TRUMBULL PUBLIC SCHOOLS
Trumbull, Connecticut

Science Curriculum
Grade 4
Next Generation
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NEXT GENERATION SCIENCE
Grade 4

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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 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, 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 the 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. 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 4 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 5E 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, History, and Human Impact
Students will understand…

- Earth's major systems interact in multiple ways to affect earth's surface materials and processes. Human activities affect Earth's systems and their interactions at its surface.
- Maps can help locate the different land and water features where people live and on other areas of Earth.
- Living things affect the physical characteristics of their regions. Many types of rocks and minerals are formed from the remains of organisms or are altered by their activities.
- All materials, energy, and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not.
- A variety of hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts.
- Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. However, humans are doing things to help protect Earth's resources and environments.

Energy, Waves and their Applications
Students will understand…

- Energy can be moved from place to place by moving objects or through sound, light, or electric currents.
- When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced.
- Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy.
- When objects collide, the contact forces transfer energy so as to change the object's motion. The expression "produce energy" typically refers to the conversion of stored energy into a desired form for practical use.
- It is important to be able to concentrate energy so that it is available for use where and when it is needed. For example, batteries are physically transportable energy storage devices, whereas electricity generated by power plants is transferred from place to place through distribution systems.
- Waves, which are regular patterns of motion, can be made in water by disturbing the surface. Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks.)
- Digitized information can be transmitted over long distances without significant degradation. High-tech devices, such as computers or cell phones, can receive and decode information—convert it from digitized form to voice—and vice versa.

Molecules to Organisms
Students will understand…

- Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.
- Organisms range in composition from a single cell to multicellular organisms. In multicellular organisms groups of cells work together to form systems of tissues and organs that are specialized for particular functions.
- Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions and support their survival.
- Eye structures have individual functions, and light waves and their frequencies affect our experience of vision. (Relationship between light and pupil size.)

Engineering Design
Students will …

- Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost.
- Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design problem.
- 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.
- Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints.

COURSE ESSENTIAL QUESTIONS

- How do people reconstruct and date events in Earth's planetary history?
- How and why is Earth constantly changing?
- How do Earth's major systems interact?
- How do the properties and movements of water shape Earth's surface and affect its systems?
- How do living organisms alter Earth's processes and structures?
- How do human activities and Earth's surface processes (including natural disasters) affect each other?
- How do humans depend on Earth's resources?
- How can humans explain and predict interactions between objects and within systems of objects?
- How can one predict an object's continued motion, changes in motion, or stability?
- What is energy?
- How do food and fuel provide energy?
- How are waves used to transfer energy and information?
- What are the characteristic properties and behaviors of waves?
- How do organisms live, grow, respond to their environment, and reproduce?
- How do organisms detect, process, and use information about the environment?
- How do engineers solve problems?
- What are the criteria and constraints of a successful solution?
- How can the various proposed design solutions be compared and improved?

COURSE KNOWLEDGE AND SKILLS

Crosscutting scientific and engineering concepts as outlined in the Next Generation Science Standards for Grade 4 (NGSS):
Students will know…

- Patterns can be used as evidence to support an explanation. Science assumes consistent patterns in natural systems. Similarities and differences in patterns can be used to sort and classify natural phenomena.
- Cause and effect relationships are routinely identified, tested, and used to explain change.
- Energy and matter: Energy can be transferred in various ways and between objects. The way in which an object or living thing is shaped and its substructure determine many of its properties and functions.
- Knowledge of relevant scientific concepts and research findings is important in engineering. Over time, people's needs and wants change, as do their demands for new and improved technologies.
- Engineers improve existing technologies or develop new ones to increase their benefits, to decrease known risks, and to meet societal demands.

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

SCIENCE YEAR AT A GLANCE

Lesson are based on Allotted Instructional Time per discipline for Grade 4: 225 minutes
(recommended 5 – forty-five minute classes per week or 4 - fifty-five minute classes per week)

September to December	Unit 1: **Changing Earth** Earth's Systems, History, and Human Impact STEM-embedded unit on Earth materials/systems/erosion
January to mid-April	Unit 2: **Energy Works** Waves and Their Applications in Technologies for Information Transfer (Energy - Natural Resources, Motion, Electricity)
Mid-April to June	Unit 3: **Plant and Animal Structures** From Molecules to Organisms: Structure and Function, Information Processing

UNIT 1- Changing Earth
Earth's Systems, History, and Human Impact

Unit Goals

Grade 4 students are expected to develop an understanding of the effects of weathering or the rate or erosion by water, ice, wind, or vegetation. They apply their knowledge of natural Earth processes to generate and compare multiple solutions to reduce the impacts of such processes on humans. In order to describe patterns of Earth's features, students will analyze and interpret data from maps. Different types of maps provide different information about the landforms and bodies of water on Earth. For example, Globes are three dimensional and use texture or elevated surfaces to show hills, mountains, or deserts.

NGSS.4-ESS1-1.	Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.
NGSS.4-ESS2-1.	Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.
NGSS.4-ESS2-2.	Analyze and interpret data from maps to describe patterns of Earth's features.
NGSS.4-ESS3-1.	Obtain and combine information to describe that energy and fuels are derived from natural resources and that their uses affect the environment.
NGSS.4-ESS3-2.	Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.
NGSS.3-5.ETS1.B	Designing Solutions to Engineering Problems. Testing a solution involves investigating how well it performs under a range of likely conditions.
NGSS.3-5-ETS1-1.	Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

NGSS.3-5-ETS1-3	Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

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

ELA/Literacy

CCS.ELA-Literacy.W.4.7	Conduct short research projects that build knowledge through investigation of different aspects of a topic.
CCS.ELA-Literacy.W.4.8	Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.
CCS.ELA-Literacy.W.4.9	Draw evidence from literary or informational texts to support analysis, reflection, and research. (4-ESS1-1)
CCS.ELA-Literacy.SL.1.5	Add drawings or other visual displays to descriptions when appropriate to clarify ideas, thoughts, and feelings.

Mathematics

CCS.MP.2	Reason abstractly and quantitatively.
CCS.MP.4	Model with mathematics.
CCS.MP.5	Use appropriate tools strategically.
CCS.MD.A.1	Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table.

NGSS 3D Learning

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. ● Identify the evidence that supports particular points in an explanation. (4-ESS1-1) ● Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution. (4-ESS3-2) **Planning and Carrying Out Investigations** Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions. ● Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation	**ESS1.C: The History of Planet Earth** ● Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed. (4-ESS1-1) **ESS2.A**: Earth Materials and Systems ● Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1) **ESS2.B: Plate Tectonics and Large-Scale System Interactions** ● The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges. Maps can help locate the different	**Patterns** ● Patterns can be used as evidence to support an explanation. (4-ESS1-1, 4-ESS2-2) **Scientific Knowledge Assumes an Order and Consistency in Natural Systems** ● Science assumes consistent patterns in natural systems. (4-ESS1-1) **Cause and Effect** ● Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1) **Influence of Science, Engineering and Technology on Society and the Natural World** ● Over time, people's needs and wants change, as do their demands for new and improved technologies. (4-ESS3-1) ● Engineers improve existing technologies or develop new ones to increase their benefits, to decrease known risks, and to meet societal demands. (4-ESS3-2)

of a phenomenon. (4-ESS2-1) Analyzing and Interpreting Data Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used. ● Analyze and interpret data to make sense of phenomena using logical reasoning. (4-ESS2-2) **Obtaining, Evaluating, and Communicating Information** Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluate the merit and accuracy of ideas and methods. ● Obtain and combine information from books and other reliable media to explain phenomena. (4-ESS3-1)	land and water features areas of Earth. (4-ESS2-2) **ESS2.E: Biogeology** ● Living things affect the physical characteristics of their regions. (4-ESS2-1) **ESS3.A: Natural Resources** ● Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not. (4-ESS3-1) **ESS3.B**: **Natural Hazards** ● A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). ● Humans cannot eliminate the hazards but can take steps to reduce their impacts. (4-ESS3-2) (Note: This Disciplinary Core Idea can also be found in 3.WC.) **ETS1.B: Designing Solutions to Engineering Problems** ● Testing a solution involves investigating how well it performs under a range of likely conditions. (secondary to 4-ESS3-2)	

Unit Essential Questions:

- How do people reconstruct and date events in Earth's planetary history?
- How and why is Earth constantly changing?
- How do Earth's major systems interact?
- How do the properties and movements of water shape Earth's surface and affect its systems?
- How do living organisms alter Earth's processes and structures?
- How do human activities and Earth's surface processes (including natural disasters) affect each other?
- How do humans depend on Earth's resources?
- How do engineers solve problems?
- What are the criteria and constraints of a successful solution?
- How can the various proposed design solutions be compared and improved?

Scope and Sequence Bundle 1:
Lesson 1: Earth's Layers and Plates
Lesson 2: Rock Formations and Patterns
Lesson 3: Weathering and Erosion
Lesson 3a: This lesson is from Building for Erosion Control: Pearson Project
STEM
Lesson 4: Mapping Earth
Lesson 5: Changing Earth
Lesson 6: Life on a Changing Earth

Earth's Systems Phenomena:
Throughout history, strong earthquakes occurred leading to volcanic eruptions. (e.g., The west coast of the United States experiences many earthquakes. In 1980, a major earthquake triggered the eruption of Mount St. Helens in Washington.)

Earth's Systems Focus Questions:

- What causes earthquakes?
- Why does the west coast experience earthquakes?
- Why did Mount St. Helens erupt after an earthquake?
- What causes the layers of sand, soil, or clay to form?
- Are there differences between soil, sand, and clay?
- What is the difference between a map and globe?
- Where are most fossils found?
- Why are fossils found in regions where water once existed?
- Why are water animals found deeper underground?

Erosion STEM-based Application Phenomena: Driving around the country, you may notice warning signs alerting people about rockslides, landslides, mudslides, or flooding. With heavy rainfall, it is crucial to exercise caution.

Erosion STEM-based Application Focus Questions:

- What causes landslides, rockslides, mudslides, or flooding?
- Why are these events more common during rainfall?
- Are there solutions to prevent landslides, rockslides, mudslides, or flooding?

Assured Assessments:

Formative:

- Student Investigation Sheets
- Science Notebook Entries
- Whole Group Check-In Discussions
- Monitoring during turn and talk
- Student responses during class discussions
- Students' questions about the investigative phenomenon at the end of the unit
- Tell Me More Responses- Extensions and Enrichment

Summative/Content:

- Lesson 1- Changing Earth Snapshot
- Journal Activity- Earth's Plates and Layers
- Erosion IAB- (CSDE Comprehensive Assessment Program)
- Lesson 4- Mapping the Earth
- Relative Age of Rocks IAB- (CSDE Comprehensive Assessment Program)

Resource:

Core

- *Building Blocks of Science® 3D: Changing Earth* . Carolina Biological Module & Teacher Edition, 2019
- *Building Blocks of Science® 3D: Changing Earth* . Carolina Biological Student Readers. 2019. Carolina Biological Supply Company. Burlington, NC.
- *Project STEM: Building for Erosion Control*. Pearson Module & Teacher Edition
- *Project STEM: Building for Erosion Control Science Reader.* Pearson Education Inc. Upper Saddle River, NJ. Print

Supplemental

- *Erosion.* Delta Science Reader. Nashua, NH, 2004. Print
- Classroom and Learning Commons content related libraries

Time Allotment

- Earth's Systems: Changing Earth- Trimester 1 (September-December)

UNIT 2- Energy Works
Waves and Their Applications in Technologies for Information Transfer
(Energy, Motion, Electricity)

Unit Overview

Energy is a central idea in science; however, it is a complex and somewhat abstract topic that students may struggle to grasp. *Energy Works* incorporates phenomena and provides opportunities for students to manipulate materials while exploring concepts related to energy. Throughout the series of six hands-on lessons, students study different kinds of energy, the transfers and transformations that occur between them, and how energy is used in the world around them. Inquiry-based investigations encourage students to make claims supported with evidence and reasoning, elaborate upon their observations, and design their own experiments.

Students begin by tracing the flow of energy that comes into their bodies and identifying other sources of energy around them. They learn about the two main types of energy—stored (potential) and motion (kinetic)—and participate in interactive demonstrations to draw comparisons between them. To understand the concept of energy transfers and transformations, students set up circuits. They also learn about waves as more than just a water-related topic by examining energy patterns and making connections to forms of communication, like Morse code. Nonrenewable and renewable energy sources are introduced and students explore the benefits and detriments of different types of alternative energy. Students create models of wind turbines and waterwheels and elaborate upon their functionalities. In the last lesson, students design an experiment to answer a question about energy and demonstrate their knowledge. As a culmination, students evaluate how much they have learned about energy by revisiting their pre-unit assessment activity.

Standards

NGSS.4-PS3-1.	Use evidence to construct an explanation relating the speed of an object to the energy of that object.
NGSS.4-PS3-2.	Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.
NGSS.4-PS3-3.	Ask questions and predict outcomes about the changes in energy that occur when objects collide.

NGSS.4-PS3-4.	Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.
NGSS.4-PS4-1.	Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move.
NGSS.4-PS4-3.	Generate and compare multiple solutions that use patterns to transfer information.
NGSS.4-ESS3-1.	Obtain and combine information to describe that energy and fuels are derived from natural resources and that their uses affect the environment.
NGSS.3-5.ETS1.B	Designing Solutions to Engineering Problems. Testing a solution involves investigating how well it performs under a range of likely conditions.
NGSS.3-5-ETS1-1.	Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
NGSS.3-5-ETS1-3	Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

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

ELA/Literacy

CCS.ELA-Literacy.W.4.2	Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
CCS.ELA-Literacy.W.4.7	Conduct short research projects that build knowledge through investigation of different aspects of a topic.

CCS.ELA-Literacy.W.4.8	Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.
CCS.ELA-Literacy.W.4.9	Draw evidence from literary or informational texts to support analysis, reflection, and research.
CCS.ELA-Literacy.SL.1.5	Add drawings or other visual displays to descriptions when appropriate to clarify ideas, thoughts, and feelings.
CCS.ELA-Literacy.SL.4.5	Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes.
CCS.ELA-Literacy.RI.4.1	Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.
CCS.ELA-Literacy.RI.4.3	Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.
CCS.ELA-Literacy.RI.4.9	Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably.

Mathematics

CCS.MP.2	Reason abstractly and quantitatively.
CCS.MP.4	Model with mathematics.
CCS.MP.5	Use appropriate tools strategically.

CCS.MD.A.1	Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table.
CCS.MD.4.OA.A.3	Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.
CCS.4.G.A.1	Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.

NGSS 3D Learning

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Asking Questions and Defining Problems Asking questions and defining problems in grades 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships. ● Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships. (4-PS3-3) **Planning and Carrying Out Investigations**	**PS3.A: Definitions of Energy** ● The faster a given object is moving, the more energy it possesses. (4-PS3-1) ● Energy can be moved from place to place by moving objects or through sound, light, or electric currents. (4-PS3-2),(4-PS3-3) **PS3.B: Conservation of Energy and Energy Transfer** ● Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby	**Energy and Matter** ● Energy can be transferred in various ways and between objects. (4-PS3-1),(4-PS3-2),(4-PS3-3),(4-PS3-4) **Patterns** ● Similarities and differences in patterns can be used to sort and classify natural phenomena. (4-PS4-1) ● Similarities and differences in patterns can be used to sort and

Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions. ● Make observations to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. (4-PS3-2) **Constructing Explanations and Designing Solutions** Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. ● Use evidence (e.g., measurements, observations, patterns) to construct an explanation. (4-PS3-1) ● Apply scientific ideas to solve design problems. (4-PS3-4) ● Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution. (4-PS4-3)	changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. (4-PS3-2),(4-PS3-3) ● Light also transfers energy from place to place. (4-PS3-2) ● Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy. (4-PS3-2),(4-PS3-4) **PS3.C: Relationship Between Energy and Forces** ● When objects collide, the contact forces transfer energy so as to change the object's motions. (4-PS3-3) **PS3.D: Energy in Chemical Processes and Everyday Life** ● The expression “produce energy” typically refers to the conversion of stored energy into a desired form for practical use. (4-PS3-4) **ETS1.A: Defining Engineering Problems** ● Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by	classify designed products. (4-PS4-3) **Connections to Nature of Science** ● Scientific Knowledge Assumes an Order and Consistency in Natural Systems ● Science assumes consistent patterns in natural systems. (4-ESS1-1) **Cause and Effect** ● Cause and effect relationships are routinely identified. (4-PS4-2) **Interdependence of Science, Engineering, and Technology** ● Knowledge of relevant scientific concepts and research findings is important in engineering. (4-PS4-3)

Developing and Using Models Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. ● Develop a model using an analogy, example, or abstract representation to describe a scientific principle. (4-PS4-1) ● Develop a model to describe phenomena. (4-PS4-2)	considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. (secondary to 4-PS3-4) **PS4.A: Wave Properties** ● Waves, which are regular patterns of motion, can be made in water by disturbing the surface. When waves move across the surface of deep water, the water goes up and down in place; there is no net motion in the direction of the wave except when the water meets a beach. (Note: This grade band endpoint was moved from K–2.) (4-PS4-1) Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks). (4-PS4-1) **ESS3.A: Natural Resources** ● Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not. (4-ESS3-1) **ETS1.C: Optimizing The Design Solution** ● Different solutions need to be tested in order to determine which of them	

	best solves the problem, given the criteria and the constraints. (secondary to 4-PS4-3)	

Unit Essential Questions:

- How can one predict an object's continued motion, changes in motion, or stability?
- What is energy?
- How are waves used to transfer energy and information?
- What are the characteristic properties and behaviors of waves?
- How do humans depend on Earth's resources as energy?
- How do food and fuel provide energy?
- How do engineers solve problems?
- What are the criteria and constraints of a successful solution?
- How can the various proposed design solutions be compared and improved?

Scope and Sequence Bundle 2:

Lesson 1: Energy Sources Are Everywhere
Lesson 2: Stored Motion and Energy
Lesson 3: Energy Transfers and Transformations
Lesson 4: Energy Moves in Waves
Lesson 5: Recycling Energy
Lesson 6: My Energy Experiment

Phenomenon:
Before a race, coaches tell their runners to eat a healthy meal of pasta, fruits, or vegetables. In fact, coaches of all sports encourage their athletes to have a snack before a game. You might have had a teacher encourage you to eat a good breakfast the morning of a big test. Why is this? What does this make you wonder?

Focus Questions:

- What are some types of energy we use?
- What are stored energy and motion energy?
- How does energy transfer form?
- What happens when objects collide?
- How is the sun's energy transferred?
- How do you build an electric circuit?
- How does a battery harness energy?
- How can you use waves to send messages?
- How can you create waves?
- How does energy move in waves?
- What are types of alternative Energy?

- How does a wind turbine generate electricity?
- What can I build to demonstrate water energy?

Assured Assessments:

Formative:

- Student Investigation Sheets
- Science Notebook Entries
- Whole Group Check-In Discussions
- Monitoring during turn and talk
- Student responses during class discussions
- Students' questions about the investigative phenomenon at the end of the unit
- Tell Me More Responses- Extensions and Enrichment

Summative:

- Lesson 2: Stored and Motion Energy
- Lesson 3: Energy Transfers and Transformations Journal Activity
- Batteries and Circuits IAB (CDSE Smarter Balanced Website)
- Lesson 4A: Energy Moves in Waves Journal Activity
- Lesson 4 (End): Water waves IAB (CDSE Smarter Balanced Website)
- Lesson 5: Recycling Energy Snapshot
- Lesson 5: Wind Turbine IAB (CDSE Smarter Balanced Website)

Resources:

Core:

- *Building Blocks of Science® 3D: Energy Works* . Carolina Biological Module & Teacher Edition, 2019
- *Building Blocks of Science® 3D: Energy Works* . Carolina Biological Student Readers. 2019. Carolina Biological Supply Company. Burlington, NC.

Supplemental

- *Energy,* Harcourt School Publishers, Print
- Classroom and Learning Commons content related libraries

Time Allotment:

- Trimester II and beginning of Trimester III (January to mid-April)

UNIT 3 - Plant and Animal Studies

From Molecules to Organisms: Structures and Processes

Unit Goals

Fourth graders are expected to develop an understanding that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. Students are expected to develop an understanding that energy can be transferred from place to place by sound, light, heat, and electric currents or from object to object through collisions. They apply their understanding of energy to design, test, and refine a device that converts energy from one form to another. For example, energy radiated from the sun is transferred to Earth by light. When light is absorbed, it warms Earth's land, air, and water and the energy produced facilitates plant growth.

Standards

NGSS.4-PS3-4.	Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.
NGSS.4-LS1-1.	Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
NGSS.4-LS1-2.	Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.

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

ELA/Literacy

CCS.ELA-Literacy.W.4.1	Write opinion pieces on topics or texts, supporting a point of view with reasons and information.

CCS.ELA-Literacy.SL.4.5	Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes.

Mathematics

CCS.4.G.A.3	Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded across the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.

NGSS 3D Learning

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. ● Use a model to test interactions concerning the functioning of a natural system. (4-LS1-2) **Engaging in Argument from Evidence** Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). ● Construct an argument with evidence, data, and/or a model. (4-LS1-1)	**LS1.A: Structure and Function** ● Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. (4-LS1-1) **LS1.D: Information Processing** ● Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions. (4-LS1-2)	**Systems and System Models** ● A system can be described in terms of its components and their interactions. (4-LS1-1),(4-LS1-2)

Unit Essential Questions

- How do organisms live, grow, respond to their environment, and reproduce?
- How do organisms detect, process, and use information about the environment?

Scope and Sequence Bundle 3
Lesson 1: Structures Used for Survival
Lesson 2: Animal Structures
Lesson 3: Plant Structures
Lesson 4: Using the Senses
Lesson 5: Exploring the Eye
Lesson 6: Structure and Function

Phenomena
In Alaska, temperatures can be extremely cold—as low as -60°C (-76°F). Few types of plants and animals can survive in such a climate, but the Alaskan wood frog is able to freeze its body, which stops its breathing and the beating of its heart. When the temperatures rise in spring, the frog thaws and returns to life. What does this make you wonder?

Essential/Focus questions
- Will a seed grow inside a plastic bag?
- How do external structures support survival?
- How do internal structures support survival?
- How does a seed grow into a plant?
- Do plants have structural adaptations?
- How do internal structures help support a plant's survival, growth , and reproduction?
- How do we sense the world around us?
- How is information processed?
- How are senses tested?
- How is information processed?
- How are senses tested?
- How does the eye work?
- How do we see images?
- How do human eyes compare to other animals eyes?
- How can the eye be improved?

Assured Assessments

<u>Formative:</u>
- Student Investigation Sheets
- Science Notebook Entries
- Whole Group Check-In Discussions

- Monitoring during turn and talk
- Student responses during class discussions
- Students' questions about the investigative phenomenon at the end of the unit
- Tell Me More Responses- Extensions and Enrichment

Summative:

- Lesson 1- Structures Used for Survival - Journal Activity
- Lesson 2- Structures Used for Survival Snapshot
- Lesson 2- Animal Structures Journal Activity
- Lesson 3- Plant Structures Activity
- Lesson 5- Exploring the Eye Snapshot

Resources:

Core:

- *Building Blocks of Science® 3D: Animal Studies* . Carolina Biological Module & Teacher Edition, 2019
- *Building Blocks of Science® 3D: Animal Studies* . Carolina Biological Student Readers. 2019. Carolina Biological Supply Company. Burlington, NC.

Supplemental:

- Classroom and Learning Commons content related libraries
- Online resources will be listed with lesson outlines.
- Interactive Word Walls: (Teacher Resource)
- Internal Goggle Drive Documents

Time Allotment

- Trimester III (from mid-April to end of school year)

Appendix A

Sample of Assured Lesson Outline
Changing Earth

+-Grade 4: Unit 1: Earth's Systems, History, and Human Impact

Plan Ahead	★ For Lesson 2, Session 3, students will need access to hot water. Teachers may wish to plan to bring in a hot water heater/plate, thermos, etc. ★ For Lesson 3, collect approximately six 16 ounce or 1 liter plastic bottles. Each bottle should have a cap. ★ Field trip suggestion: Connecticut Science Center (November) *This unit has connections to Social Studies:* **Social Studies States and Regions: Harcourt Brace **Social Studies: Chapter 1: ***Lesson 2: Rivers Change the Land***	
Grade*:* Grade 4	***Topic:*** Earth's Layers and Plates	***Lesson 1 of 6*** ***(approximately 7 class sessions)***

Performance Standard:

- **4-ESS1-1:** Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.
- **4-ESS2-1:** Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.
- **4-ESS2-2:** Analyze and interpret data from maps to describe patterns of Earth's features.
- **4-ESS3-2:** Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.

Crosscutting Concepts: Patterns, Cause and Effect

Students will know...

- Earth is composed of three layers: crust, mantle, and core.
- The mantle is made of liquid rock (magma), which convects and results in movement of the crust. n Volcanic activity and earthquakes are common along the boundaries between tectonic plates.
- The movement of tectonic plates can cause magma to rise from Earth's mantle and flow from volcanoes as lava.
- Earth is constantly changing; however, it can occur quickly or at a very slow rate.
- Changes to landforms or evidence of erosion may not be noticeable in a year or even a lifetime, but we can find evidence of past changes to predict future changes.
- Evidence of quick changes are noticeable when catastrophic events occur such as earthquakes, volcanoes, and flooding.

Objectives ...

- Construct a model of three layers of Earth.
- Assemble a map of Earth's tectonic plates and make predictions about the effects of their movement.
- Recognize patterns within the Ring of Fire to draw conclusions about volcanic activity and earthquakes.

Phenomena: Our Earth is constantly changing; however, it occurs at a very slow rate. Changes to landforms or evidence of erosion may not be noticeable in a year or even a lifetime, but we can find

evidence of past changes to predict future changes. The anchoring phenomenon for *Changing Earth* is identifying geological events and structures to explain the history of Earth.

Lesson Plan – 5 E Model:

Essential Question(s):

- How do people reconstruct and date events in Earth's planetary history?
- How and why is Earth constantly changing?
- How do Earth's major systems interact?

Teacher Prep and resources: **https://carolinascienceonline.com/#/teacher/product-lines/BBS**
The Building Blocks of Science® 3D: Changing Earth module "Earth's Layers and Plates", Teacher Guide, and Student Reader
**All digital resources, including simulations, for Building Blocks of Science can be found online, with teacher access code, at http://www.carolinascienceonline.com* or click on the link above.

Before beginning this Unit of Study - Watch Phenomena video and Teacher Preparation Video in Digital Resources Under Unit Overview and Lesson 1 links for Carolina Biological 3D (link above)

LESSON OVERVIEW:

- Earth is made up of mountain ranges, lakes, volcanoes, rivers, canyons, and many other landforms and waterways, all of which are continually changing. Most of these changes are not noticeable in a single lifetime; for example, it takes rivers thousands—even millions—of years to form canyons. Other changes are more drastic and immediate, such as those resulting from an earthquake or a volcanic eruption. This unit focuses on Earth and its changing surface due to erosion, weathering, plate tectonics, and human impact.

- Begin school year by introducing Science Word Wall with poster: *Say It Like A Scientist*
  - During each lesson that introduces new vocabulary, have students post terms on the wall space provided.

ENGAGE: *Opening activity – access prior learning / stimulate interest / generate questions:*

Scope and Sequence:

Lesson 1, Session 1:

Investigation "A": What Are Earth's Layers?

- Read "Unit Overview: *Changing Earth*" from the *Building Blocks of Science® 3D: Changing Earth* Teacher Guide (p. xxiv) and "Background Information" (p. 36). AND on digital resources at:: https://carolinascienceonline.com/#/teacher/product-lines/BBS/products/59e9c920424253000000002 4?node=5ca568f57d7f805cce2a0c2e&tab=5ca568f57d7f805cce2a0c16
- Prepare SMARTBoard and computer.
- Introduce phenomenon by reading section titled, "Investigative Phenomenon for Lesson 1" to students followed by the corresponding video (p. 34).

Investigative Phenomenon for Lesson 1 (Beginning of Lesson):
Throughout history, the west coast of the United States has experienced many earthquakes. In 1980, a strong earthquake occurred and led to the volcanic eruption of Mount St. Helens in Washington. The

earthquake also caused a massive avalanche. Ask students to respond to the following question: "What does this make you wonder?" Chart student questions to refer to throughout the sessions.

Anticipated Questions:

- What causes earthquakes?
- Why does the west coast experience earthquakes?
- Why did Mount St. Helens erupt after an earthquake?

In science notebooks, students will create a two-column chart titled, "Our Earth." The first column should be titled, "What I Know About Earth" and the second column should be titled "What I Want to Know About Earth." Allow students to fill this chart in with as much detail as they can. Students can Turn & Talk or share with the whole class.

EXPLORE: *Lesson Description – Materials needed / probing or clarifying questions / resources*

Scope and Sequence	**Materials** listed with each lesson design in Teacher Guide
Session 1: Investigation "A": *Pre-Unit Assessment: What Are Earth's Layers?* Introduce Lesson 1: Investigation A: What are Earth's Layers? (pp. 37 -39). These steps are outlined in Teacher Guide: **1.** Ask students to create a two-column chart in their science notebooks titled "Our Earth." The first column should be titled "What I Know About Earth," and the second column should be titled "What I Want to Know About Earth." Tell students that they are beginning a unit about Earth and how it can change. Allow a few minutes for students to fill in the chart with as much detail as they can. (you can also use the Interactive Digital resource for the SMART Board) https://carolinascienceonline.com/#/teacher/product-lines/BBS/products/59e9c92042425300000000024?node=5ca568f57d7f805cce2a0c2f&sort=TITLE_ASC&tab=5ca568f57d7f805cce2a0c2b&play	**Teacher Prep:** 10 minutes **Lesson : 45 minutes** **Digital Tip:** Rather than drawing, use the Earth's Layers simulation during your discussion. **MATERIALS:** Students ● 1 Science notebook* ● 1 Ball of craft dough- three colors- yellow, red, green ● 1 Marble ● 1 Plastic knife **Team of two students** ● 1 Paper plate of clay **Teacher** ● 15 Paper plates* ● Chart paper or whiteboard* ● Clay ● Markers*

2. Tell students that they will learn about Earth's layers by building a model. Guide students to think about Earth's materials. Use the following questions to guide a discussion:

- How can we describe Earth? *(Answers will vary. Students might suggest that Earth is round, that it has water and land, that there are mountains, that Earth revolves around the Sun, or that Earth is made of different layers.)*
- What makes Earth different from other planets? *(Earth has living things and a large amount of water.)*
- How can the Earth support living things? *(Earth has air, water, food, and shelter, which are needed to support life.)*
- What is the Earth made of? *(Answers will vary, but students are likely to say things like soil, rocks, or water.)*

3. Draw attention to the idea that Earth is made of different materials. Begin a discussion about the different layers of Earth by drawing or providing a model like the one in Figure 1.2. Discuss Earth's three layers and their characteristics.

- Guide students to construct a model of Earth's layers using a marble, plastic knife, craft dough (various colors)

Investigation A

1. Each student will need about 2 tablespoons of each color of clay for their 3D Earth model. Place about one-quarter cup of clay on a paper plate for pairs of students to share.

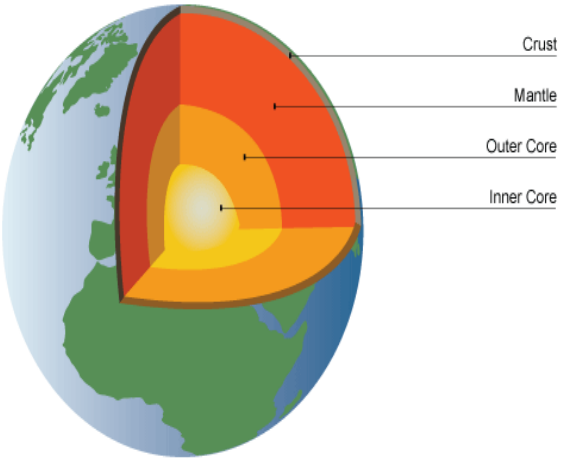
2. Title a sheet of chart paper "Our Earth." Create a two-column chart with one column titled "What We Know About Earth" and the other column titled "What We Want to Know About Earth." Alternatively, use Interactive Whiteboard: Our Earth.

*Use marble for inner core; yellow dough for outer core; red dough for mantle; green dough for crust

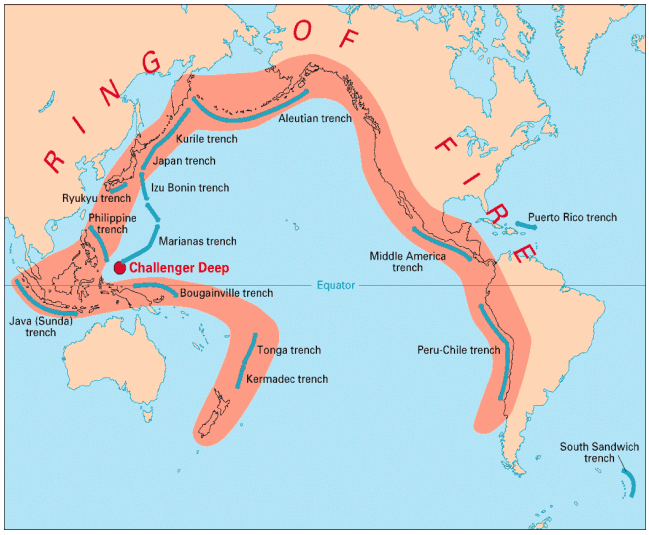
***Do not use the soil (crust) for this activity.**

Vocabulary:

- **Crust:** The crust is the outermost layer of Earth and is solid. This is where life exists.
- **Mantle:** The mantle is the middle layer of Earth and is made of melted rocks. It is extremely hot and is constantly moving and flowing. This movement is what causes changes in Earth's crust.
- **Core:** The core is the deepest, innermost layer of Earth and is the hottest layer. It is made mostly of metals, which is what causes the Earth to be magnetic and have north and south poles.

Turn & Talk: The mantle of Earth moves around, causing the crust to change shape. What landforms on Earth might have been formed by the movement of the mantle?	 **Tell Me More Investigation A**: page 39 (optional) The mantle of Earth moves around, causing the crust to change shape. What landforms on Earth might have been formed by the movement of the mantle?
Lesson 1, Session 2: (2 or 3 Days) ***TEACHER TIP:** **Prior to lesson - assign cutting of plates for homework - (suggest placing pieces in baggies)** **Watch prior to lesson:** **Brain Pop:** The Mysteries of Life: Plate Tectonics (6:49 min) **https://www.brainpop.com/science/earthsystem/platetectonics/** **You may want to explore the links to graphic organizer, related articles, worksheets, and vocabulary within the Brain Pop **Investigation "B":** *Why Does Earth Have Plates?* ● Introduce Investigation B: Why Does Earth Have Plates?" (pp. 40-41). **Use the discussion**	**Teacher Preparation:** 5 minutes **Lesson:** 45 minutes (each lesson) **For each student:** , Student Investigation Sheet 1B: *How is Earth Divided into Plates?* , Glue stick , Pair of scissors , Science notebooks , *Changing Earth* Literacy Reader, p. 5 , **Find the Continents and Oceans Make a copy for each student** **Teacher:** , Chart paper or whiteboard , Markers **Teaching Tip:** This investigation will introduce students to tectonic plates. Depending on the background knowledge of

questions listed on pages 40 - 41 during investigation. ● Students will construct a puzzle of a map as an introduction to studying about Earth's tectonic plates. ● In partnerships, facilitate discussion on observations from the map. Have students brainstorm the effects of the moving plates and record these in their Science Notebooks. **Turn & Talk:** Earthquakes and volcanic eruptions are common events along Earth's plates. What do you think causes an earthquake? Think about Earth's plates. **Watch after lesson:** **Earth's Interior and Plate Tectonics:(5:43 min)** **https://easyscienceforkids.com/plate-tectonics-for-kids-video/**	your students, it may be helpful to review the names of the continents. List them on the board, or provide a map for the class.  **Continents and Oceans** **Identify Phenomena:** Make connections to convections in the mantle and the convection of air, which rises as it heats, due to the sun, and falls as it cools. (p.41 TG) **Tell Me More Investigation B**: page 41 (optional) What do you think causes an earthquake? Think about Earth's plates.
EXPLAIN: *Concepts explained and vocabulary defined:*	
Lesson 1, Session 3: **Investigation "C"**: *What is the Ring of Fire?* ● Review vocabulary and concepts from Investigations A & B. ● Introduce Lesson 1: Investigation C: *What is the Ring of Fire?* (pp. 41-43). **Use the discussion questions listed on pages 41 - 43 during investigation.** ● Students will make observations using a map to recognize patterns related to the Ring of Fire and volcanic activity. ● Review students' questions about the investigative phenomenon from the beginning of the lesson.	**Teacher Preparation:** 5 minutes **Lesson:** 45 minutes **For each student:** , Red marker , Science notebook , *Changing Earth* Literacy Reader, pp. 6-9 **Teacher:** , Chart paper or whiteboard , Markers **Teacher Tip:**



Use the Magma Convection simulation to provide visual support for the idea that convection within the mantle causes magma to rise into a volcano.

Simulation: *Magma Convection* *

**All digital resources for Building Blocks of Science can be found online, with teacher access code, at http://www.carolinascienceonline.com*

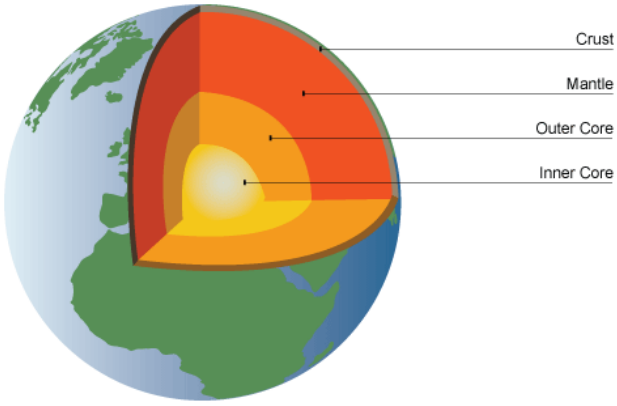
Concepts

- Rocks, soil, and sand are present in most areas where plants and animals live.
- Maps show the shapes and types of land and water in any area. Maps can help locate the different land and water features where people live and other areas of Earth.
- The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns.
- A variety of hazards result from natural processes such as earthquakes, volcanic eruptions, and coastal erosion.

Vocabulary:

Boundary - a dividing line or a line that marks the limits of an area

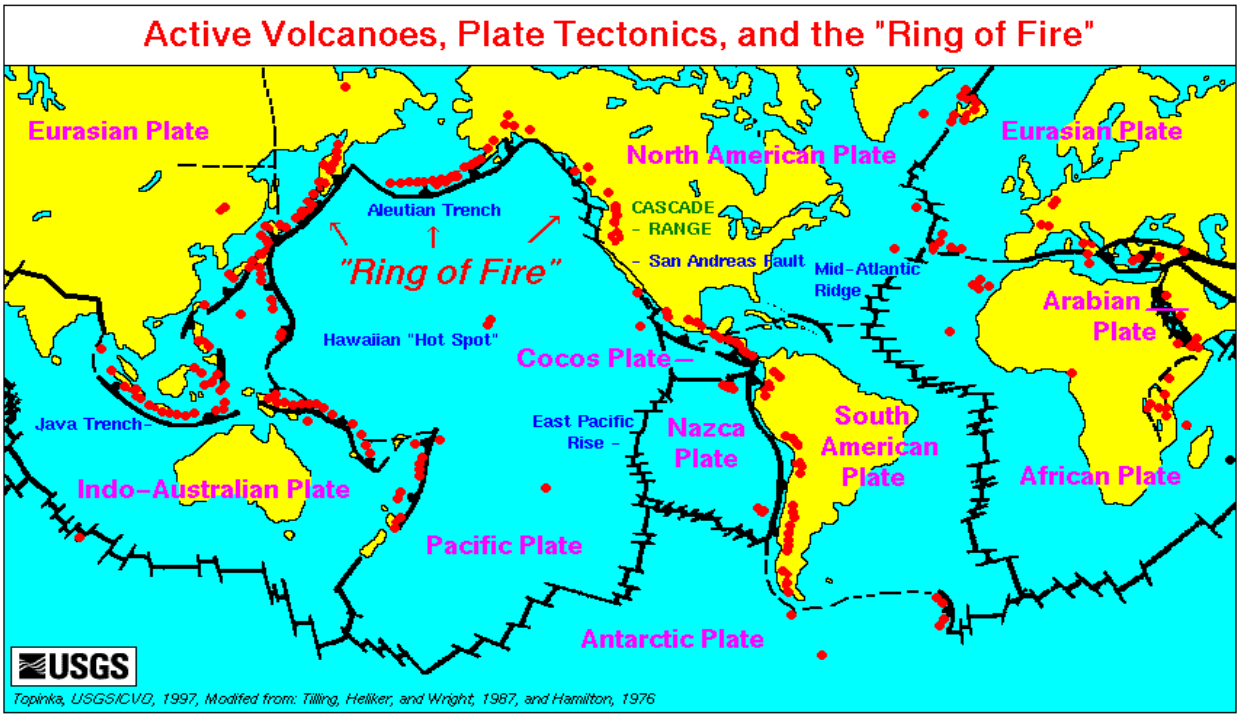
Convection current - An up and down movement in a liquid or a gas that is caused by differences in temperature.



Core - The innermost layer of the Earth.
Crust - The outermost, rocky layer of Earth.
Magma - molten rock beneath Earth's surface.
Mantle - The layer inside Earth between the crust and the outer core.
Plate tectonics - The widely accepted theory that today's continents were once part of a single landmass that broke apart about 200 million years ago, have moved into their present locations, and are still in motion.

	Volcano - an opening in Earth's crust through which lava, ash, and cinders erupt, or the mountain formed from past eruptions.

Earth's Plate Boundaries

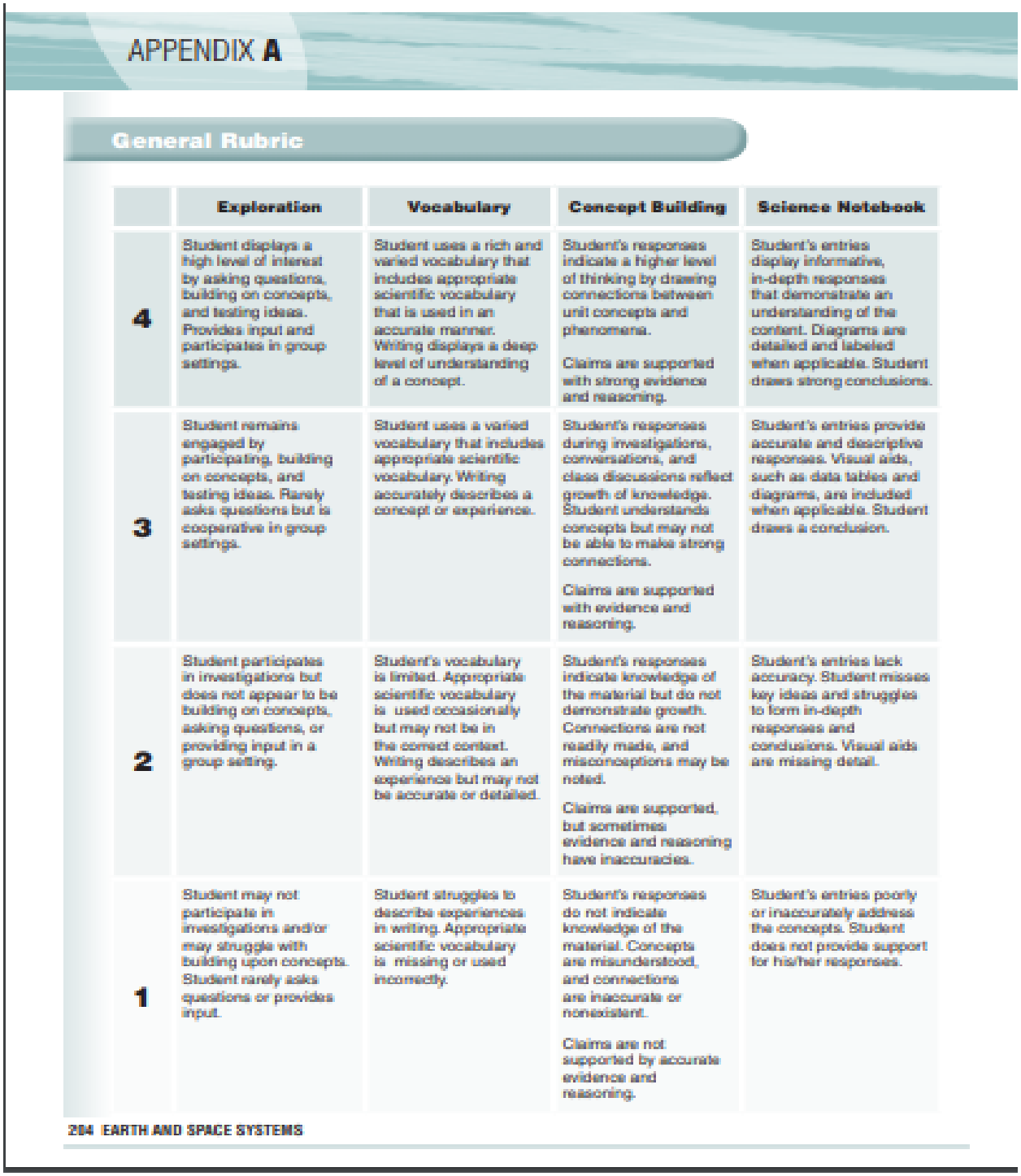


ELABORATE: *Applications and extensions*

	Materials
Lesson 1, Session 4: 1 or 2 Days: REVIEW **Phenomenon (End of Lesson):** Review students' questions about the investigative phenomenon from the beginning of this lesson. Guide students in applying the concepts explored in this lesson and connecting them to the anchoring phenomenon: identifying geological events and structures to explain the history of Earth. By the end of the lesson, students should be able to explain that: ● Earthquakes occur when tectonic plates shift, causing the land to vibrate. ● The West Coast of the U.S. experiences many earthquakes because it is located along a plate boundary.	**Teacher Preparation:** 5 minutes **Lesson:** 40 minutes Science in the News Article Report (Teacher discretion for students to work individually or in pairs.) *Kilauea Newsela Article* *Nature's Fury Newsela Article* *Volcano Warning Signs Newsela Article* *Mount St. Helens Research Newsela Article* *WHOLE CLASS: SMART Board*

• Earthquakes can cause volcanic eruptions because volcanoes are also commonly located along plate boundaries. The vibrations of an earthquake may cause magma to erupt from a nearby volcano. **Science in the News** • Choose articles that discuss earthquake or volcanic eruptions • Allow for choice (3-4 articles max) If time, have students share reports in groups.	Carolina Bio Digital Resource: Changing Earth - Scenario Based Digital Assessment https://carolinascienceonline.com/#/teacher/product-lines/BBS/products/59e9c92042425300000000024?node=5ca568f57d7f805cce2a0c2e&tab=5ca568f57d7f805cce2a0c2d&sort=TITLE_ASC&play **Tell Me More Investigation C**: page 43 (optional) The mantle is made of melted rock. What could be formed when the melted rock cools?
EVALUATE: *Assured assessments*	
Formative Monitoring: questioning / discussion	*Summative Assessment*
Lesson 1, Session 5: • Science Notebook Entry • 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.	Journal Entry- "Earth's Layers and Plates" Snapshot- Lesson 1- Changing Earth
ELABORATE FURTHER*: Reflective / enrichment* (optional) See individual lesson plans. **Tell Me More: Investigation A**: The mantle of Earth moves around, causing the crust to change shape. What landforms on Earth might have been formed by the movement of the mantle? **Tell Me More: Investigation B:** What do you think causes an earthquake? Think about Earth's plates. **Tell Me More: Investigation C:** The mantle is made of melted rock. What could be formed when the melted rock cools?	

General Scoring Rubric



APPENDIX A

General Rubric

	Exploration	Vocabulary	Concept Building	Science Notebook
4	Student displays a high level of interest by asking questions, building on concepts, and testing ideas. Provides input and participates in group settings.	Student uses a rich and varied vocabulary that includes appropriate scientific vocabulary that is used in an accurate manner. Writing displays a deep level of understanding of a concept.	Student's responses indicate a higher level of thinking by drawing connections between unit concepts and phenomena. Claims are supported with strong evidence and reasoning.	Student's entries display informative, in-depth responses that demonstrate an understanding of the content. Diagrams are detailed and labeled when applicable. Student draws strong conclusions.
3	Student remains engaged by participating, building on concepts, and testing ideas. Rarely asks questions but is cooperative in group settings.	Student uses a varied vocabulary that includes appropriate scientific vocabulary. Writing accurately describes a concept or experience.	Student's responses during investigations, conversations, and class discussions reflect growth of knowledge. Student understands concepts but may not be able to make strong connections. Claims are supported with evidence and reasoning.	Student's entries provide accurate and descriptive responses. Visual aids, such as data tables and diagrams, are included when applicable. Student draws a conclusion.
2	Student participates in investigations but does not appear to be building on concepts, asking questions, or providing input in a group setting.	Student's vocabulary is limited. Appropriate scientific vocabulary is used occasionally but may not be in the correct context. Writing describes an experience but may not be accurate or detailed.	Student's responses indicate knowledge of the material but do not demonstrate growth. Connections are not readily made, and misconceptions may be noted. Claims are supported, but sometimes evidence and reasoning have inaccuracies.	Student's entries lack accuracy. Student misses key ideas and struggles to form in-depth responses and conclusions. Visual aids are missing detail.
1	Student may not participate in investigations and/or may struggle with building upon concepts. Student rarely asks questions or provides input.	Student struggles to describe experiences in writing. Appropriate scientific vocabulary is missing or used incorrectly.	Student's responses do not indicate knowledge of the material. Concepts are misunderstood, and connections are inaccurate or nonexistent. Claims are not supported by accurate evidence and reasoning.	Student's entries poorly or inaccurately address the concepts. Student does not provide support for his/her responses.

Carolina Biological: Building Blocks of Science 3D Scoring Rubric (2019)