TRUMBULL PUBLIC SCHOOLS
Trumbull, Connecticut

Science Curriculum
Grade 3
Next Generation
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SCIENCE-NEXT GENERATION
Grade 3

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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 Public School System, in partnership with the community, strives to meet the educational needs of all students within a challenging and supportive academic environment that empowers each student to become a life-long learner and to live and participate in a democratic, diverse and global society.

- We believe that all individuals are capable of learning.
- We believe that all individuals should have the resources necessary to achieve success within a challenging curriculum.
- We believe that a family, school, and community partnership is essential to our success.
- We believe that a safe and orderly environment is critical to learning.
- We believe that there is strength in diversity and that all individuals are worthy of our respect and dignity.
- We believe that our school climate must be welcoming, caring, and supportive for all members of the learning community.
- We believe that a reflective evaluation of present practices and processes is necessary in order to plan for our future.

INTRODUCTION & PHILOSOPHY

The Connecticut State Board of Education, in its 2008 Position Statement on Science Education, calls for 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 a globally competitive economy.

In 2015, the Connecticut State Board of Education adopted the Next Generation Science Standards which embodies the National Research Council's *Framework for K-12 Education: Practices, Crosscutting Concepts, and Core Ideas* (2011); and furthermore developed a 5-year Implementation Plan of the Next Generation Science Standards (NGSS) for transitioning curriculum, instruction, and assessment. (Appendix B). The NGSS architecture was designed to provide information to teachers and curriculum and assessment developers beyond the traditional one line standard and uses Science and Engineering Practices along with various components of the Disciplinary Core Ideas and Crosscutting Concepts to make up the performance expectations for students.

The Board offers guidelines to support the establishment of collaborations among various stakeholders to build a coordinated science education system. (SDE, 2008).
As developed by the writers of the *Framework for K-12 Science Education* (Council, 2011), a core idea for K-12 science instruction should:

1. "Have broad importance across multiple sciences or engineering disciplines or be a key organizing principle of a single discipline."
2. "Provide a key tool for understanding or investigating more complex ideas and solving problems."
3. "Relate to the interests and life experiences of students or be connected to societal or personal concerns that require scientific or technological knowledge."

4. “Be teachable and learnable over multiple grades at increasing levels of depth and sophistication.” (Council, 2011)

The Trumbull Public School’s Grade 3 science curriculum addresses the Next Generation Science Standards as listed with each unit of study.

SAFETY FIRST

The Trumbull Public School System follows the recommended guidelines for student safety in the classroom as represented in the National Science Education Standards, State Science Frameworks and NGSS, the National Science Teachers Association, and OSHA and as outlined in subsections of Policy 6000 in regards to Instruction. We encourage and foster a hands-on, process and inquiry-based approach to science instruction with student safety always first and foremost in mind. The use of lab safety guidelines are supported throughout the district.

COURSE GOALS

The course goals derive from the 2013 Next-Generation Science 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. An important role of science education is not to teach “all the facts” but rather to prepare students with sufficient core knowledge so that they can later acquire additional information on their own.

COURSE ENDURING UNDERSTANDINGS

Earth’s Systems- Weather and Climate
Students will understand…

- Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next.
- Climate describes a range of an area’s typical weather conditions and the extent to which those conditions vary over years.
- A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts.

Motion and Stability- Forces and Interactions
Students will understand…

- Each force acts on one particular object and has both strength and direction.
- An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object.
- The patterns of an object’s motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it.
- Objects in contact exert forces on each other.
- Electric and magnetic forces between a pair of objects do not require that the objects be in contact.

- The sizes of the forces in each situation depend on the properties of the objects and their distances apart. For forces between two magnets the size of the force in each situation depends on their orientation relative to each other.

Ecosystems and Heredity
Students will understand…

- For any particular environment some kinds of organisms survive well, some survive less well, and some cannot survive at all.
- Populations live in a variety of habitats, and change in those habitats affects the organisms living there.
- When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die.
- Some kinds of plants and animals that once lived on Earth are no longer found anywhere.
- Fossils provide evidence about the types of organisms that lived long ago and also about the nature of the environment.
- Being part of a group helps animals obtain food, defend themselves, and cope with changes. Groups may serve different functions and vary dramatically in size.
- Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles.
- Plants and animals have traits inherited from parents and that variation of traits exists in a group of similar organisms.
- Many characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment.
- Different organisms vary in how they look and function because they have different inherited information.
- The environment also affects the traits that an organism develops.
- Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing.

COURSE ESSENTIAL QUESTIONS

- What is the difference between weather and climate, and how do they influence each other?
- What tools and methods do scientists use to measure and analyze weather?
- How do scientists collect and interpret data from weather stations?
- What are some common weather measurement instruments and their purposes?
- How do changes in weather occur, and what are the factors that contribute to these changes?
- What are the different climate zones around the world, and how do they impact weather patterns?
- How do different climate zones influence the types of weather experienced in specific regions?
- What are the dangers associated with extreme weather events, and how can we mitigate their impact?

- What are some examples of weather hazards and their potential consequences?
- What are the different types of forces that objects experience?

- How do pushes and pulls affect motion?
- How do gravity, magnetism, and friction affect the motion of objects?
- What is force?
- What is net force?
- What are balanced and unbalanced forces? How do they affect an object?
- How can you change the direction of motion of an object?
- What are the ways speed can change?
- What are contact forces?
- How can objects affect each other when not in contact?
- What role does mass play in determining the effects of forces?
- How do magnetic forces cause motion, and what are their properties?
- How do magnetic objects interact with each other?
- What affects the size of a force?

- How do life cycles, inherited and acquired traits, and adaptations impact the diversity of life on Earth?
- How do organisms grow and develop through their life cycles?
- What are the differences between inherited and acquired traits, and how do they contribute to variations in organisms?
- What are the different types of adaptations, and how do they help organisms survive and thrive in their environments?
- How do physical adaptations, such as bird beaks, enable organisms to obtain food?
- What are the benefits of behavioral adaptations, such as camouflage, in predator-prey relationships?
- How does the environment impact the life cycles of organisms, and how do environmental changes affect ecosystems?
- How do variations in environmental conditions affect the growth and development of organisms?
- What are the long-term effects of environmental changes on ecosystems?
- How do scientists use the fossil record to understand how organisms and their environments have changed over time?
- What can fossil structures and data tell us about past organisms and the environments they lived in?
- How does the study of fossils contribute to our understanding of the diversity of life on Earth?
- How do human activities impact ecosystems, and how can we design solutions to address environmental problems?

COURSE KNOWLEDGE AND SKILLS

Crosscutting scientific and engineering concepts as outlined in the Next Generation Science Standards(NGSS):

Students will know…

- 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 measurements 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
- Analyze and interpret data
- Use mathematics and computational thinking
- Construct explanations (for science) and design solutions (for engineering)
- Engage in arguments from evidence
- Obtain, evaluate, and communicate information

Scope and Sequence

September to December	Bundle 1: Earth Systems: Weather and Climate
January to Mid-April	Bundle 2: Motion and Stability: Forces and Interactions
Mid-April to June	Bundle 3: Ecosystems and Heredity

BUNDLE 1:

Earth Systems : Weather and Climate

Unit Overview:

Step outside or look out the window, and you can observe the weather. Perhaps it is cold and rainy today where you live, but in other parts of the world it may be hot and sunny, or perhaps a tropical storm is developing. “Climate” refers to an area’s average weather pattern over many years, and climate influences the weather. Extreme weather events occur around the world every day, but how does climate variability influence the probability of extreme weather events? What do scientists need to know to inform people about dangerous weather and prevent damage and death from weather hazards? Throughout this unit, students will explore and learn about patterns in weather, climate, seasons, and weather hazards. Students will be introduced to the components that make up weather, the tools used to measure weather, how changes in weather happen, and the connection between weather and climate. Students explore these concepts by investigating, discussing, and problem-solving. Students make observations and predictions, analyze and graph data, develop claims supported with evidence and reasoning, and evaluate problems and solutions.

Unit Goals:

Science Standards:

NGSS: 3-ESS2-1: Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.

NGSS: 3-ESS2-2: Obtain and combine information to describe climates in different regions of the world.

NGSS: 3-ESS3-1: Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.

The following course goals derive from the 2010 Connecticut Core Standards.

ELA-Literacy Standards

CCSS.ELA-Literacy. RI 3: Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. *(3-ESS2-2*

CCSS.ELA-Literacy. RI 3.9: Compare and contrast the most important points and key details presented in two texts on the same topic. *(3-ESS2-2)*

CCSS.ELA-Literacy.W.3.1: Write opinion pieces on topics or texts, supporting a point of view with reasons. *(3-ESS3-1)*

CCSS.ELA-Literacy.W.3.7: Conduct short research projects that build knowledge about a topic. *(3-ESS3-1)*

CCSS.ELA-Literacy.W.3.9: Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories. *(3-ESS2-2)*

Mathematics Standards

CCS.Mathematics.MP.2: Reason abstractly and quantitatively. *(3-ESS2-1), (3-ESS2-2), (3-ESS3-1)*

CCS.Mathematics.MP.4: Model with mathematics. *(3-ESS2-1),(3-ESS2-2), (3-ESS1-1)*

CCS.Mathematics.MP.5: Use appropriate tools strategically. *(3-ESS2-1)*

CCS. Mathematics.*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. *(3-ESS2-1)*

The following standards derive from the 2013 Next-Generation Science (NGSS) Elementary School Engineering Design Standards.

NGSS.3-5-ETS1-2: Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

BUNDLE 1: Weather and Climate

Science & Engineering Practices

- **Analyzing and Interpreting Data**
  - Represent data in tables and various graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships.*(3-ESS2-1)*
- **Obtaining, Evaluating, and Communicating Information**
  - Obtain and combine information from books and other reliable media to explain phenomena. *(3-ESS2-2)*
- **Engaging in Argument from Evidence**
  - 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. *(3-ESS3-1)*

Disciplinary Core Ideas

- **ESS2.D: Weather and Climate**
  - Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next. *(3-ESS2-1)*
  - Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years. *(3-ESS2-2)*
- **ESS3.B: Natural Hazards**
  - A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts. *(3-ESS3-1)*

Crosscutting Concepts

- **Patterns**
  - Patterns of change can be used to make predictions. *(3-ESS2-1),(3-ESS2-2)*
- **Cause and Effect**
  - Cause and effect relationships are routinely identified, tested, and used to explain change. *(3-ESS3-1)*

Unit Essential Questions:

1. What are the components that make up weather?
2. How do changes in weather happen?
3. How is weather related to climate?
4. How can students use tools to measure and monitor weather patterns?
5. How does collecting and analyzing daily data contribute to understanding local weather conditions?
6. In what ways does geographic location affect weather data?
7. How do climate zones vary globally?
8. What role does geographic location play in determining climate zones?
9. What are the characteristics and dangers associated with tropical storms, and how do they contribute to dangerous weather conditions?
10. How do scientists and engineers reduce the impact of dangerous weather on humans?

Scope and Sequence of Bundle 1:

Lesson 1: Weather and the Tools Used to Study Weather
Lesson 2: Analyzing Weather and Data Patterns
Lesson 3: Weather and Climate Connections
Lesson 4: Dangerous Weather
Lesson 5: Possible Solutions to Reduce Impact of Weather Hazards

Phenomenon: Step outside or look out the window, and you can observe the weather. Perhaps it is cold and rainy today where you live, but in other parts of the world it may be hot and sunny, or perhaps a tropical storm is developing. "Climate" refers to an area's average weather pattern over many years, and climate influences the weather. This phenomenon has impacted Earth throughout its geologic history. In fact, dangerous weather events occur around the world every day as a result of climate variability. How does climate variability influence the probability of a weather event? What do scientists need to know to inform people about the weather and prevent damage and deaths from extreme weather events? The anchoring phenomenon for this unit is recognizing that weather and climate are connected.

Focus questions:

- What tools do we use to measure weather?
- What is the benefit of understanding patterns in weather?
- Can I analyze and graph weather data?
- Can I analyze patterns in weather in various places?
- How are weather and climate related?
- What factors shape climate?
- What are patterns in climate zones?
- How can dangerous weather affect an area?
- How can we reduce the impact of a weather hazard?
- How well does the solution reduce the impact of the weather hazard?

Academic Vocabulary:

air, air mass, air pressure, altitude, anemometer, atmosphere, average, barometer, biosphere, celsius, climate, climate zone, cloud, degrees, equator, fahrenheit, forecast, forecast model, geosphere, greenhouse gasses, hazard, meteorologist, meteorology, polar, precipitation, rain, rain gauge, rainfall, satellite, season, temperate, temperature, thermometer, topography, tropical, tropical storm, weather, wind, wind vane, windsock

Assured Assessments:

Formative/Skills:

- Student Investigation Sheets
- Science Notebook Entries
- Whole group check-in discussions
- Monitoring during Turn and Talk
- Student responses during class discussions
- Review students' questions about the investigative phenomenon from the beginning of the lesson.
- Tell Me More Extension - responses

Summative/Content:

- Lesson 2- Analyzing Weather and Data Patterns Snapshot/ Poster
- Lesson 3- Weather and Climate Patterns Snapshot

Resources:

Core

- Building Blocks of Science® 3D: Weather and Climate (©2019) Carolina Biological Supply Company. Burlington, NC.
- Building Blocks of Science Literacy Series™: Weather and Climate. Carolina Biological Supply Company. Print.

Supplemental

- Classroom Libraries

Time Allotment

- Bundle 1: Earth's Systems Weather and Climate- Trimester 1

BUNDLE 2:

Motion and Stability: Forces and Interactions

Unit Overview:

Everything around us is subject to forces. While students are likely familiar with forces that set things in motion, like pushes or pulls, there's a good chance they might not know much about other forces, such as magnetism or gravity, which are a bit more abstract and need us to observe things happening. In this unit, students are diving into Newton's three laws of motion, the basics of physical science that students will build on as they move through their science courses. The goal is for the students to get a deeper understanding of forces and how they make things start, change, or stop moving. Students will learn about balanced and unbalanced forces, by learning about topics such as gravity, magnetism, friction, mass, and distance.

Unit Goals:

Science Standards

3-PS2-1: Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.

3-PS2-2: Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.

3-PS2-3: Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.

3-PS2-4: Define a simple design problem that can be solved by applying scientific ideas about magnets.

The following course goals derive from the 2010 Connecticut Core Standards.

ELA-Literacy Standards

CCS.ELA-Litearcy.RI.3.1: Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. *(3-PS2-1),(3-PS2-3)*

CCS.ELA-Literacy.RI.3.3: Describe the connection 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. *(3-PS2-3)*

CCS.ELA-Literacy.RI.3.8: Describe the logical connection between particular sentences and paragraphs in a text (e.g., comparison, cause/effect, first/second/third in a sequence). *(3-PS2-3)*

CCS.ELA-Literacy.W.3.7: Conduct short research projects that build knowledge about a topic. *(3-PS2-1),(3-PS2-2)*

CCS.ELA-Literacy.W.3.8: Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories. *(3-PS2-1),(3-PS2-2).*

CCS.ELA-Literacy.W.2.8: Recall information from experiences or gather information from provided sources to answer a question. *(2-ESS1-1),(2-ESS2-3)*

CCS.ELA-Literacy.SL.2.2: Recount or describe key ideas or details from a text read aloud or information presented orally or through other media. *(2-ESS1-1)*

CCS.ELA-Literacy.SL.3.3: Ask and answer questions about information from a speaker, offering appropriate elaboration and detail. *(3-PS2-3)*

Mathematics Standards

CCS.Mathematics.MP.2: Reason abstractly and quantitatively. *(3-PS2-1)*

CCS.Mathematics.MP.5: Use appropriate tools strategically. *(3-PS2-1)*

CCS.Mathematics 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. *(3-PS2-1)*

The following standards derive from the 2013 Next-Generation Science (NGSS) Elementary School Engineering Design Standards.

NGSS.3-5-ETS1-2: Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

BUNDLE 2: Motion and Stability: Forces and Interactions

Science & Engineering Practices

- **Asking Questions and Defining Problems**
  - Ask questions that can be investigated based on patterns such as cause and effect relationships. *(3-PS2-3)*
  - Define a simple problem that can be solved through the development of a new or improved object or tool. *(3-PS2-4)*
- **Planning and Carrying Out Investigations**
  - Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. *(3-PS2-1)*
  - 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. *(3-PS2-2)*

Disciplinary Core Ideas

- **PS2.A: Forces and Motion**
  - Each force acts on one particular object and has both strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object's speed or direction of motion. *(3-PS2-1)*
  - The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it. *(3-PS2-2)*
- **PS2.B: Types of Interactions**
  - Objects in contact exert forces on each other. *(3-PS2-1)*
  - Electric, and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other. *(3-PS2-3),(3-PS2-4)*

Crosscutting Concepts

- **Patterns**
  - Patterns of change can be used to make predictions. *(3-PS2-2)*
- **Cause and Effect**
  - Cause and effect relationships are routinely identified. *(3-PS2-1)*
  - Cause and effect relationships are routinely identified, tested, and used to explain change. *(3-PS2-3)*

Unit Essential Questions:

- What are the fundamental forces and interactions that govern motion and impact objects in our everyday lives?
- How do Newton's three laws of motion serve as a framework for understanding physical science concepts related to forces and interactions?
- In what ways can balanced and unbalanced forces be identified, manipulated, and utilized to determine mass using tools like a beam balance?
- How does gravity play a crucial role in shaping our understanding of inertia, and how do forces such as gravity and friction, in combination with mass, influence the movement of objects?
- What role does magnetism play in causing motion, and how can students identify, explain, and manipulate magnetic forces, polarity, attraction, and repulsion?
- How do real-world phenomena connect with the concepts of forces, gravity, and magnetism explored in the unit?
- How does gravity, magnetism, friction, mass, and distance, influence and shape the interactions and movement of objects?

Scope and Sequence of Bundle 2:

Lesson 1: Balanced Forces
Lesson 2: Unbalanced Forces
Lesson 3: Changes in Motion
Lesson 4: Magnetism and Electricity
Lesson 5:Magnetic Solutions

Phenomenon: All motion relies on the interactions of forces. Depending on the forces at work on an object, it may start, stop, change direction, or change speed. The mass of the object and the strength of the forces at work affect the resulting motion of the object. The anchoring phenomenon for this unit is recognizing the interactions between forces at an amusement park.

Essential/Focus questions:

- How can we use a balance to estimate mass?
- How does gravity affect balance?
- What is inertia?
- How does inertia affect the motion of an object?
- Why does friction slow movement?
- How does force affect the motion of an object?
- How does mass affect the motion of an object?
- How can I increase magnetic force?
- Are all metals magnetic?
- What is a magnetic field and how can we see it?
- How does the shape of a magnet affect its magnetic forces?
- How do electric forces compare to magnetic forces?
- Can you illustrate different forces and interactions?
- Can you achieve the project goal by designing a model using magnets?

Academic Vocabulary:
accelerate, attract, balance, balanced forces, charge, decrease, distance, equal, even, force, friction, fulcrum, gram, gravity, increase, inertia, Isaac Newton, level, load, magnet, magnetic field, magnetism, mass, motion, newton, repel, scale, speed, spring scale, static electricity, strength, unbalanced forces

Assured Assessments

Formative/Skills:

- Student Investigation Sheets
- Science Notebook Entries
- Whole group check-in discussions
- Monitoring during Turn and Talk
- Student responses during class discussions
- Review students' questions about the investigative phenomenon from the beginning of the lesson.
- Tell Me More Extension - responses

Summative/Content:

- Lesson 1 Snapshot: Gravity and Balance
- Lesson 2 Snapshot: Unbalanced Forces and Inertial
- Lesson 3 Snapshot: Mass, Force, and Inertia
- Lesson 4 Snapshot: Magnetism and Electricity

Resources:

Core

- Building Blocks of Science® 3D:Earth Materials (©2019) Carolina Biological Supply Company. Burlington, NC.
- Building Blocks of Science Literacy Series™: Earth Materials. Carolina Biological Supply Company. Print.

Supplemental

- Online resources will be listed with lesson outlines on "Pacing Chart".
- Classroom and Learning Commons content related libraries

Time Allotment

- Bundle 2: Earth's Systems: Processes that Shape the Earth: Earth Materials- Trimester 2

BUNDLE 3:
Ecosystems and Heredity

Unit Overview:
In this unit, students will be introduced to life cycles, inherited and acquired traits, adaptations, and the fossil record and how all of those things impact the diversity of life on Earth**.** Students begin by drawing upon previous knowledge to document what they know about the components of ecosystems. They are introduced to life cycles by setting up habitats for Triops® and Wisconsin Fast Plants® by beginning unit-long observations of these organisms. Students further explore growth and development by examining some of the inherited and acquired traits that they possess and evaluating trait variations in their plants, their Triops, and other organisms.

Students discuss behavioral and physical adaptations, and they investigate physical adaptations by comparing model bird beaks to the types of food birds can obtain. Students build on their knowledge of adaptations to describe the benefits of camouflage in predator–prey relationships, and they observe how variations in adaptations can impact an organism's survival. Students investigate the effect of the environment on the life cycles of organisms by setting up a second plant growing system and withholding one important plant need. The experimental system is compared with students' original growing systems, and students analyze how environmental changes can impact various ecosystems, and use fossil structures and data to determine how organisms and the environments they lived in change over time.

In the culminating lesson, students discuss how humans depend on and impact ecosystems. Students work in groups to analyze the ways that an environmental problem could affect the plants and animals in an ecosystem. They evaluate a proposed solution and determine whether the solution helps solve the environmental problem or harms the ecosystem by introducing additional changes with negative impacts.

Unit Goals:

Science Standards
3-LS1-1: Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death

3-LS2-1: Construct an argument that some animals form groups that help members survive.

3-LS3-1: Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.

3-LS3-2: Use evidence to support the explanation that traits can be influenced by the environment.

3-LS4-1: Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago.

3-LS4-2: Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.

3-LS4-3: Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.

3-LS4-4: Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.

The following course goals derive from the 2010 Connecticut Core Standards.

ELA-Literacy Standards

CCS.ELA-Literacy.R.I. 3.1:

- Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. *(3-LS2-1)*
- Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. *(3-LS3-1),(3-LS3-2)*
- Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. *(3-LS4-1),(3-LS4-2),(3-LS4-3) (3-LS4-4)*

CCS.ELA-Literacy.R.I. 3.2

- Determine the main idea of a text; recount the key details and explain how they support the main idea. *(3-LS3-1),(3-LS3-2)*
- Determine the main idea of a text; recount the key details and explain how they support the main idea. *(3-LS4-1),(3-LS4-2),(3-LS4-3),(3LS4-4)*

CCS.ELA-Literacy.R.I. 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. *(3-LS2-1)*
- 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. *(3-LS3-1),(3-LS3-2)*
- 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. *(3-LS4-1),(3-LS4-2),(3-LS4-3),(3-LS4-4)*

CCS.ELA-Literacy.R.I. 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). *(3-LS1-1)*

CCS.ELA-Literacy.W.3.1

- Write opinion pieces on topics or texts, supporting a point of view with reasons. *(3-LS2-1)*

CCS.ELA-Literacy.W.3.2

- Write informative/explanatory texts to examine a topic and convey ideas and information clearly. *(3-LS3-1),(3-LS3-2)*
- Write informative/explanatory texts to examine a topic and convey ideas and information clearly. *(3-LS4-1),(3-LS4-2),(3-LS4-3),(3-LS4-4)*

CCS.ELA-Literacy.W.3.9

- Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories. *(3-LS4-1)*

CCS.ELA-Literacy.S.L.3.4

- Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace. *(3-LS3-1),(3-LS3-2)*
- Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace. *(3-LS4-2),(3-LS4-3),(3-LS4-4)*

CCS.ELA-Literacy.S.L.3.5

- Create engaging audio recordings of stories or poems that demonstrate fluid reading at an understandable pace; add visual displays when appropriate to emphasize or enhance certain facts or details. *(3-LS1-1)*

Mathematics Standards

CCS.Mathematics.MP.2 : Reason abstractly and quantitatively. *,(3-LS3-1), (3-LS3-2) (3-LS4-1), (3-LS4-2), (3-LS4-3), (3-LS4-4)*

CCS.Mathematics.MP.4: Model with mathematics. *(3-LS1-1), (3-LS2-1), (3-LS3-1), (3-LS3-2), (3-LS4-1), (3-LS4-2), (3-LS4-3), (3-LS4-4)*

CCS.Mathematics.MP.5: Use appropriate tools strategically. *(3-LS4-1)*

CCS.Mathematics.3.NBT: Number and Operations in Base Ten *(3-LS1-1), (3-LS2-1)*

CCS.Mathematics.3.NF: Number and Operations—Fractions *(3-LS1-1)*

CCS.Mathematics.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. *(3-LS3-1), (3-LS3-2), (3-LS4-1) (3-LS4-2), (3-LS4-3)*

The following standards derive from the 2013 Next-Generation Science (NGSS) Elementary School Engineering Design Standards.

NGSS.3-5-ETS1-2: Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

BUNDLE 3: Ecosystems and Heredity

Science & Engineering Practices

- **Developing and Using Models**
  - Develop models to describe phenomena. *(3-LS1-1)*
- **Engaging in Argument from Evidence**
  - Construct an argument with evidence, data, and/or a model. *(3-LS2-1)*
- **Analyzing and Interpreting Data**
  - Analyze and interpret data to make sense of phenomena using logical reasoning. *(3-LS3-1), (3-LS4-1)*
- **Constructing Explanations and Designing Solutions**
  - Construct an argument with evidence. *(3-LS4-3)*
  - Use evidence (e.g., observations, patterns) to support an explanation. *(3-LS3-2),(3-LS4-2)*
  - 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. *(3-LS4-4)*

Disciplinary Core Ideas

- **LS1.B: Growth and Development of Organisms**
  - Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles. *(3-LS1-1)*
- **LS2.D: Social Interactions and Group Behavior**
  - Being part of a group helps animals obtain food, defend themselves, and cope with changes. Groups may serve different functions and vary dramatically in size *(3-LS2-1)*
- **LS3.A: Inheritance of Traits**
  - Many characteristics of organisms are inherited from their parents. *(3-LS3-1)*
  - Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment. *(3-LS3-2)*
- **LS3.B: Variation of Traits**
  - Different organisms vary in how they look and function because they have different inherited information. *(3-LS3-1)*
  - The environment also affects the traits that an organism develops. *(3-LS3-2)*
- **LS2.C: Ecosystem Dynamics, Functioning, and Resilience**
  - When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die. *(secondary to 3-LS4-4)*
- **LS4.A: Evidence of Common Ancestry and Diversity**
  - Some kinds of plants and animals that once lived on Earth are no longer found anywhere. *(3-LS4-1)*
  - Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments. *(3-LS4-1)*
- **LS4.B: Natural Selection**
  - Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing. *(3-LS4-2)*

- **LS4.C: Adaptation**
    - For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. *(3-LS4-3)*
- **LS4.D: Biodiversity and Humans**
    - Populations live in a variety of habitats, and change in those habitats affects the organisms living there. *(3-LS4-4)*

Crosscutting Concepts

- **Patterns**
    - Patterns of change can be used to make predictions. *(3-LS1-1)*
    - Similarities and differences in patterns can be used to sort and classify natural phenomena. *(3-LS3-1)*
- **Cause and Effect**
    - Cause and effect relationships are routinely identified and used to explain change. *(3-LS2-1), (3-LS4-2), (3-LS4-3)*
    - Cause and effect relationships are routinely identified and used to explain change. *(3-LS3-2)*
- **Scale, Proportion, and Quantity**
    - Observable phenomena exist from very short to very long time periods. *(3-LS4-1)*
- **Systems and System Models**
    - A system can be described in terms of its components and their interactions. *(3-LS4-4)*

Unit Essential Questions:

- What role do organisms in local ecosystems play in providing essential resources such as food, shelter, and oxygen for human life?
- How do life cycles, inherited traits, and acquired traits contribute to the diversity of life on Earth, and how can they be observed and studied?
- What are the behavioral and physical adaptations that organisms develop for survival, and how do variations in these adaptations impact an organism's ability to thrive in its environment?
- In what ways do environmental changes affect the life cycles of organisms, and how can these changes impact various ecosystems?
- How does the fossil record provide insights into the historical changes in organisms and the environments they inhabited, and what can be learned from this data?
- How do humans depend on ecosystems, and what are the potential impacts of human activities on these ecosystems?
- How can students analyze and evaluate proposed solutions to environmental problems, considering their potential effects on plants, animals, and overall ecosystem health?

Scope and Sequence of Bundle 3:

Lesson 1: Life in Ecosystems
Lesson 2: Inheritance and Variation of Traits
Lesson 3: Adaptations
Lesson 4: Environmental Influences
Lesson 5: Ecosystems, Humans, and Biodiversity

Phenomenon:. Earth is a very special place and is the only planet that has been found to support life. Have you ever stopped to consider the sheer number of organisms that surround us in our daily interactions? As students travel to school, play on the playground, or participate in a school fire drill, they are observing and sharing space with many of the different organisms that live in the local ecosystem. The anchoring phenomenon for *Life in Ecosystems* is recognizing the amazing diversity of life in the ecosystems we live in.

Focus questions

- What patterns exist as organisms grow and develop?
- Why do some animals live in groups?
- What is a trait, and where do I get it from?
- Why don't all organisms look exactly alike?
- How do adaptations help organisms survive?
- How does the structure of a bird's beak help it survive?
- How can camouflage be beneficial in a predator-prey relationship?
- How can the environment influence traits?
- What do fossils tell us about past and present organisms?
- How do we depend on and impact ecosystems?
- Does the solution help the problem impacting an ecosystem?

Academic Vocabulary:

acquired trait, adaptation, ancestor, behavioral adaptation, camouflage, community, ecologist, ecology, ecosystem, environment, extinct, fossil, geologic time scale, germinating, habitat, influence, inherited trait, larvae, life cycle, offspring, organism, paleontologist, physical adaptation, population, predator, prey, reproduce, species, survive, trait, variation,

Assured Assessments

Formative/Skills:

- Student Investigation Sheets
- Science Notebook Entries
- Whole group check-in discussions
- Monitoring during Turn and Talk
- Student responses during class discussions
- Review students' questions about the investigative phenomenon from the beginning of the lesson.
- Tell Me More Extension - responses

Summative/Content:

- Lesson 2 Snapshot- Inheritance and Variation of Traits.
- Lesson 3 Snapshot- Adaptations

Resources:

Core

- Building Blocks of Science® 3D: Life in Ecosystems (©2019) Carolina Biological Supply Company. Burlington, NC.
- Building Blocks of Science Literacy Series™: Life in Ecosystems. Carolina Biological Supply Company. Print.

Supplemental

- Online resources will be listed with lesson outlines on “Pacing Chart”.
- Classroom and Learning Commons content related libraries

Time Allotment

- Bundle 3: Ecosystems and Heredity- Trimester 3