Unit #1: Earth & Space Science 8- Earth's History

Content Area: **Science**
Course(s): **Science 8**
Time Period: **First Marking Period**
Length: **September through December**
Status: **Published**

Unit Overview

Science is central to the lives of all Americans. Our science education program must prepare our students to be informed citizens and knowledgeable consumers. If the nation is to compete and lead in the global economy and if American students are to be able to pursue expanding employment opportunities in science-related fields, all students in Linden must have a solid K–12 science education that prepares them for college and careers.

The latest standards are based on learning progressions that provide students with opportunities to investigate core ideas in science in increasingly complex ways over time. The target goals for the curriculum are to help students know and use scientific explanations of the natural world and the designed world; to understand the nature and development of scientific knowledge and technological capabilities; and to participate productively in scientific and engineering practices.

GOALS

The **FOSS Earth History Course** emphasizes the use of knowledge and evidence to construct explanations about the processes and systems that have operated over geological time. Students investigate sedimentary rocks and fossils from the Grand Canyon to discover clues that reveal Earth's history. They study the processes that create sedimentary, igneous, and metamorphic rocks and organize their observations and inferences into the Rock Cycle. Students use the knowledge and data gained from observing rocks to make inferences about organisms, environments, and events that occurred over Earth's history.

STAGE 1- DESIRED RESULTS

2020 New Jersey Student Learning Standards- Science

Physical Science

SCI.MS-PS1-3	Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.

Earth and Space Science

SCI.MS-ESS2-1	Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.
SCI.MS-ESS3-5	Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.
SCI.MS-ESS3-1	Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.
SCI.MS-ESS1-4	Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history.
SCI.MS-ESS3-2	Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.
SCI.MS-ESS2-2	Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.
SCI.MS-ESS3-4	Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.
SCI.MS-ESS2-3	Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.
SCI.MS-ESS3-3	Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

Life Science

SCI.MS-LS4-2	Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships.
SCI.MS-LS4-1	Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.

Science and Engineering Practices

- Analyzing and Interpreting Data
- Asking Questions and Defining Problems
- Constructing Explanations and Designing Solutions
- Developing and Using Models
- Engaging in Argument from Evidence
- Obtaining, Evaluating, and Communicating Information
- Planning and Carrying Out Information
- Using Mathematics and Computational Thinking

Cross Cutting Concepts

- Cause and Effect
- Energy and Matter
- Influence of Engineering, Technology, and Science on Society and the Natural World
- Interdependence of Science, Engineering, and Technology
- Patterns
- Scale, Proportion, and Quantity
- Stability and Change
- Structure and Functions
- Systems and System Models

Disciplinary Core Ideas

Physical Sciences

- PS1A: Structure and Properties of Matter

Life Sciences

- LS4A: Evidence of Common Ancestry and Diversity

Earth and Space Sciences

- ESS1C: The History of Planet Earth
- ESS2A: Earth Materials and Systems
- ESS2B: Plate Tectonics and Large-Scale Systems
- ESS2C: The Role of Water in Earth's Surface Processes
- ESS3A: Natural Resources
- ESS3B: Natural Hazards
- ESS3C: Human Impacts on Earth Systems
- ESS3D: Global Climate Change

Engineering. Technology. and Applications of Science

- ETS1A: Defining and Delimiting an Engineering Problem

- ETS1B: Developing Possible Solutioins
- ETS1C: Optimizing the Design Solution

Essential Questions

Investigation 1: Earth is a Rock

Part 1. Which landforms occur at different locations on earth?

Part 2. Why do there appear to be stripes of the walls of the Grand Canyon?

Part 3. How are the rocks from the two Grand Canyon sites related to eachother?

Investigation 2: Weathering and Erosion

Part 1. How big are rocks?

Part 2. How do Earth materials get sorted in nature?

Part 3. Which came first, the sand or sandstone?

Part 4. How is soil related to rocks?

Investigation 3: Deposition

Part 1. What happens to sediments that get deposited in basins?

Part 2. How does limestone form?

Part 3. What do sedimentary rock layers reveal about ancient environments?

Investigation 4: Fossils and Past Environments

Part 1. How do fossils get in rocks?

Part 2. How old are fossils?

Part 3. How do we categorize extremely long periods of time?

Part 4. When did the Grand Canyon rocks form?

Investigation 5: Igneous Rocks

Part 1. How do igenous rocks form?

Part 2. What affects crystal formation in igneous rocks?

Part 3. What can crystal size tell us about where an igneous rock forms?

Investigation 6: Volcanoes and Earthquakes

Part 1. Where do volcanoes occur on Earth? Where do earthquakes occur on Earth?

Part 2. Why do volcanoes and earthquakes occur where they do?

Part 3. What causes plates to move?

Investigation 7: Mountains and Metamorphic Rocks

Part 1. What happens to Earths crust during plate interactions?

Part 2. What are some ways that mountains form?

Part 3. How do metamorphic rocks form?

Part 4. What is gthe geological history of Shenandoah National Park?

Investigation 8: Geoscenarios

Part 1. What do we need to know to tell the geological story of a place?

Part 2. What do we need to know to tell the geological story of a place?

Part 3. What do we need to know to tell the geological story of a place?

Investigation 9: What is Earths story?

Part 1. What is the geological story of the Grand Canyon?

Part 2. How do Earth materials recycle through constructive and destructive processes?

Enduring Understanding

The Earth History course emphasizes the use of knowledge and evidence to construct explanations for the landforms and earth materials found on Earth and the processes that created them. It challenges students to consider the environment around them and to contemplate that all has not always been as we observe it today. It exposes students to large numbers in the context of Earth history to help them begin to put into perspective the changes that have happened over time and the human race's place in them.

Students will know…

***Investigation Guide* Vocabulary**

Investigation 1: Earth Is Rock

calcite correlation elevation geologist landform layer limestone sandstone shale

Investigation 2: Weathering and Erosion

Abrasion basin bedrock chemical reaction chemical weathering clay deposition differential erosion erosion frost wedging humus inference minerals model physical weathering rock rock fall root wedging sand sediments silt soil soil profile sorting weathering

Investigation 3: Deposition

Cement cementation compaction groundwater horizontal ooze precipitate
principle of original horizontality principle of superposition sedimentary rock uniformitarianism

Investigation 4: Fossils and Past Environments

Cenozoic cross section crossbedding era formation fossil fossil record geological time index fossil Mesozoic paleontology Paleozoic period Precambrian unconformity

Investigation 5: Igneous Rocks

Asthenosphere crust crystal crystallizes extrusive igneous rock inner core intrusive lava lithosphere magma mantle outer core

Investigation 6: Volcanoes and Earthquakes

Active continental drift continental shelf convection convergent boundary divergent boundary dormant earthquake extinct latitude longitude plate plate boundaries prime meridian Ring of Fire seismology spreading ridge subduction zone tectonic theory of plate tectonics transform boundary volcano volcanology

Investigation 7: Mountains and Metamorphic Rocks

Dome fault fault block folding foliate gneiss marble metamorphic rock plateau quartzite rock cycle schist slate stratigraphic column subduction trench uplift

Science Resources **Vocabulary**

Investigation 1: Earth Is Rock

Earth-imaging satellite geologist perspective satellite terrain

Investigation 2: Weathering and Erosion

Abrasion atmosphere calcite carbonate chemical reaction chemical weathering crust deposition differential erosion ecosystem erosion flood hoodoo horizon humus infer limestone molecule pedologist physical weathering rock fall sandstone shale soil soil profile spelunker stalactite stalagmite talus weathering

Investigation 3: Deposition

Fossil hot spring sedimentary rock uniformitarianism volcano

Investigation 4: Fossils and Past Environments

Advance Cenozoic crossbed eon epoch era igneous rock index fossil law of fossil succession magma Mesozoic paleontology Paleozoic period principle of original horizontality principle of superposition retreat stratigraphy

Investigation 5: Igneous Rocks

atom lava

Investigation 6: Volcanoes and Earthquakes

Mantle plate tectonics seismologist tectonic plates

Investigation 7: Mountains and Metamorphic Rocks

asthenosphere biosphere convection converges fold foliate geosphere hydrosphere lithosphere metamorphic rock slab pull source rock strain subduction tectonic uplift

Investigation 8: Geoscenarios

Caldera crude oil erratic extremophile fossil fuel fossil fuel fumarole geyser glacial till greenhouse gas hotspot interglacial mud pot peat terminal moraine transform

COMMON MISCONCEPTIONS

- Span of time in which layers and landforms are created and change.
- Students tend to describe geologic processes in human time frame than on the geologic scale.
- Students often use the terms "rock" and "mineral" as the same thing. Minerals are naturally occurring inorganic solids (not coal, not pearly, not glass). Rocks are made of minerals and other things.
- Students think that the property of color is a good way to identify rocks and minerals when, in fact, it is a poor way to do this. Limestone occurs in many different colors depending on minerals that are included within the rock. There are many colors of the same rock type or kind of mineral so color should be the last property used for identification.
- Students often have difficulty connecting sediments to sedimentary rocks. Furthermore, they often have the misconception that heat is involved in sedimentary rock formation and have this confused with metamorphic rocks.
- Students do not recognize the geologic way or sorting sediments by their sizes and the term boulder, gravel, sand, and clay referring to the size of sediments. For example, clay to students is the colorful modeling clay found in art stores.
- Students have the misconception that a religious idea on the age of the Earth is scientifically based. Scientists use evidence to develop theories. A theory is not just a "guess," but a scientific theory is a well-developed idea accepted by the scientific community and based on a great deal of evidence. Theories do change over time as new evidence is brought forth. Religious ideas are not based in scientific evidence but rather in beliefs. Student beliefs should be valued but students need to understand the major scientific theories agreed upon by scientists as well.
- Students have the misconception that scientific studies in the past are irrelevant. Students need to understand how the body of scientific knowledge grows as evidence is collected over time. The work of John Wesley Powell was instrumental in understanding the formation of the Colorado Plateau and Grand Canyon. Other scientists have built upon this work and expanded what we now know.
- Students have the misconception that a rock is just a rock and that it provides no other information. We can infer form rock layers and formation the environment at the time of sediment deposition as well as the processes that have acted on the rock over time.
- Students have the misconception that fossils are the actual organism that lived long ago. In reality, fossils can be imprints of organism's exterior parts (cast) or a mold of the interior. Fossils can also be things like footprints, a burrow, dung, or the actual remains that have been preserved.
- Students are confused if a sample was natural rock or not (e.g. house brick).
- Students describe mountains as made of molten rock or rocks that were pushed up.
- Students think that weathering and erosion are the same definition, and the two words can be interchangeably. They believe gravity is the strongest force of erosion

- Volcanoes are randomly located across the earth's surface.
- Volcanoes are found only on land.
- Volcanoes are found only in hot climates.
- All volcanoes erupt violently.
- Volcanoes only erupt straight up through the top vent.
- If a volcano doesn't erupt for 100 years, it is extinct.
- If a volcano doesn't produce lava it isn't dangerous.
- A volcano is just a mountain with the top cut off so that the lava can come off.
- Any mountain can become a volcano.
- There are more plates in the Pacific than the Atlantic. That's why there are more earthquakes and volcanoes in the Pacific.
- Earthquakes happen randomly across the earth's surface.

- The ground opens up during an earthquake.
- Continents sit on top of a layer of water, and the water is above a plate.
- Ocean basins are not part of earth's plates.
- Pangea broke apart long ago. Now the continents are coming together on the other side of the earth, causing earthquakes. (continents bumping into each other)
- Mountains form when earthquakes push the ground up.
- Mountains form by the piling up of the pieces of rock.
- Rocks do not change.
- Earth's plates are located within the earth and are not exposed at the earth's surface.
- Mountains form quickly.

Students will be able to...

Investigation 1: Earth is a Rock

- Make and record observations of landorms on Earths surface and some of the rocks that compose them.
- Analyze rock samples from different sites to make rock correlations.

Investigation 2: Weathering and Erosion

- Sort earth materials by size, using different methods.
- Use models to represent, study, and manipulate Earth processes.

Investigation 3: Deposition

- Identify the components of sandstone, shale, limestone, and soil.
- Infer change in environments through the interpretration of a sequence of sedimentary rock layers.

Investigation 4: Fossils and Past Environments

- Construct a time line of geological events and ancient life.
- Infer ancient environments based on rock fossils evidence.
- Describe how rocks can be given a relative age based on their relationshop to other rocks.

Investigation 5: Igneous Rocks

- Identify properties of a new set of rock samples, differentiating them from sedimentary rocks.
- Design an experiment to test how cooling rate affects crystal size.
- Confirm a relationship between cooling rate and crystal size that can be applied to igenous rock

formation.

Investigation 6: Volcanoes and Earthquakes

- Analyze volcano and earthquake data for patterns.
- Model continental drift that had occurred on Earth
- Describe how convection and plate tectonics drive continental drift
- Model plate boundary interactions.

Investigation 7: Mountains and Metamorphic Rocks

- Stimulate plate interaqctions to produce various landforms.
- Model the metamorphic rock process, using candy.
- Apply understanding of geological proceses to interpret rock evidence to thell the geological story of Shenandoah National Park.

Investigation 8: Geoscenarios

- Interpret various data resources to learn about a geological site or process.
- Collaborate as a team to bring together data and develop an evidence based story of a place or process.
- Describe how human activities and values interqact with geological processes in societal decision making.
- Present and communicate findings to the rest of the class.

Investigation 9: What is Earths story?

Analyze evidence from rocks, landforms, and other resources to put together Earths geological story

STAGE 2- EVIDENCE OF LEARNING

Formative Assessment

- 3- Minute Pause
- A-B-C Summaries

- Analogy Prompt
- Choral Response
- Debriefing
- Exit Card / Ticket
- Hand Signals
- Idea Spinner
- Index Card Summaries
- Inside-Outside Circle Discussion (Fishbowl)
- Journal Entry
- Misconception Check
- Observation
- One Minute Essay
- One Word Summary
- Portfolio Check
- Questions & Answers
- Quiz
- Self-Assessment
- Student Conference
- Think-Pair-Share
- Web or Concept Map

Authentic Assessments

- follow lab procedures
- complete assignments
- develop and utilize models
- cooperate in groups and with partners
- complete a written science journal
- maintain class notes and vocabulary in MacBook Airs
- complete data tables
- complete and interpret graph

Benchmark Assessments

- Final module exam.
- End of investigation assessments.
- iChecks
- Focus Questions

STAGE 3- LEARNING PLAN

Instructional Map

Earth & Space Science:(Grade 8) 14 weeks

Investigation 1: Earth is a Rock- 7 sessions

Students will begin to study the landforms and rocks that make up Earths crust. They develop an awareness of the complexity of Earths crust and how geologists study it by trying to answer the questions, “what is the story of this place?”

Investigation 2: Weathering and Erosion- 8 sessions

Students discover that sediments are broken down pieces of rock. Using a stream table, they explore how water can erode sediments and deposit the sorted sediments down stream. Students also consider soil formation.

Investigation 3: Deposition-4 sessions

Students investigate the processes by which sediments turn into sedimentary rock. They begin to make inferences about past environments, based on evidence found in sedimentary rock layers.

Investigation 4: Fossils and Past Environments- 8 sessions

Students consider the time scale in which rocks and fossils form. They create a scaled timeline and identify the formation of Grand Canyon rocks on the timeline after reviewing evidence from index fossils.

Investigation 5: Igneous Rocks- 5 sessions

Students examine rock samples from a new location. They investigarte the relationship between crystal size and the formation of igneous rocks.

Investigation 6: Volcanoes and Earthquakes- 5 sessions

Students plot data about geological events and identify patterns. Convection and the theory of plate tectonics are introduced to explain continental drift, plate boundary interactions, and the patterns of volcanoes and earthquakes.

Investigation 7: Mountains and Metamorphic Rocks- 8 sessions

Students work with different models of mountains and explore how interactions at plate boundaries produce mountains. They apply this information in an activity to explore the history of the Applachian mountains.

Investigation 8: Geoscenarios- 4 sessions

Students synthesize their knowledge from the course with new site-specific information. Each student works in a different role bringing back to the team critical insight into the story of a geological site.

Investigation 9: What is Earths story?- 4 sessions

Students return to the Grand Canyon, this time considering all geological evidence, not just sedimentary, to answer the question, "What is the story of this place?"

Modification/Differentiation of Instruction

Differentiation Strategies for Special Education Students

- Remove unnecessary material, words, etc., that can distract from the content
- Use of off-grade level materials
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Time allowed
- Level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in "chunks"
- Varied texts and supplementary materials
- Use technology, if available and appropriate
- Varied homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language.
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Ability to work at their own pace
- Present ideas using auditory, visual, kinesthetic, & tactile means
- Provide graphic organizers and/or highlighted materials
- Strategy and flexible groups based on formative assessment
- Differentiated checklists and rubrics, if available and appropriate

Differentiation Strategies for Gifted and Talented Students

- Increase the level of complexity
- Decrease scaffolding
- Variety of finished products

- Allow for greater independence
- Learning stations, interest groups
- Varied texts and supplementary materials
- Use of technology
- Flexibility in assignments
- Varied questioning strategies
- Encourage research
- Strategy and flexible groups based on formative assessment or student choice
- Acceleration within a unit of study
- Exposure to more advanced or complex concepts, abstractions, and materials
- Encourage students to move through content areas at their own pace
- After mastery of a unit, provide students with more advanced learning activities, not more of the same activity
- Present information using a thematic, broad-based, and integrative content, rather than just single-subject areas

Differentiated Strategies for ELL Students

- Remove unnecessary materials, words, etc., that can distract from the content
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Gradually increase the level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in “chunks”
- Varied texts and supplementary materials, including visuals
- Use technology, if available and appropriate
- Differentiate homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language.
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Allow students to work at their own pace
- Presenting ideas through auditory, visual, kinesthetic, & tactile means
- Role play
- Provide graphic organizers, highlighted materials
- Strategy and flexible groups based on formative assessment

Differentiation Strategies for At Risk Students

- Remove unnecessary materials, words, etc., that can distract from the content
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Gradually increase the level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in "chunks"
- Varied texts and supplementary materials
- Use technology, if available and appropriate
- Differentiate homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Presenting ideas through auditory, visual, kinesthetic, & tactile means
- Provide graphic organizers and/or highlighted materials
- Strategy and flexible groups based on formative assessment

504 Plans

Students can qualify for 504 plans if they have physical or mental impairments that affect or limit any of their abilities to:

- walk, breathe, eat, or sleep
- communicate, see, hear, or speak
- read, concentrate, think, or learn
- stand, bend, lift, or work

Examples of accommodations in 504 plans include:

- preferential seating
- extended time on tests and assignments
- reduced homework or classwork
- verbal, visual, or technology aids
- modified textbooks or audio-video materials
- behavior management support

- adjusted class schedules or grading
- verbal testing
- excused lateness, absence, or missed classwork
- pre-approved nurse's office visits and accompaniment to visits
- occupational or physical therapy

Modification Strategies

- Cooperative Grouping
- Extended Time
- Frequent Breaks
- Highlighted Text
- Interactive Notebook
- Modified Test
- Oral Directions
- Peer Tutoring
- Preferential Seating
- Re-direct
- Repeated Drill and Practice
- Shortened Assisgnment
- Teacher Notes
- Tutorials
- Use of Additional Reference Materials
- Use of Audio Resources

Differentiation Strategies

High Preparation

- Alternative Assessments
- Choice Boards
- Games and Tournaments
- Group Investigations
- Guided Reading

- Independent Research / Project
- Interest Groups
- Learning Contracts
- Leveled Rubrics
- Literature Circles
- Multiple Intelligence Options
- Multiple Texts
- Personal Agendas
- Project Based Learning (PBL)
- Stations / Centers
- Think-Tac-Toe
- Tiered Activities / Assignments
- Varying Graphic Organizers

Low Preparation

- Choice of Book / Activity
- Cubing Activities
- Exploration by Interest (using interest inventories)
- Flexible Grouping
- Goal Setting With Student
- Homework Options
- Jigsaw
- Mini Workshops to Re-teach or Extend Skills
- Open-ended Activities
- Think-Pair-Share by Readiness, Interest, or Learning Style
- Use of Collaboration
- Use of Reading Buddies
- Varied Journal Prompts
- Varied Product Choice
- Varied Supplemental Materials
- Work Alone / Together

Horizontal Intergration- Interdisciplinary Connections

Student Learning Standards for Mathematics

Grade 8

8.EE.B. Understand the connections between proportional relationships.

8.EE.C. Solve real world problems and mathematical problems.

8.F.A. Define, evaluate, and compare functions.

8.F.B Use functions to model relationships between quantities.

Reading Science and Technical Subjects

RST.6-8.1. Cite specific textual evidence to support analysis of science and technical texts.

RST.6-8.2. Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

RST.6-8.3. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

RST.6-8.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 6-8 texts and topics*.

RST.6-8.5. Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.

RST.6-8.6. Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.

RST.6-8.7.Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

RST.6-8.8.Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

RST.6-8.9. Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

RST.6-8.10. By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently.

Writing History, Science and Technical Subjects

WHST.6-8.1. Write arguments focused on *discipline-specific content*.

A. Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.

B. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.

C. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.

D. Establish and maintain a formal/academic style, approach, and form.

E. Provide a concluding statement or section that follows from and supports the argument presented.

WHST.6-8.2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

A. Introduce a topic and organize ideas, concepts, and information using text structures (e.g. definition, classification, comparison/contrast, cause/effect, etc.) and text features (e.g. headings, graphics, and multimedia) when useful to aiding comprehension.

B. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.

C. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.

D. Use precise language and domain-specific vocabulary to inform about or explain the topic.

E. Establish and maintain a formal/academic style, approach, and form.

F. Provide a concluding statement or section that follows from and supports the information or explanation presented

WHST.6-8.3(See note; not applicable as a separate requirement)

WHST.6-8.4. Produce clear and coherent writing in which the development, organization, voice, and style are appropriate to task, purpose, and audience.

WHST.6-8.5. With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.

WHST.6-8.6. Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.

WHST.6-8.7. Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

WHST.6-8.8. Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

WHST.6-8.9. Draw evidence from informational texts to support analysis, reflection, and research.
WHST.6-8.10. Write routinely over extended time frames (time for research, reflection, metacognition/self-correction, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

2020 New Jersey Student Learning Standards- Computer Science and Design Thinking

Computer Science and Design Thinking Practices

CSDT.K-12.CSDTP1	Fostering an Inclusive Computing and Design Culture
CSDT.K-12.CSDTP2	Collaborating Around Computing and Design
CSDT.K-12.CSDTP3	Recognizing and Defining Computational Problems
CSDT.K-12.CSDTP4	Developing and Using Abstractions
CSDT.K-12.CSDTP5	Creating Computational Artifacts
CSDT.K-12.CSDTP6	Testing and Refining Computational Artifacts
CSDT.K-12.CSDTP7	Communicating About Computing and Design

8.2 Design Thinking

8.2.8.ED.1: Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and the producer. 8.2.8.ED.2: Identify the steps in the design process that could be used to solve a problem. 8.2.8.ED.3: Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch). 8.2.8.ED.4: Investigate a malfunctioning system, identify its impact, and explain the step-by-step process used to troubleshoot, evaluate, and test options to repair the product in a collaborative team. 8.2.8.ED.5: Explain the need for optimization in a design process. 8.2.8.ED.6: Analyze how trade-offs can impact the design of a product. 8.2.8.ED.7: Design a product to address a real-world problem and document the iterative design process, including decisions made as a result of specific constraints and trade-offs (e.g., annotated sketches).
8.2.8.ITH.1: Explain how the development and use of technology influences economic, political, social, and cultural issues. 8.2.8.ITH.2: Compare how technologies have influenced society over time. 8.2.8.ITH.3: Evaluate the impact of sustainability on the development of a designed product or system. 8.2.8.ITH.4: Identify technologies that have been designed to reduce the negative consequences of other technologies and explain the change in impact. 8.2.8.ITH.5: Compare the impacts of a given technology on different societies, noting factors that may make a technology appropriate and sustainable in one society but not in another.

8.2.8.NT.1: Examine a malfunctioning tool, product, or system and propose solutions to the problem. 8.2.8.NT.2: Analyze an existing technological product that has been repurposed for a different function. 8.2.8.NT.3: Examine a system, consider how each part relates to other parts, and redesign it for another purpose. 8.2.8.NT.4: Explain how a product designed for a specific demand was modified to meet a new demand and led to a new product.
8.2.8.ETW.1: Illustrate how a product is upcycled into a new product and analyze the short- and long-term benefits and costs. 8.2.8.ETW.2: Analyze the impact of modifying resources in a product or system (e.g., materials, energy, information, time, tools, people, capital). 8.2.8.ETW.3: Analyze the design of a product that negatively impacts the environment or society and develop possible solutions to lessen its impact. 8.2.8.ETW.4: Compare the environmental effects of two alternative technologies devised to address climate change issues and use data to justify which choice is best.
8.2.8.EC.1: Explain ethical issues that may arise from the use of new technologies. 8.2.8.EC.2: Examine the effects of ethical and unethical practices in product design and development.

2020 New Jersey Student Learning Standards- Career Readiness, Life Literacies, and Key Skills

Career Readiness, Life Literacies, and Key Skills Practices

CRP.K-12.CRP1	Act as responsible and contributing community members and employee.
CRP.K-12.CRP2	Attend to financial well-being.
CRP.K-12.CRP3	Consider the environmental, social and economic impacts of decisions.
CRP.K-12.CRP4	Demonstrate creativity and innovation.
CRP.K-12.CRP5	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP6	Model integrity, ethical leadership and effective management.
CRP.K-12.CRP7	Plan education and career paths aligned to personal goals.
CRP.K-12.CRP8	Use technology to enhance productivity, increase collaboration and communicate effectively.
CRP.K-12.CRP9	Work productively in teams while using cultural/global competence.

9.2 Career Awareness and Planning

9.2.8.CAP.1: Identify offerings such as high school and county career and technical school courses, apprenticeships, military programs, and dual enrollment courses that support career or occupational areas of interest. 9.2.8.CAP.2: Develop a plan that includes information about career areas of interest. 9.2.8.CAP.3: Explain how career choices, educational choices, skills, economic conditions, and personal behavior affect income. 9.2.8.CAP.4: Explain how an individual's online behavior (e.g., social networking, photo exchanges, video postings) may impact opportunities for employment or advancement.
9.2.8.CAP.11: Analyze potential career opportunities by considering different types of resources, including occupation databases, and state and national labor market statistics. 9.2.8.CAP.12: Assess personal strengths, talents, values, and interests to appropriate jobs and careers to maximize career potential.

9.4 Life Literacies and Key Skills

9.4.8.CI.1: Assess data gathered on varying perspectives on causes of climate change (e.g., cross-cultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4). 9.4.8.CI.2: Repurpose an existing resource in an innovative way (e.g., 8.2.8.NT.3). 9.4.8.CI.3: Examine challenges that may exist in the adoption of new ideas (e.g., 2.1.8.SSH, 6.1.8.CivicsPD.2). 9.4.8.CI.4: Explore the role of creativity and innovation in career pathways and industries.
9.4.8.CT.1: Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (MS-ETS1-2). 9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1). 9.4.8.CT.3: Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led

to a positive or negative outcome.
9.4.8.DC.1: Analyze the resource citations in online materials for proper use. 9.4.8.DC.2: Provide appropriate citation and attribution elements when creating media products (e.g., W.6.8). 9.4.8.DC.3: Describe tradeoffs between allowing information to be public (e.g., within online games) versus keeping information private and secure. 9.4.8.DC.4: Explain how information shared digitally is public and can be searched, copied, and potentially seen by public audiences. 9.4.8.DC.5: Manage digital identity and practice positive online behavior to avoid inappropriate forms of self-disclosure. 9.4.8.DC.6: Analyze online information to distinguish whether it is helpful or harmful to reputation. 9.4.8.DC.7: Collaborate within a digital community to create a digital artifact using strategies such as crowdsourcing or digital surveys. 9.4.8.DC.8: Explain how communities use data and technology to develop measures to respond to effects of climate change (e.g., smart cities).
9.4.8.GCA.1: Model how to navigate cultural differences with sensitivity and respect (e.g., 1.5.8.C1a). 9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal.
9.4.8.IML.1: Critically curate multiple resources to assess the credibility of sources when searching for information. 9.4.8.IML.2: Identify specific examples of distortion, exaggeration, or misrepresentation of information. 9.4.8.IML.3: Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping (e.g., 6.SP.B.4, 7.SP.B.8b). 9.4.8.IML.4: Ask insightful questions to organize different types of data and create meaningful visualizations. 9.4.8.IML.5: Analyze and interpret local or public data sets to summarize and effectively communicate the data. 9.4.8.IML.6: Identify subtle and overt messages based on the method of communication. 9.4.8.IML.7: Use information from a variety of sources, contexts, disciplines, and cultures for a specific purpose (e.g., 1.2.8.C2a, 1.4.8.CR2a, 2.1.8.CHSS/IV.8.AI.1, W.5.8, 6.1.8.GeoSV.3.a, 6.1.8.CivicsDP.4.b, 7.1.NH. IPRET.8). 9.4.8.IML.8: Apply deliberate and thoughtful search strategies to access high-quality information on climate change (e.g., 1.1.8.C1b). 9.4.8.IML.9: Distinguish between ethical and unethical uses of information and media (e.g., 1.5.8.CR3b, 8.2.8.EC.2). 9.4.8.IML.10: Examine the consequences of the uses of media (e.g., RI.8.7). 9.4.8.IML.11: Predict the personal and community impact of online and social media activities. 9.4.8.IML.12: Use relevant tools to produce, publish, and deliver information supported with evidence for an authentic

audience. 9.4.8.IML.13: Identify the impact of the creator on the content, production, and delivery of information (e.g., 8.2.8.ED.1). 9.4.8.IML.14: Analyze the role of media in delivering cultural, political, and other societal messages. 9.4.8.IML.15: Explain ways that individuals may experience the same media message differently.
9.4.8.TL.1: Construct a spreadsheet in order to analyze multiple data sets, identify relationships, and facilitate data-based decision-making. 9.4.8.TL.2: Gather data and digitally represent information to communicate a real-world problem (e.g., MS-ESS3-4, 6.1.8.EconET.1, 6.1.8.CivicsPR.4). 9.4.8.TL.3: Select appropriate tools to organize and present information digitally. 9.4.8.TL.4: Synthesize and publish information about a local or global issue or event (e.g., MS-LS4-5, 6.1.8.CivicsPI.3). 9.4.8.TL.5: Compare the process and effectiveness of synchronous collaboration and asynchronous collaboration. 9.4.8.TL.6: Collaborate to develop and publish work that provides perspectives on a real-world problem.

Vertical Integration- Discipline Mapping

Grade 5: Earth and Sun

Grade 6: Weather and Water

Grade 7: Planetary Science

Preparation for High School Science Curriculum

Additional Materials

- Classroom posters that show Grand Canyon
- Word Wall
- YouTube videos: How earth was formed
- Original Horizontality Bill Nye short video
- Erosion Weathering and Erosion video
- Colored pencils for coding
- labeling Students resource book.
- Foss web site.
- Fearless Planet
- Wegner