or technical text, including what happened and why, based on specific information in the text.

RI.4.4: Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a Grade 4 topic or subject area.

RI.4.5: Describe the overall structure (e.g., chronology, comparison, cause/effect, problem/solution) of events, ideas, concepts or information in a text or part of a text.

RI.4.7: Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.

W.4.2: Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

W.4.4: Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience.

W.4.6: With some guidance and support from adults, use technology, including the Internet, to produce and publish writing as well as to interact and collaborate with others; demonstrate sufficient command of keyboarding skills to type a minimum of one page in a single sitting.

W.4.7: Conduct short research projects that build knowledge through investigation of different aspects of a topic.

SL.4.1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on Grade 4 topics and texts, building on others' ideas and expressing their own clearly.

SL.4.3: Identify the reasons and evidence a speaker provides to support particular points.

Mathematics

MP.2: Reason abstractly and quantitatively.

MP.4: Model with mathematics.

MP.5: Use appropriate tools strategically.

continued

ENVIRONMENTAL GUIDELINES FOR LEARNING

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

Strand 1: Questioning, Analysis, and Interpretation Skills

- Guideline A—Questioning—Learners are able to develop questions that help them learn about the environment and do simple investigations.
- Guideline B—Designing investigations—Learners are able to design simple investigations.
- Guideline C—Collecting information—Learners are able to locate and collect information about the environment and environmental topics.
- Guideline D—Evaluating accuracy and reliability—Learners understand the need to use reliable information to answer their questions. They are familiar with some basic factors to consider in judging the merits of information.
- Guideline E—Organizing information—Learners are able to describe data and organize information to search for relationships and patterns concerning the environment and environmental topics.
- Guideline F—Working with models and simulations—Learners understand that relationships, patterns, and processes can be represented by models.
- Guideline G—Drawing conclusions and developing explanations—Learners can develop simple explanations that address their questions about the environment.

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 are able to identify changes and differences in the physical environment.
- Guideline B—Changes in matter—Learners are able to identify basic characteristics of and changes in matter.
- Guideline C—Energy—While they may have little understanding of formal concepts associated with energy, learners are familiar with the basic behavior of some different forms of energy.

Strand 2.3: Humans and Their Societies

- Guideline A—Individuals and groups—Learners understand that people act as individuals and as group members and that groups can influence individual actions.
- Guideline C—Political and economic systems—Learners understand that government and economic systems exist because people living together in groups need ways to do things such as provide for needs and wants, maintain order, and manage conflict.

continued

COMMON CORE STATE STANDARDS

<http://www.corestandards.org/ELA-Literacy/>
http://www.corestandards.org/wp-content/uploads/Math_Standards.pdf

4.MD.A.1: Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table.

4.MD.A.2: Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.

4.OA.A.1: Interpret a multiplication equation as a comparison, e.g., interpret $35 = 5 \times 7$ as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.

Strand 3.2: Decision-Making and Citizenship Skills

- Guideline A—Forming and evaluating personal views—Learners are able to examine and express their own views on environmental issues.
- Guideline B—Evaluating the need for citizen action—Learners are able to think critically about whether they believe action is needed in particular situations and whether they believe they should be involved.
- Guideline C—Planning and taking action—By participating in issues of their choosing—mostly close to home—they learn the basics of individual and collective action.
- Guideline D—Evaluating the results of actions—Learners understand that civic actions have consequences.

ENVIRONMENTAL GUIDELINES FOR LEARNING

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

- Guideline D—Global connections—Learners understand how people are connected at many levels—including the global level—by actions and common responsibilities that concern the environment.

Strand 2.4: Environment and Society

- Guideline A—Human/environment interactions—Learners understand that people depend on, change, and are affected by the environment.
- Guideline B—Places—Learners understand that places differ in their physical and human characteristics.
- Guideline C—Resources—Learners understand the basic concepts of resource and resource distribution.
- Guideline D—Technology—Learners understand that technology is an integral part of human existence and culture.
- Guideline E—Environmental issues—Learners are familiar with some local environmental issues and understand that people in other places experience environmental issues as well.

Strand 3: Skills for Understanding and Addressing Environmental Issues

Strand 3.1: Skills for Analyzing and Investigating Environmental Issues

- Guideline A—Identifying and investigating issues—Learners are able to identify and investigate issues in their local environments and communities.
- Guideline B—Sorting out the consequences of issues—As learners come to understand that environmental and social phenomena are linked, they are able to explore the consequences of issues.
- Guideline C—Identifying and evaluating alternative solutions and courses of action—Learners understand there are many approaches to resolving issues.
- Guideline D—Working with flexibility, creativity, and openness—Learners understand the importance of sharing ideas and hearing other points of view.

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.

NYS SCIENCE STANDARDS http://www.p12.nysed.gov/ciai/mst/pub/intersci.pdf	MST STANDARDS http://www.p12.nysed.gov/ciai/mst/pub/intersci.pdf	NGSS CROSS-CUTTING CONCEPTS http://www.nextgenscience.org/sites/ngss/files/Appendix%20G%20-%20Crosscutting%20Concepts%20FINAL%20edited%204.10.13.pdf
<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>

NYS SCIENCE STANDARDS

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

- 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)**
- 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)**

MST STANDARDS

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

- Key Idea5:** Identifying patterns of change is necessary for making predictions about future behavior and conditions.
- Standard 7: Interdisciplinary Problem Solving**
- 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.
- 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)**

NGSS CROSS-CUTTING CONCEPTS

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

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.

Systems and System Models:

A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.

- 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.

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

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

NGSS CROSS-CUTTING CONCEPTS

<http://www.nextgenscience.org/sites/ngss/files/Appendix%20G%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.

continued

NYS SCIENCE STANDARDS

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

- 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)**

MST STANDARDS

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

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).

Standard. 7 - Interdisciplinary Problem Solving - Connections

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.

NGSS CROSS-CUTTING CONCEPTS

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

- 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.

Stability and Change:

For both designed and natural systems, conditions that affect stability and factors that control rates of change are critical elements to consider and understand.

- 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.

Systems and System Models:

A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.

- 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.

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

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

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

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.

NYS SCIENCE STANDARDS

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

Major Understandings:

Quoted from New York State Elementary Core Curriculum Performance Indicators (LE. 4.2a, b) (Elementary LE. 5.2e, g; 5.3a, b)

- 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, eater, 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)**

continued

MST STANDARDS

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

Standard 2: Information Systems

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

Standard 6: Systems Thinking:

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.

Standard 7: Interdisciplinary Problem Solving

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.

NGSS CROSS-CUTTING CONCEPTS

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

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.

Systems and System Models:

A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.

- Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems.

continued

<p>NYS SCIENCE STANDARDS http://www.p12.nysed.gov/ciai/mst/pub/intersci.pdf</p>		<p>NGSS CROSS-CUTTING CONCEPTS http://www.nextgenscience.org/sites/ngss/files/Appendix%20G%20-%20Crosscutting%20Concepts%20FINAL%20edited%204.10.13.pdf</p>
<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.

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

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.

NYS SCIENCE STANDARDS

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

MST STANDARDS

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

NGSS CROSS-CUTTING CONCEPTS

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

Major Understandings:

Quoted from New York State Performance Indicators (3.2a, 5.1c-e; 5.2a, 6.1a,b, 6.2a, 7.1a 7.2b-d)

- 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)**

continued

Standard 6: Interconnectedness

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.

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.

continued

Systems and System Models:

A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.

- 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.

continued

NYS SCIENCE STANDARDS

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

- The methods for obtaining nutrients vary among organisms. Producers, such as green plants, use light energy to make their food. Consumers, such as animals, take in energy-rich foods. **(5.1d)**
- Photosynthesis is carried on by green plants and other organisms containing chlorophyll. In this process, the Sun's energy is converted into and stored as chemical energy in the form of sugar. The quantity of sugar molecules increases in green plants during photosynthesis in the presence of sunlight. **(6.2a)**
- Herbivores obtain energy from plants. Carnivores obtain energy from animals. Omnivores obtain energy from both plants and animals. Decomposers, such as bacteria and fungi, obtain energy by consuming wastes and/or dead organisms. **(5.1e)**
- Food provides molecules that serve as fuel and building material for all three organisms. All living things, including plants, must release energy from their food, using it to carry on their life processes. **(5.2a)**
- Energy flows through ecosystems in one direction, usually from the Sun, through producers to consumers and then to decomposers. This process may be visualized with food chains or energy pyramids. **(6.1a)** 
- Food webs identify feeding relationships among producers, consumers. And decomposers in an ecosystem. **(6.1b)**
- In all environments, organisms with similar needs may compete with one another for resources. **(3.2a)**
- The environment may be altered through the activities of organisms. Alterations are sometimes abrupt. Some species may replace others over time, resulting in long-term gradual changes (ecological succession). **(7.2b)** 

MST STANDARDS

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

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).

Standard 7: Interdisciplinary - Problem Solving

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.

- Overpopulation by any species impacts the environment due to the increased use of resources. Human activities can bring about environmental degradation through resource acquisition, urban growth, land-use decisions, waste disposal, etc. **(7.2c)** 

NGSS CROSS-CUTTING CONCEPTS

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

Scale, Proportion, and Quantity:

In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change.

- Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume.

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.
- 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.

- Since the Industrial Revolution, human activities have resulted in major pollution of air, water, and soil. Pollution has cumulative ecological effects such as acid rain, global warming, or ozone depletion. The survival of living things on our planet depends on the conservation and protection of Earth's resources. **(7.2d)** 

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

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.

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.
- 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.

Grades

3-5 Cross-Cutting Concepts

<p>Patterns: Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.</p>	<ul style="list-style-type: none"> ■ Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence. 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>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.</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>Scale, Proportion, and Quantity: In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change.</p>	<ul style="list-style-type: none"> ■ Natural objects and/or observable phenomena exist from the very small to the immensely large or from very short to very long time periods. ■ Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume.
<p>Systems and System Models: 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.

continued

<p>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.</p>	<ul style="list-style-type: none"> ■ Matter is made of particles. ■ 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>Structure and Function: The way an object is shaped or structured determines many of its properties and functions.</p>	<ul style="list-style-type: none"> ■ Different materials have different substructures, which can sometimes be observed. ■ Substructures have shapes and parts that serve functions.
<p>Stability and Change: 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.

Developed by NSTA using information from Appendix G of the Next Generation Science Standards © 2011, 2012, 2013 Achieve, Inc.

Adapted from: National Research Council. "Chapter 4: Crosscutting Concepts". A Framework for K–12 Science Education: Practices, Crosscutting Concepts, and Core Ideas. Committee on a Conceptual Framework for New K–12 Science Education Standards. National Research Council of the National Academies, Board on Science Education, Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press, 2011.

Asking Questions and Defining Problems	Developing and Using Models	Planning and Carrying Out an Investigation	Analyzing and Interpreting Data	Using Mathematics and Computational Thinking	Constructing Explanations and Defining Solutions	Engaging in Argument From Evidence	Obtaining, Evaluating, and Communicating Information
<p>Asking questions and defining problems in 3–5 builds on K–2 experiences and progresses to specifying qualitative relationships.</p> <p>Ask questions about what would happen if a variable is changed.</p> <p>Identify scientific (testable) and non-scientific (non-testable) questions.</p> <p>Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships.</p> <p>Use prior knowledge to describe problems that can be solved.</p> <p>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.</p>	<p>Modeling in 3–5 builds on the K-2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.</p> <p>Identify limitations of models.</p> <p>Collaboratively develop and/or revise a model based on evidence that shows the relationships among variables for frequent and regular occurring events.</p> <p>Develop a model using an analogy, example, or abstract representation to describe a scientific principle or design solution.</p> <p>Develop and/or use models to describe and/ or predict phenomena. Develop a diagram or simple physical prototype to convey a proposed object, tool, or process.</p> <p>Use a model to test cause and effect relationships or interactions concerning the functioning of a natural or designed system.</p>	<p>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.</p> <p>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.</p> <p>Evaluate appropriate methods and/or tools for collecting data.</p> <p>Make observations and/ or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution.</p> <p>Make predictions about what would happen if a variable changes.</p> <p>Test two different models of the same proposed object, tool, or process to determine which better meets criteria for success.</p>	<p>Analyzing data on 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations.</p> <p>When possible and feasible, digital tools should be used. Represent data in tables and/or various graphical displays (bar graphs, pictographs and/ or pie charts) to reveal patterns that indicate relationships.</p> <p>Analyze and interpret data to make sense of phenomena, using logical reasoning, mathematics, and/or computation.</p> <p>Compare and contrast data collected by different groups in order to discuss similarities and differences in their findings. Analyze data to refine a problem statement or the design of a proposed object, tool, or process.</p> <p>Use data to evaluate and refine design solutions.</p>	<p>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.</p> <p>Decide if qualitative or quantitative data are best to determine whether a proposed object or tool meets criteria for success.</p> <p>Organize simple data sets to reveal patterns that suggest relationships. Describe, measure, estimate, and/or graph quantities (e.g., area, volume, weight, time) to address scientific and engineering questions and problems.</p> <p>Create and/or use graphs and/or charts generated from simple algorithms to compare alternative solutions to an engineering problem</p>	<p>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.</p> <p>Construct an explanation of observed relationships (e.g., the distribution of plants in the back yard). Use evidence (e.g., measurements, observations, patterns) to construct or support an explanation or design a solution to a problem.</p> <p>Identify the evidence that supports particular points in an explanation.</p> <p>Apply scientific ideas to solve design problems. Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution.</p>	<p>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).</p> <p>Compare and refine arguments based on an evaluation of the evidence presented.</p> <p>Distinguish among facts, reasoned judgment based on research findings, and speculation in an explanation.</p> <p>Respectfully provide and receive critiques from peers about a proposed procedure, explanation, or model by citing relevant evidence and posing specific questions.</p> <p>Construct and/or support an argument with evidence, data, and/or a model.</p> <p>Use data to evaluate claims about cause and effect.</p> <p>Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem.</p>	<p>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.</p> <p>Read and comprehend Grade-appropriate complex texts and/or other reliable media to summarize and obtain scientific and technical ideas and describe how they are supported by evidence.</p> <p>Compare and/or combine across complex texts and/or other reliable media to support the engagement in other scientific and/or engineering practices.</p> <p>Combine information in written text with that contained in corresponding tables, diagrams, and/ or charts to support the engagement in other scientific and/or engineering practices.</p> <p>Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem.</p> <p>Communicate scientific and/or technical information orally and/ or in written formats, including various forms of media as well as tables, diagrams, and charts.</p>

Appendix A

NYSED Mandated Instruction in Science

New York State Education Law: Article 17, Sections 809–810

809. Instruction in the humane treatment of animals

Summary:

1. Instruction. Every elementary school under state control or supported wholly or partly by public money of the state, must give instruction in the humane treatment and protection of animals and the importance of the part they play in the economy of nature as well as the necessity of controlling the proliferation of animals which are subsequently abandoned and caused to suffer extreme cruelty. Such instruction shall be for such period of time during each school year as the board of regents may prescribe and may be joined with work in literature, reading, language, nature study or ethnology. Such weekly instruction may be divided into two or more periods. A school district shall not be entitled to participate in the public school money on account of any school or the attendance at any school subject to the provisions of this section, if the instruction required hereby is not given.

2. Study and care of live animals. Any school which cares for or uses animals for study shall ensure that each animal in such school be afforded the following: appropriate quarters; sufficient space for the normal behavior and postural requirements of the species; proper ventilation, lighting, and temperature control; adequate food and clean drinking water; and quarters which shall be cleaned on a regular basis and located in an area where undue stress and disturbance are minimized.

3. Application. The provisions of this section shall not be construed to prohibit or constrain vocational instruction in the normal practice of animal husbandry, or prohibit or constrain instruction in environmental education activities as established by the department of environmental conservation.

4. Dissection of animals. Any student expressing a moral or religious objection to the performance or witnessing of the dissection of an animal, either wholly or in part, shall be provided the opportunity to undertake and complete an alternative project that shall be approved by such student's teacher; provided, however, that such objection is substantiated in writing by the student's parent or legal guardian. Students who perform alternative projects who do not perform or witness the dissection of animals shall not be penalized.

5. Treatment of live vertebrate animals. a. Except as provided for in this subdivision, no school district, school principal, administrator, or teacher shall require or permit the performance of a lesson or experimental study on a live vertebrate animal in any such school or during any activity conducted under the auspices of such school whether or not the activity takes place on the premises of such school where such lesson or experimental study employs: (i) micro-organisms which cause disease in humans or animals, (ii) ionizing radiation, (iii) known cancer producing agents, (iv) chemicals at toxic levels, (v) drugs producing pain or deformity, (vi) severe extremes of temperature, (vii) electric or other shock, (viii) excessive noise, (ix) noxious fumes, (x) exercise to exhaustion, (xi) overcrowding, (xii) paralysis by muscle relaxants or other means, (xiii) deprivation or excess of food, water or other essential nutrients, (xiv) surgery or other invasive procedures, (xv) other extreme stimuli, or (xvi) termination of life. b. Notwithstanding any inconsistent provision of this section, the commissioner may, upon the submission of a written program plan, issue to such school a written waiver of such restrictions for students subject to the following provisions: (i) the student shall be in Grade ten, eleven, or twelve; and (ii) the student shall be under the supervision of one or more teachers certified in science; and (iii) the student shall be pursuing an accelerated course of study in the sciences as defined by the commissioner in preparation for taking a state or national advanced placement examination. The commissioner shall issue a waiver of such restrictions for any teacher certified in science instructing such student. The written program plan shall include, but not be limited to: (i) the educational basis for requesting a waiver; (ii) the objective of the lesson or experiment; (iii) the methods and techniques to be used; and (iv) any other information required by the commissioner.

6. Report. On or before the first day of January next succeeding the effective date of this amended section, the commissioner shall annually submit a report to the governor and the legislature which shall include, but not be limited to, the number of written program plan proposals submitted by schools and the number of such proposals subsequently approved by the commissioner. In those cases where a program plan proposal has been approved by the commissioner, such plan shall be appended to and become a part of the commissioner's annual report.

810. Conservation Day

Summary:

The last Friday in April each year is declared to be known as Conservation day.

Every school and teacher or instructor shall encourage the planting, protection and preservation of trees, shrubs and the best methods to accomplish these results and to provide lectures, pictures or tours to increase the students' interest in fish and wildlife, soil and water of the state.

The commissioner of education may prescribe from time to time a course of exercises and instruction in the subjects hereinbefore mentioned, which shall be adopted and observed by the public school authorities on Conservation day. Upon receipt of copies of such course sufficient in number to supply all the schools under their supervision, the school authorities aforesaid shall promptly provide each of the schools under their charge with a copy, and cause it to be observed.

NOTE: Conservation Day should not be confused with Earth Day, which falls on April 22 each year.



K-5

**2015
2016**

NYC Science Scope & Sequence

