TRUMBULL PUBLIC SCHOOLS

Trumbull, Connecticut

GRADE 1 SCIENCE
2019

(Last revision date: 2005)

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Grade 1 Science
Table of Contents

The Trumbull Board of Education will continue to take Affirmative Action to ensure that no persons are discriminated against in its employment.

CORE VALUES AND BELIEFS

The Trumbull School Community engages in an environment conducive to learning which believes that all students will **read** and **write effectively**, therefore communicating in an articulate and coherent manner. All students will participate in activities **that present problem-solving through critical thinking**. Students will use technology as a tool applying it to decision making. We believe that by fostering self-confidence, self-directed and student-centered activities, we will promote **independent thinkers and learners**. We believe **ethical conduct** to be paramount in sustaining the welcoming school climate that we presently enjoy.

Approved 8/26/2011

INTRODUCTION & PHILOSOPHY

The Connecticut State Board of Education, based on its 2008 Position Statement on Science Education, has supported "a systematic approach to ensuring that every student in Connecticut receives a rich and coordinated PK-12 education in science. Science learning should focus simultaneously on developing an understanding of core concepts, as well as knowing how scientists work collaboratively to test ideas, analyze evidence, and solve problems. The realization of this vision is critical for our students' futures, as well as for Connecticut's place in the globally competitive economy."

The Board offers five principles to support strong elementary grades science education:

- "Ensure that the instructional focus for science is comparable to that provided for language arts and mathematics and teachers are able to integrate literacy and numeracy instruction within the context of students' science learning experiences."
- "Maintain class sizes that ensure instructional excellence and the safety of the students and the teacher."
- "Provide indoor and outdoor science learning areas, including rooms with flat, movable desks or tables and chairs, appropriate science equipment, storage space, and access to water and electricity as needed."
- "Provide students with multiple opportunities every week to experience inquiry investigations that develop students' abilities to question, explore, observe, gather simple data, create graphs, draw conclusions based on the data, and build their understanding of natural phenomena."
- "Provide science enrichment opportunities to foster student interest in science."

In 2015, the Connecticut State Board of Education adopted the Next-Generation Science Standards (NGSS), which embody the National Research Council's *Framework for K-12 Education* (2011). The TPS Grade 1 science curriculum integrates the NGSS as listed for each unit of study. The NGSS architecture uses Science and Engineering Practices along with various components of Disciplinary Core Ideas and Crosscutting Concepts to comprise the performance expectations for students. Based on the NRC *Framework*, a core idea for science education should meet at least two of the following four criteria:

- "Have broad importance across multiple sciences or engineering disciplines or be a key organizing principle of a single discipline."

- "Provide a key tool for understanding or investigating more complex ideas and solving problems."
- "Relate to the interests and life experiences of students or be connected to societal or personal concerns that require scientific or technological knowledge."
- "Be teachable and learnable over multiple grades at increasing levels of depth and sophistication."

The TPS Grade 1 science curriculum also follows the TPS guidelines for student safety in the classroom as represented in the National Science Education Standards, the Next-Generation Science Standards, the National Science Teachers Association, and OSHA. The curriculum encourages and fosters a hands-on, process and inquiry-based approach to science education, with student safety first and foremost. Lab safety guidelines are implemented through the district.

The curriculum is designed to be implemented within the parameters established by Trumbull Board of Education Policy 6112.2, "Allotment of Time for Subjects, Grades K-5."

COURSE GOALS

The course goals derive from the 2013 Next-Generation Science Standards and the 2010 Connecticut Core Standards. Goals are listed specific to each unit in this curriculum guide, and developed through unit lessons using the 5-E learning model (engage, explore, explain, elaborate, evaluate) in order to encourage student engagement and foster metacognitive learning strategies through a reflective process. See Appendix A.

COURSE ENDURING UNDERSTANDINGS

Students will understand that . . .

- Scientists are people who carefully observe, record, make hypotheses, test, and draw conclusions.
- The Earth and moon, sun, and planets have predictable patterns of movement, some of which cause day and nights and seasons. The sun is but one of a vast number of stars in the sky, illuminating the moon and appearing to rise in one part of the sky and set in another. Sunrise and sunset occur at different times during seasonal changes.
- Sound can make matter vibrate, and vibrating matter can make sound. Very hot objects (e.g., a fire, the sun) give off light, and objects can be seen only when lights is available to illuminate them. Some materials allow light to pass through them, others allow only some light through, and others block all the light and create a dark shadow on any surface beyond them, where the light cannot reach. Mirrors and prisms can be used to redirect a light beam. People use a variety of devices to communicate over long distances (send a receive information).
- All organisms have external parts. Different animals (e.g., insects) use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water, and air. Insects have many roles in natural systems, including as pollinators, predators, and herbivores. Plants have different parts (roots, stems, leaves, flowers, fruits) that helps them survive, grow, and produce more plants. Both animals and plants grow and change; they can also have young. Ecosystems where plants and animals live often change, sometimes slowly and sometimes rapidly (e.g., island ecosystems). Materials have properties that make them good choices for some uses and

poor choices for other uses, and conducting experiments helps to determine which materials are the best choices for a given task.

COURSE ESSENTIAL QUESTIONS

- How is scientific knowledge created and communicated?
- What patterns of movement exist in the Earth and in the moon, sun, and planets, and how can I observe, describe, and predict those patterns of movement?
- What patterns exist in sound and light, and how can I observe, describe, and predict those patterns?
- How can sound and light be used to communicate?
- What are the parts and functions of insect and plant organisms, and how can I observe, describe, and predict those parts and functions?
- What are technologies, and who designs them?

COURSE KNOWLEDGE & SKILLS

Students will understand, at an age-appropriate level, . . .

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

Students will be able to . . .

- ask questions (for science) and define problems (for engineering).
- develop and use models.
- plan and carry out investigations.

SCIENCE YEAR AT A GLANCE

early September	Unit 1: Introduction to Scientific Practices and Inquiry-Based Learning
mid September – December	Unit 2: Earth's Place in the Universe
January – mid March	Unit 3: Waves and Their Applications in Technologies for Information Transfer
mid March – June	Unit 4: From Molecules to Organisms: Structures and Processes

UNIT 1
Introduction to Scientific Practices and Inquiry-Based Learning

"Engaging in the practices of science helps students understand how scientific knowledge develops; such direct involvement gives them an appreciation of the wide range of approaches that are used to investigate, model, and explain the world. Engaging in the practices of engineering likewise helps students understand the work of engineers, as well as the links between engineering and science." (National Research Council. *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*. Washington, DC: The National Academies Press, 2012. 42.)

Unit Goals

At the completion of this unit, students will:

NGSS.K-2-ETS1-1	Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
NGSS.K-2-ETS1-2	Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.
NGSS.K-2-ETS1-3	Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.
CCS.ELA-Literacy.RI.1.1	Ask and answer questions about key details in a text.
CCS.ELA-Literacy.W.1.6	With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers.
CCS.ELA-Literacy.W.1.8	With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.
CCS.ELA-Literacy.SL.1.5	Add drawings or other visual displays to descriptions when appropriate to clarify ideas, thoughts, and feelings.
CCS.MP.2	Reason abstractly and quantitatively.
CCS.MP.4	Model with mathematics.
CCS.MP.5	Use appropriate tools strategically.

CCS.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.

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Asking Questions and Defining Problems: • Ask questions based on observations to find more information about the natural and/or designed world(s). (NGSS.K-2-ETS1-1) • Define a simple problem that can be solved through the development of a new or improved object or tool. (NGSS.K-2-ETS1-1) Developing and Using Models: • Develop a simple model based on evidence to represent a proposed object or tool (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard). (NGSS.K-2.ETS1-2) Analyzing and Interpreting Data: • Analyze data from tests of an object or tool to determine if it works as intended (i.e., collecting, recording, and sharing observations). (NGSS.K-2-ETS1-3)	Defining and Delimiting Engineering Problems: • A situation that people want to change or create can be approached as a problem to be solved through engineering. (NGSS.K-2-ETS1-1) • Asking questions, making observations, and gathering information are helpful in thinking about problems. (NGSS.K-2-ETS1-1) • Before beginning to design a solution, it is important to clearly understand the problem. (NGSS.K-2-ETS1-1) Developing Possible Solutions: • Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (NGSS.K-2-ETS1-2) Optimizing the Design Solution: • Because there is always more than one possible solution to a problem, it is useful to compare and test designs. (NGSS.K-2-ETS1-3)	Structure and Function: • The shape and stability of structures of natural and designed objects are related to their function(s). (NGSS.K-2-ETS1-2)

Unit Essential Questions

- What is a scientist?
- How are science notebooks and tools used?

Scope and Sequence

- Scientists are people who carefully observe, record, make hypotheses, test, and draw conclusions.
- Science tools, such as magnifiers, graduated cylinders, measuring tools, balances, pipettes, notebooks, etc., are used to make observations and record data.

Assured Assessments

Student performance on the following assessments will be included in the Trimester 1 standards-based report card.

Formative Assessments:

- informal teacher observations during investigations
- whole-group and center check-in discussions
- monitoring during Turn & Talk
- discussions of observations made outside in Session 4
- review and discussion of K-W-L chart

Summative Assessment:

- Science Notebook entry

Resources

Core

- Canizares, Susan, and Betsey Chessen. *Science Outside*. Teaching Resources, 1998. Print.
- Canizares, Susan, and Betsey Chessen. *Science Tools*. New York: Scholastic, 1998. Print.
- Chanko, Pamela, and Samantha Berger. *Scientists*. New York: Scholastic, 1998. Print.
- Dotlich, Rebecca Kai. *What Is Science?* New York: Square Fish, 2016. Print.

Time Allotment

- Approximately two weeks (early September)

UNIT 2
Earth's Place in the Universe

"Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted. At night one can see the light coming from many stars with the naked eye, but telescopes make it possible to see many more and to observe them and the moon and planets in greater detail. . . . Seasonal patterns of sunrise and sunset can be observed, described, and predicted." (National Research Council. *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*. Washington, DC: The National Academies Press, 2012. 174-76.)

Unit Goals

At the completion of this unit, students will:

NGSS.1-ESS1-1	Use observations of the sun, moon, and stars to describe patterns that can be predicted.
NGSS.1-ESS1-2	Make observations at different times of the year to relate the amount of daylight to the time of the year.
CCS.ELA-Literacy.W.1.7	Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions).
CCS.ELA-Literacy.W.1.8	With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.
CCS.MP.2	Reason abstractly and quantitatively.
CCS.MP.4	Model with mathematics.
CCS.MP.5	Use appropriate tools strategically.
CCS.1.OA.1	Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.
CCS.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.

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations: • Make observations (firsthand or from media) to collect data that can be used to make comparisons. (NGSS.1-ESS1-2) Analyzing and Interpreting Data: • Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (NGSS.1-ESS1-1)	The Universe and Its Stars: • Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted. (NGSS.1-ESS1-1) Earth and the Solar System: • Seasonal patterns of sunrise and sunset can be observed, described, and predicted. (NGSS.1-ESS1-2)	Patterns: • Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (NGSS.1-ESS1-1, NGSS.1-ESS1-2) Scientific Knowledge Assumes an Order and Consistency in Natural Systems: • Science assumes natural events happen today as they happened in the past. (NGSS.1-ESS1-1) • Many events are repeated. (NGSS.1-ESS1-1)

Unit Essential Questions

- What is the universe and what is Earth's place in it?
- What are predictable patterns caused by Earth's movement in the solar system?
- What can be seen in the sky during the day and/or during the night?
- What comparisons can be made between the amount of daylight in the winter and the amount of daylight in the spring or fall?

Scope and Sequence

- What Can We See in the Sky? (Phenomenon: Finding Our Moon!)
- Rotating Day and Night
- Revolution and the Seasons
- Shadows and the Sun
- The Moon and Its Patterns
- Our Place in Space

Assured Assessments

Student performance on the following assessments will be included in the Trimester 1 standards-based report card.

Formative Assessments:

- informal teacher observations during investigations
- whole-group and center check-in discussions
- monitoring during Turn & Talk
- reflections, worksheets, & responses to prompts in Science Notebook

- student responses during class discussions
- monitoring during planning and presenting

Summative Assessments:
- Revolution and the Seasons Assessment
- Phases of the Moon Assessment
- Earth's Place in the Universe Assessment
- Science Notebook entry

Resources

Core
- *Sky Watchers: A New Generation Unit Kit*, Carolina Biological Supply Company.
- *Sky Watchers Storybook*, Carolina Biological Supply Company. Print.

Supplemental
- Asch, Frank. *Moonbear's Shadow*. New York: Aladdin, 2014. Print.
- BrainPOP Jr. *Moon*. https://jr.brainpop.com/science/space/moon/. Web.
- Branley, Franklyn M. *Day Light, Night Light: Where Light Comes From*. New York: HarperCollins, 1998. Print.
- Branley, Franklyn M. *What Makes Day and Night*. New York: HarperCollins, 2015. Print.
- Bulla, Clyde Robert. *What Makes a Shadow*. New York: HarperCollins, 1994. Print.
- Canizares, Susan, and Betsey Chessen. *Science Outside*. Teaching Resources, 1998. Print.
- Canizares, Susan, and Betsey Chessen. *Science Tools*. New York: Scholastic, 1998. Print.
- Chanko, Pamela, and Samantha Berger. *Scientists*. New York: Scholastic, 1998. Print.
- Delta Science First Readers. *Sky*. Nashua, NH: Delta Education, 2005. Print.
- Delta Science Readers. *Finding the Moon*. Nashua, NH: Delta Education, 2004. Print.
- Gibbons, Gail. *Seasons*. Print.
- Gibbons, Gail. *Sun Up, Sun Down*. New York: Voyager, 1987. Print.
- "The Moon." https://www.nasa.gov/moon. Web.
- Simon, Seymour. *The Moon*. New York: Simon & Schuster, 2003. Print.
- Siy, Alexandra. *Footprints on the Moon*. Watertown, MA: Charlesbridge, 2001. Print.

Time Allotment

- Approximately eleven weeks (mid September – December)

UNIT 3
Waves and Their Applications in Technologies for Information Transfer

"Sound can make matter vibrate, and vibrating matter can make sound. . . . Objects can be seen only when light is available to illuminate them. Very hot objects give off light (e.g., a fire, the sun). Some materials allow light to pass through them, others allow only some light through, and others block all the light and create a dark shadow on any surface beyond them (i.e., on the other side from the light source), where the light cannot reach. Mirrors and prisms can be used to redirect a light beam. . . . People also use a variety of devices to communicate (send and receive information) over long distances." (National Research Council. *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*. Washington, DC: The National Academies Press, 2012. 132-37.)

Unit Goals

At the completion of this unit, students will:

NGSS.1-PS4-1	Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.
NGSS.1-PS4-2	Make observations to construct an evidence-based account that objects in darkness can be seen only when illuminated.
NGSS.1-PS4-3	Plan and conduct investigations to determine the effect of placing objects made with different materials in the path of a beam of light.
NGSS.1-PS4-4	Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.
CCS.ELA-Literacy.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.
CCS.ELA-Literacy.W.1.7	Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions).
CCS.ELA-Literacy.W.1.8	With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.
CCS.ELA-Literacy.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.

CCS.1.MD.1	Order three objects by length; compare the lengths of two objects indirectly by using a third object.
CCS.1.MD.2	Express the length of an object as a whole number of length units, by laying multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps.

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations: • Plan and conduct investigations collaboratively to produce evidence to answer a question. (NGSS.1-PS4-1, NGSS.1-PS4-3) Constructing Explanations and Designing Solutions: • Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena. (NGSS.1-PS4-2) • Use tools and materials to design a device that solves a specific problem. (NGSS.1-PS4-4) Scientific Investigations Use a Variety of Methods: • Science investigations begin with a question. (NGSS.1-PS4-1) • Scientists use different ways to study the world. (NGSS.1-PS4-1)	Wave Properties: • Sounds can make matter vibrate, and vibrating matter can make sounds. (NGSS.1-PS4-1) Electromagnetic Radiation: • Objects can be seen if light is available to illuminate them or if they give off their own light. (NGSS.1-PS4-2) • Some materials allow light to pass through them, others allow only some light through, and others block all the light and create a dark shadow on any surface beyond them, where the light cannot reach. Mirrors can be used to redirect a light beam. (NGSS.1-PS4-3) Information Technologies and Instrumentation: • People also use a variety of devices to communicate (send and receive information) over long distances. (NGSS.1-PS4-4)	Cause and Effect: • Simple tests can be designed to gather evidence to support and refute student ideas about causes. (NGSS.1-PS4-1, NGSS.1-PS4-2, NGSS.1-PS4-3) Influence of Engineering, Technology, and Science on Society and the Natural World: • People depend on various technologies in their lives; human life would be very different without technology. (NGSS.1-PS4-4)

Unit Essential Questions

- Why is light important?
- What is needed in order for objects to be seen?
- How do different materials affect the way light shines through them?

- What is a reflection?
- How can mirrors change the path of light?
- What are vibrations?
- What causes sound?
- How can changing the length of an object change its sound?
- How does sound travel?
- How can we communicate using light and/or sound?

Scope and Sequence

- The Properties of Light
- Transparent, Translucent, Opaque
- Reflection: Bouncing Beams
- Vibrations and Sound
- How Does Sound Travel?
- Communicating with Light and Sound

Assured Assessments

Student performance on the following assessments will be included in the Trimester 2 standards-based report card.

Formative Assessments:

- informal teacher observations during investigations
- whole-group and center check-in discussions
- monitoring during Turn & Talk
- reflections, worksheets, & responses to prompts in Science Notebook
- student responses during class discussions
- monitoring during planning and presenting

Summative Assessments:

- Light Assessment
- Sound Waves Assessment
- Light and Sound Waves Summative Assessment
- Science Notebook entry

Resources

Core

- *Light and Sound Waves: A New Generation Unit Kit*, Carolina Biological Supply Company.
- *Light and Sound Waves Storybook*, Carolina Biological Supply Company. Print.

Supplemental

- BrainPOP Jr. *Light*. https://jr.brainpop.com/science/energy/light/. Web.
- ReadWorks.org. "Light." https://www.readworks.org/article/Light/47163b5a-415e-417d-aa1e-d16f90071f66#!articleTab:content/. Web.

- Waddell, Martin. *Can't You Sleep, Little Bear?* https://www.youtube.com/watch?v=u1aJimzuzbg. Web.

Time Allotment

- Approximately eleven weeks (January – mid March)

UNIT 4
From Molecules to Organisms: Structures and Processes

"All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water, and air. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive, grow, and produce more plants. . . . Plants and animals have predictable characteristics at different stages of development. Plants and animals grow and change. Adult plants and animals can have young. In many kinds of animals, parents and the offspring themselves engage in behaviors that help the offspring to survive." (National Research Council. *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*. Washington, DC: The National Academies Press, 2012. 144-46.)

Unit Goals

At the completion of this unit, students will:

NGSS.1-LS1-1	Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.
NGSS.1-LS1-2	Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.
NGSS.1-LS3-1	Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.
CCS.ELA-Literacy.RI.1.1	Ask and answer questions about key details in a text.
CCS.ELA-Literacy.RI.1.2	Identify the main topic and retell key details of a text.
CCS.ELA-Literacy.RI.1.10	With prompting and support, read informational texts appropriately complex for grade 1.
CCS.ELA-Literacy.W.1.7	Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions).
CCS.ELA-Literacy.W.1.8	With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.
CCS.MP.2	Reason abstractly and quantitatively.
CCS.MP.5	Use appropriate tools strategically.

CCS.1.NBT.3	Compare two two-digit numbers based on meanings of the tens and ones digits, recording the results of comparisons with the symbols >, =, and <.
CCS.1.NBT.5	Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used.
CCS.1.NBT.6	Subtract multiples of 10 in the range 10-90 from multiples of 10 in the range 10-90 (positive or zero differences), using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.
CCS.1.MD.1	Order three objects by length; compare the lengths of two objects indirectly by using a third object.

Science & Engineering Practices	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Constructing Explanations and Designing Solutions: • Use materials to design a device that solves a specific problem or a solution to a specific problem. (NGSS.1-LS1-1) • Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena. (NGSS.1-PS4-2) Obtaining, Evaluating, and Communicating Information: • Read grade-appropriate texts and use media to obtain scientific information to determine patterns in the natural world. (NGSS.1-LS1-2)	Structure and Function: • All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water, and air. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow. (NGSS.1-LS1-1) Growth and Development of Organisms: • Adult plants and animals can have young. In many kinds of animals, parents and the offspring themselves engage in behaviors that help the offspring to survive. (NGSS.1-LS1-2)	Patterns: • Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence. (NGSS.1-LS1-2, NGSS.1-LS3-1) Structure and Function: • The shape and stability of structures of natural and designed objects are related to their function(s). (NGSS.1-LS1-1)

	Information Processing: • Animals have body parts that capture and convey different kinds of information needed for growth and survival. Animals respond to these inputs with behaviors that help them survive. Plants also respond to some external inputs. (NGSS.1-LS1-1) Inheritance of Traits: • Young animals are very much, but not exactly, like their parents. Plants also are very much, but not exactly, like their parents. (NGSS.1-LS3-1) Variation of Traits: • Individuals of the same kind of plant or animal are recognizable as similar but can also vary in many ways. (NGSS.1-LS3-1)	

Unit Essential Questions

- How do organisms grow and develop?
- How do the structures of organisms enable life's functions?
- What is the structure and function of the insect (painted lady, ladybug, or ant)?
- What is the life cycle of that insect?
- How do we know if insects are helpful or harmful?
- What do we know about plants?
- What is the structure and function of brassica plants?
- How can I observe and record the progress of our plants?
- What is pollen and why is it so important?
- What are technologies and who designs them?
- What is an engineer?

Scope and Sequence

- Living things grow, need air/water/food to survive, make other living things like themselves.

- Living things depend on the land, water, and air to live and grow.
- Life cycles of insects and plants
- Living things can survive only where and when their needs are met.
- Technology is almost anything created to solve a problem to meet a need.
- An engineer is someone who uses his/her knowledge of science, math, and creativity to design objects, systems, or processes to solve problems.

Assured Assessments

Student performance on the following assessments will be included in the Trimester 3 standards-based report card.

Formative Assessments:

- informal teacher observations during investigations
- whole-group and center check-in discussions
- monitoring during Turn & Talk
- reflections, worksheets, & responses to prompts in Science Notebook
- student responses during class discussions
- monitoring during planning and presenting

Summative Assessments:

- Insect Life Cycle Assessment
- Islands Assessment
- Plant Life Cycle Assessment
- Designing a Hand Pollinator Assessment
- Science Notebook entry

Resources

Core

- *The Best of Bugs: Designing Hand Pollinators Module*, EIE Institute, Museum of Science of Boston.
- *Designing Hand Pollinators Storybook: Mariana Becomes a Butterfly*, EIE Institute, Museum of Science of Boston. Print.
- *Insects Module*, FOSS Science.
- *New Plants Module*, FOSS Science.

Supplemental

- Anderson, Sheila. *Islands*. Minneapolis: Lerner, 2008. Print.
- Ashley, Susan. *Incredible Ladybugs*. Milwaukee: Gareth Stevens, 2011. Print.
- Baby Professor. *Five Major Island of the World*. Newark, DE: Speedy, 2017, Print.
- Berger, Melvin. *The World of Ants*. New York: Macmillan, 1993. Print.
- Gibbons, Gail. *From Seed to Plant*. New York: Holiday House, 1991. Print.
- Gibbons, Gail. *Ladybugs*. New York: Holiday House, 2013. Print.
- *Insects*. Berkeley, CA: Delta Education, 2003. Print.
- *New Plants*. Nashua, NH: Delta Education, 2003. Print.

Time Allotment

- Approximately eleven weeks (mid March – June)

- **APPENDIX A: FRAMEWORKS FOR INQUIRY EDUCATION**

The BSCS 5E Instructional Model

Engage
These experiences mentally engage the students with an event or question. Engagement activities help students to make connections with what they know and can do. During the engagement phase, the teacher can

- Create a need to know/create an interest
- Assess prior knowledge
- Focus on a problem/ask questions

Explore
Students work with one another to explore ideas through hands-on activities. Under the guidance of the teacher, students experience a common set of experiences that helps them clarify their own understanding of major concepts and skills. During the exploration phase, the students

- Investigate
- Develop awareness/practice skills
- Design, plan, build models, collect data
- Test predictions and form new predictions

Explain
Students explain their understanding of the concepts and processes they are learning. Teachers help students clarify their understanding and introduce information related to the concepts to be learned. During the explanation phase, teachers and students

- Clarify understanding
- Define concepts or terms
- Share understandings for feedback
- Listen critically to one another
- Form generalizations
- Refer to previous activities

Elaborate
These activities challenge students to apply what they have learned and extend their knowledge and skills. During the elaboration phase, students

- Build on their understanding of concepts
- Use knowledge of concepts to investigate further—extension
- Apply explanations and skills to new, but similar, situations
- Provide practice and reinforcement –application

Evaluate
Students assess their own knowledge, skills, and abilities. Evaluation activities also allow teachers to evaluate students' progress. During the evaluation phase, students

- Draw conclusions using evidence from previous experiences
- Demonstrate an understanding or knowledge of concept or skill

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Bybee, R.W., Taylor, J.A., Gardner, A., et al. *The BSCS 5E Instructional Model: Origins and Effectiveness. A Report Prepared for the Office of Science Education, National Institutes of Health*. Colorado Springs: BSCS, 2006. Web. https://bscs.org/sites/default/files/_legacy/BSCS_5E_Instructional_Model-Full_Report.pdf.

APPENDIX B: SAMPLE ASSURED LESSON OUTLINE

Unit 1, Lesson 1 – Introduction to Scientific Processes and Inquiry-Based Learning

<table>
<tr><td>Grade: 1</td><td>Topic: Introduction to Scientific Processes and Inquiry-Based Learning</td><td>Lesson: Lesson 1 of 1
- approx. 6 class sessions duration</td></tr>
<tr><td colspan="3">Essential Questions:
Who is a scientist?
How are science notebooks and tools used?</td></tr>
<tr><td colspan="3">Lesson Objectives:
Students will:
Learn what a scientist is and does.
Explore and learn to use basic science tools.
Build on their knowledge of how to observe, record, make a prediction, and write a statement based on evidence of what they have learned.</td></tr>
<tr><td colspan="3">Lesson Plan – 5 E Model:</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td colspan="3">ENGAGE: Opening activity – access prior learning / stimulate interest / generate questions</td></tr>
<tr><td colspan="3">Session 1
Prepare chart paper. If using a SMARTBoard, print out the statements generated and post them in the classroom to keep them visible.
Initiate using K-W-L Chart based on “What is a scientist?”
Generate statements from students and place all statements on chart under “K” and “W.”
Maintain chart and refer back to the statements throughout future lessons.
Read What Is Science? by Rebecca Kai Dotlich; explain to students that they will be learning about science all around us!</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td colspan="3">EXPLORE: Description – Materials needed / probing or clarifying questions / resources</td></tr>
<tr><td colspan="2">Scope & Sequence</td><td>Materials</td></tr>
<tr><td colspan="2">Session 2
Read Scientists by Pamela Chanko and Samantha Berger.
Stop for discussion, then view PBS video that you have previewed in advance. (See other resources available at PBS site.)</td><td>Session 2
PBS video: http://pbskids.org/sid/scientist.html.</td></tr>
<tr><td colspan="2">Session 3
Read Science Tools by Susan Canizares and Betsey Chessen.
Review and discuss safety rules for using tools (even scissors) in the classroom.
Discuss how scientists use tools when observing, then view BrainPOP Jr. video.
Model how to sketch and label tools.</td><td>Session 3
BrainPop Jr. video: https://jr.brainpop.com/science/beascientist/makingobservations/.
Optional activity: Explore science tools in the classroom, using the science tools identification sheet.</td></tr>
</table>

Session 4 • Take class outside. • Read *Science Outside* by Susan Canizares and Betsey Chessen. • Read and discuss: "A scientist is always observing. Let's stop, listen, look, and when I say go [give students 5 minutes to observe], in your notebooks sketch what you see, and write your observations – what you smell, and what you hear (no tasting or touching)."	Session 4 • Science Notebooks. • pencils
EXPLAIN: Concepts explained and vocabulary defined	
Scope & Sequence	**Concepts & Vocabulary**
Session 5 • Revisit and develop earlier K-W-L chart based on Turn & Talk. • Establish a classroom statement for what a scientist is and does. Add this to the chart. (Example: Scientists are people who carefully observe, record, make hypotheses, test, and draw conclusions. One example of a scientist is an astronomer. An astronomer is a person who studies the universe and things in it.") • Ask students, "What have you learned about scientists?" • Complete "L" section of chart and compare it to the "K" section to confirm or disconfirm statements.	Session 5 • sketch • observe/observation • explore • experiment • investigate • discover • record • scientist • science tools • magnifiers • label
ELABORATE: Applications and extensions	
• Teacher discretion	
EVALUATE: Assured assessments	
Formative Assessments	**Summative Assessment**
Sessions 1-6 • Monitoring during Turn & Talk • Discussion of observations in Session 4 • Review and discussion of K-W-L chart	Session 6 • Science Notebook: Each student should sketch, label, and write which kind of scientist(s) he/she would like to be.
ELABORATE FURTHER: Reflection / enrichment (optional)	
• Teacher discretion	

APPENDIX C: INTERACTIVE SCIENCE NOTEBOOKS RESOURCES

Setting up Interactive Science Notebooks

(Beginning of School – before starting science units.
Guidelines below are also available on the G drive.)

1. Student Rubric: Glued inside of front cover. Be sure to review it carefully with students so that they can refer to it at any time.
2. Teacher Note Page: A note from you to students stating your expectations for science. You can also include what you will cover at your grade level and how Science Notebooks will be used for recording what students learn.
3. Classroom Rules: These are your regular classroom rules so that students understand that Science is part of their curriculum in school and the same rules pertain. They are not taking time to "do science," but instead they are *learning* science!
4. Author's Page: All about the student – what type of a scientist would the student be? This is the student's choice. Use of color enhances their work!
5. Science Safety Rules: Cut and paste into notebooks. Read with the students and have them sign that they have read the rules with the class.
6. Why Interactive Science Notebooks? This will help you and your students understand ISNs.
7. Observation Helper / Examples of How to Show What You Know About What You Learned! These two sheets help students with ideas. They should be glued into the back two pages of the Science Notebook so students can peek at them when they need ideas to help them demonstrate their understanding.

GRADE 1 Science Notebook Student Rubric

- You followed all the directions.
- Your diagrams/sketches are neat, complete, and labeled.
- You wrote neatly and checked your spelling.
- You added evidence to support your claim!

	(3) Wow! (Meets Grade-Level Standards)	(2) Almost (Progressing towards Standards)	(1) Not Yet (Making limited progress towards meeting the Standards)
<u>Content Accuracy</u> Indicator #1 on Report Card: Demonstrates understanding of current science concepts and key vocabulary.	Your written responses demonstrate an understanding of the science concepts and proper vocabulary use. 	Your written responses demonstrate a partial understanding of the science concepts and proper vocabulary use. 	Your written responses demonstrate an inaccurate understanding of science concepts and/or proper vocabulary use. 
<u>Illustrations and Diagrams</u> Indicator #2 on Report Card: Makes observations and presents information in words and drawings.	Your illustrations and diagrams/sketches are clear, accurate, and labeled showing what you know about what you learned. 	Your illustrations and diagrams are partially accurate and labeled with information missing. 	Your illustrations and diagrams are unclear or missing. 

Dear First-Graders,

Welcome to First-Grade Science!!! This year we will be learning how to think like scientists and engineers as we study Earth, moon, and sun, light and sound, and insects, pollinators, butterflies, and plants! As scientists we will go through each exciting unit and explore! We will make observations, conduct experiments, learn new science concepts, and reflect on all of this right here in our Science Notebooks!

To think like a scientist we expect you to:

- use your senses when making observations (your observations are not opinions, but actual happenings).
- record your observations accurately in your science notebook.
- ask realistic questions and ones that we can investigate.
- be respectful with partners whom you work with so we can all enjoy our learning.

Your science notebook is a great way to collect all the information you will learn throughout this year. We know you will be great scientists/engineers and cannot wait to get started!!!

Sincerely,
Your First-Grade Teacher

About the Scientist

Name _____

A picture of the scientist:

One science concept I hope to learn about this year is

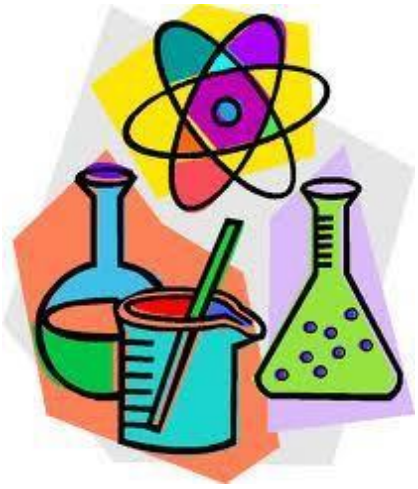
_____

_____

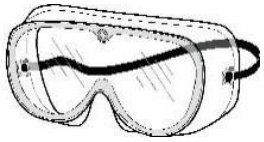
_____

_____

Science Safety Rules

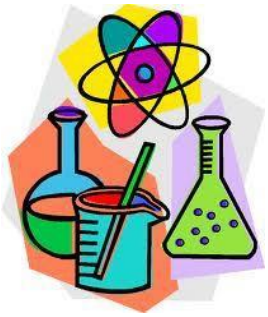


1. Always follow the safety rules given by your teacher.
2. Ask questions if you are not sure about what to do.
3. Tell your teacher about accidents, even small ones.
4. Clean up spills as quickly and carefully as you can.
5. Be careful using science tools (especially when they are sharp or pointy).



6. Protect your eyes always and wear safety goggles when necessary!
7. Never put anything into your mouth. DO NOT smell or taste anything unless your teacher tells you to do so.
8. DO NOT touch your face, mouth, ears, or eyes when working with plants, animals, or chemicals.

9. Always wash your hands when you are done with an experiment.
10. Always clean up!



I have read these rules with my class and I promise to follow them:

_____ _____

(name) (date)

Why Interactive Science Notebooks?

An Interactive Science Notebook is . . .

- A student's own personalized record of learning.
- A place for teacher input of testable and other important information.
- A place for student output demonstrating the student's understanding.

It also . . .

- Promotes metacognitive learning strategies and use of both sides of the brain to make learning easier.
- Encourages information processing through the use of both words and visuals.

AND . . . An Interactive Science Notebook . . .

- Provides a place to apply critical and creative thinking skills.
- Builds organizational skills while promoting creative thought and reflection.
- Becomes a working portfolio demonstrating student understanding for formative and summative assessments.

Observation Helper

Ways to help me start my writing . . .

Think of properties you can see such as size, shape, color, lines, texture, pattern, behavior . . .	I observed . . . 
Think of the other senses of smell, sound, touch, and perhaps taste!	I noticed . . . 
Connect it with something that you already know.	It (or this) reminds me of . . .
Add more detail as needed. Support what you say or claim with evidence.	This is so because . . . 
Be curious and ask questions you could investigate.	I am curious about . . . It surprised me that . . . or I wonder what would happen if. . .

Examples of how to show what you know about what you learned!

- Make a drawing or a diagram – be sure to label it carefully!
- Write a reflection:
  - Explain the steps you took for your experiment
  - Write a prediction and explain why
  - Make a connection to something you may have already learned
  - Write how you would change your investigation if you had a chance to do it over
  - Begin your sentences with
    - I noticed that . . .
    - I wonder if . . .
    - That is how I . . .

- Draw a chart or a graph to show how you collected information
- Record your observations – use your sense to write or draw
  - What do you see, hear, feel, and smell?
- Teach a friend about what you know by reading your written explanation or sharing your illustration
- Be sure to:
  - Always number the page in the upper outer corner
  - Always put the date on a new entry page
  - Use at least 3 colors in your diagrams or drawings
  - Organize your information – it helps your brain to learn!
  - Use color pencils and crayons – stay away from markers and highlighters because they leak through the paper