

Unit #1: Earth and Space Science: Soils, Rocks, and Landforms

Content Area: **Science**
Course(s): **Grade 4**
Time Period: **First Trimester**
Length: **12 Week**
Status: **Published**

Unit Overview

Geology is the study of our planet's earth materials and natural resources. Because they are so ubiquitous and abundant, they are often taken for granted. This unit provides students with firsthand experiences with soils and rocks and modeling experiences using tools such as topographic maps and stream tables to study changes to rocks and landforms at Earth's surface.

This unit has four investigations that focus on the concepts that weathering by water, ice, wind, living organisms, and gravity breaks rocks into smaller pieces, erosion (water, ice, and wind) transports earth materials to new locations, and deposition is the result of that transport process that builds new land. Students conduct controlled experiments by incrementally changing specific environmental conditions to determine the impact of changing the variables of slope and amount of water in stream tables. Students interpret data from diagrams and visual representations to build explanations from evidence and make predictions of future events. They develop model mountains and represent the landforms from different perspectives to look for change. Students gain experiences that will contribute to the understanding of crosscutting concepts of patterns; cause and effect; scale, proportion, and quantity; systems and system models; structure and function; and stability and change.

STAGE 1- DESIRED RESULTS

Educational Standards

2020 New Jersey Student Learning Standards- Science

Performance Expectations

Physical Sciences

SCI.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.
SCI.4-PS3-1	Use evidence to construct an explanation relating the speed of an object to the energy of that object.
SCI.4-PS3-4	Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.
SCI.4-PS3	Energy
SCI.4-PS4-2	Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.
SCI.4-PS3-2	Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.
SCI.4-PS3-3	Ask questions and predict outcomes about the changes in energy that occur when objects collide.
SCI.4-PS4-3	Generate and compare multiple solutions that use patterns to transfer information.
SCI.4-PS4	Waves and their Applications in Technologies for Information Transfer

Life Sciences

SCI.4-LS1	From Molecules to Organisms: Structures and Processes
SCI.4-LS1-1	Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
SCI.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.

Earth and Space Sciences

SCI.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.
SCI.4-ESS3	Earth and Human Activity
SCI.4-ESS2	Earth's Systems
SCI.4-ESS2-2	Analyze and interpret data from maps to describe patterns of Earth's features.
SCI.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.
SCI.4-ESS3-1	Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.
SCI.4-ESS1	Earth's Place in the Universe
SCI.4-ESS3-2	Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.

Engineering Design

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

Science and Engineering Practices

- Practice 1: Asking Questions and Defining Problems
- Practice 2: Developing and Using Models
- Practice 3: Planning and Carrying Out Investigations
- Practice 4: Analyzing and Interpreting Data
- Practice 5: Using Mathematics and Computational Thinking
- Practice 6: Constructing Explanations and Designing Solutions
- Practice 7: Engaging in Argument from Evidence
- Practice 8: Obtaining, Evaluating, and Communicating Information

Cross Cutting Concepts

- Patterns
- Cause and Effect
- Scale, Proportion, and Quantity
- Systems and System Models
- Energy and Matter
- Structure and Functions
- Stability and Change

Disciplinary Core Ideas

Physical Sciences

- PS1. Matter and Its Interaction
- PS1.A: Structure and Properties of Matter
- PS1.B: Chemical Reactions

- PS1.C: Nuclear Processes
- PS2. Motion and Stability: Forces of Interaction
- PS2.A: Forces and Motion
- PS2.B: Types of Interactions
- PS2.C: Stability and Instability in Physical Systems
- PS3. Energy
- PS3.A: Definitions of Energy
- PS3.B: Conservation of Energy and Energy Transfer
- PS3.C: Relationship Between Energy and Forces
- PS3.D: Energy and Chemical Processes in Everyday Life
- PS4. Waves and Their Applications in Technologies for Information Transfer
- PS4.A: Wave Properties
- PS4.B: Electromagnetic Radiation
- PS4.C: Information Technologies and Instrumentation

Life Sciences

- LS1. From Molecules to Organisms: Structure and Processes
- LS1.A: Structure and function
- LS1.B: Growth and development of organisms
- LS1.C: Growth and development of organisms
- LS1.D: Information Processing
- LS2. Ecosystems: Interactions, Energy, and Dynamics
- LS2.A: Interdependent relationships in ecosystems
- LS2.B: Cycles of matter and energy transfer in ecosystems
- LS2.C: Ecosystem dynamics, functioning, and resilience
- LS2.D: Social interactions and group behavior
- LS3. Heredity: Inheritance and Variation of Traits
- LS3.A: Inheritance of traits
- LS3.B: Variation of traits
- LS4. Biological Evolution: Unity and Diversity
- LS4.A: Evidence of common ancestry and diversity
- LS4.B: Natural selection
- LS4.C: Adaptation
- LS4.D: Biodiversity and humans

Earth and Space Sciences

- ESS1. Earth's Place in the Universe
- ESS1.A: The universe and its stars
- ESS1.B: Earth and the solar system
- ESS1.C: The history of planet Earth
- ESS2. Earth's System
- ESS2.A: Earth materials and systems
- ESS2.B: Plate tectonics and large-scale system interactions
- ESS2.C: The roles of water in Earth's surface processes
- ESS2.D: Weather and climate
- ESS2.E: Biogeology
- ESS3. Earth and Human Activity
- ESS3.A: Natural resources
- ESS3.B: Natural hazards
- ESS3.C: Human impacts on Earth systems
- ESS3.D: Global climate change

Essential Questions

Investigation 1: Soils and Weathering

Part 1: What is soil?

Part 2: What causes big rocks to break down into smaller rocks?

Part 3: How are rocks affected by acid rain?

Part 4: What's in our schoolyard soils?

Investigation 2: Landforms

Part 1: How do weathered rock pieces move from one place to another?

Part 2: How does slope affect erosion and deposition?

How do floods affect erosion and deposition?

Part 3: Where are erosion and deposition happening in our school yard?

Part 4: How do fossils get in rocks and what can they tell us about the past?

Investigation 3: Mapping Earth's Surface

Part 1: How can we represent the different elevations of landforms?

Part 2: How can we draw the profile of a mountain from a topographic map?

Part 3: How can scientists and engineers help reduce the impacts that events like volcanic eruptions might have on people?

Part 4: What events can change Earth's surface quickly?

Investigation 4: Natural Resources

Part 1: What are natural resources and what is important to know about them?

Part 2: How are natural resources used to make concrete?

Part 3: How do people use natural resources to make or build things?

Enduring Understanding

This earth and space unit develops students' understanding of:

- 1) What the universe is and Earth's place in it;
- 2) How and why the Earth is constantly changing; and
- 3) How Earth's processes and human activities affect each other.

Students will know...

VOCABULARY

Investigation 1: Soils and Weathering

abrasion, acid rain, basalt, calcite, chemical reaction, chemical weathering, clay, conglomerate, earth material, expand, freeze, granite, gravel, humus, limestone, marble, pebble, physical weathering, rock, sand, sandstone, silt, soil, system, weathering

Investigation 2: Landforms

alluvial fan, basin, canyon, cast, delta, deposition, erosion, flood, floodplain, fossil, imprint, landform, meander, mold, mountain, petrification, preserved remains, river channel, river mouth, sediment, sedimentary rock, shale, slope, superposition, valley

Investigation 3: Mapping Earth's Surface

contour interval, contour line, crust, earthquake, elevation, landslide, lava, magma, mantle, profile, satellite cone, sea level, topographic map, volcano

Investigation 4: Natural Resources

aggregate, cement, concrete, fossil fuel, geothermal power, natural resource, nonrenewable resource, renewable resource, solar energy, wind power

Students will be able to...

Investigation 1: Soils and Weathering

- Ask questions about soils as they begin an extended study that sets the context for how weathering and erosion change the shape of land.
- Develop and use models to explain why soils are different in different locations and why the rock material in soils is different sizes. Models are used to better understand natural earth systems.
- Plan and carry out investigations dealing with soil properties and aspects of physical and chemical weathering that affect the breakdown of rock material.
- Analyze and interpret data to draw conclusions about how physical and chemical weathering contribute to the breakdown of rock material.
- Construct explanations using evidence to describe interactions of earth materials with each other and other substances in the environment such as acid rain.
- Engage in argument from evidence about different soils, where they might be from based on properties, and why they are different from one location to another.
- Obtain, evaluate, and communicate information from books and media and integrate that with their firsthand experiences to construct explanations about soil properties and the weathering of rock material that becomes part of the soil.

Investigation 2: Landforms

- Ask questions about the stability of landforms and the factors that affect how erosion moves earth materials from one location to another. These questions are investigated using stream-table models to observe cause-and-effect patterns.
- Develop and use models to describe the natural process of landform destruction and construction through the process of erosion. Use the stream-table model to test these relationships and describe the limitations of these models. Use models of fossil formation to understand the process.
- Plan and carry out investigations dealing with erosion using stream tables by changing variables and producing data to serve as the basis for constructing explanations.
- Analyze and interpret data in the classroom and outdoors in the schoolyard to draw conclusions about how erosion and deposition change the shape of landforms small and large.
- Construct explanations using evidence to describe interactions of solid earth materials and moving water.
- Obtain, evaluate, and communicate information from books and media and integrate that with students' firsthand experiences to construct explanations about erosion, deposition, and fossil evidence from past environments.

Investigation 3: Mapping Earth's Surface

- Develop and use models to visually display topographic features of landforms from different perspectives and describe the limitations of the model.
- Plan and carry out investigations to determine the impact of the Mount St. Helens volcanic eruption.
- Analyze and interpret data to draw conclusions about the shape of landforms before and after catastrophic events such as volcanic eruptions.
- Use mathematics and computational thinking to determine contour intervals and changes in elevations in feet (Mount Shasta) and meters (Mount St. Helens).
- Construct explanations using evidence to describe cause-and-effect relationships in changing landforms due to rapid changes caused by natural earth processes.
- Engage in argument from evidence about the cause-and-effect relationships of earth processes and resulting landforms.
- Obtain, evaluate, and communicate information from books and media and integrate that with students' firsthand experiences to construct explanations about changes to landforms due to earthquakes, landslides, floods, and volcanic eruptions. Communicate information in visual displays using topographic maps and landforms profiles.

Investigation 4: Natural Resources

- Plan and carry out investigations dealing with properties of rock material to make a product for human use – concrete.
- Construct explanations using evidence to describe interactions of earth materials with each other and other substances in the environment and to find ways that humans use earth materials in everyday life. Design solutions by using earth materials to produce a product.
- Engage in argument from evidence about the process of soil formation and the impact of weathering, erosion, deposition, and volcanic eruptions on the surface of Earth. Work with others to critique relevant information and how it supports explanations.

Obtain, evaluate, and communicate information from books and media and integrate that with their firsthand experiences to construct explanations about natural earth processes and the use of natural resources by humans.

STAGE 2- EVIDENCE OF LEARNING

Formative Assessment Suggestions

- 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 Suggestions

Investigation 1: Soils and Weathering

- Science notebook entries
- Survey
- Response sheet
- Performance assessment
- Investigation 1 I-Check

Investigation 2: Landforms

- Science notebook entries
- Response sheet
- Performance assessment
- Investigation 2 I-Check

Investigation 3: Mapping Earth's Surface

- Science notebook entries
- Response sheet
- Performance assessment
- Investigation 3 I-Check

Investigation 4: Natural Resources

- Science notebook entries
- Response sheet
- Performance assessment

Benchmark Assessments

Unit Posttest

STAGE 3- LEARNING PLAN

Instructional Map

Investigation 1: Soils and Weathering

Investigation 2: Landforms

Investigation 3: Mapping Earth's Surface

Investigation 4: Natural Resources

Investigation 1: Soils and Weathering

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Investigation 1: Part 1 – Soil Composition

Students observe and compare four different soils. They learn that soils are composed of essentially the same types of materials (inorganic earth materials and humus), but the amounts of the materials vary. Students speculate on where each of the four soils came from: mountain, desert, river delta, or forest.

Content:

- Soils can be described by their properties.
- Soils are composed of different kinds and amounts of earth materials and humus.

Investigation 1: Part 2 – Physical Weathering

Students begin to explore how large masses of rock break into smaller pieces. They tumble rocks and freeze water to see how these two types of physical weathering can break rocks.

Content:

- Weathering is the breakdown of rocks and minerals at or near Earth's surface.
- The physical-weathering processes of abrasion and freezing break rocks and minerals into smaller pieces.

Investigation 1: Part 3 – Chemical Weathering

Students plan and conduct an investigation to test rocks for interaction with "acid rain." They see that some rocks (limestone and marble) are very susceptible to acid rain, one form of chemical weathering, but other rocks (basalt and sandstone) are unaffected.

Content:

- Weathering is the breakdown of rocks and minerals at or near Earth's surface.
- Chemical weathering occurs when exposure to water and air changes rocks and minerals into something new.

Investigation 1: Part 4 – Schoolyard Soils

Students collect and observe different soils from several locations in the schoolyard. They analyze the soil samples to determine how much humus and rock material are in the local soils.

Content:

- Soils can be described by their properties.
- Soils are composed of different kinds and amounts of earth materials and humus.
- Weathering is the breakdown of rocks and minerals at or near Earth's surface.

Investigation 2 – Landforms

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Investigation 2: Part 1 – Erosion and Deposition

Students use stream tables to observe that water moves earth materials from one location to another. After running a volume of water through the stream table, students shake a vial containing a sample of earth material mixed with water to observe the rate at which different particle sizes of earth material settle out.

Content:

- Weathered rock material can be reshaped into new landforms by the slow processes of erosion and deposition.
- Erosion is the transport (movement) of weathered rock material (sediments) by moving water or wind.
- Deposition is the settling of sediments when the speed of moving water or wind declines.

Investigation 2: Part 2- Stream-Table Investigations

Students continue to run stream tables to learn how environmental variables can affect erosion and deposition. They investigate the variables of slope and water volume (flood). Then they plan and conduct their own stream-table investigations.

Content:

- The rate and volume of erosion relate directly to the energy of moving water or wind.
- The energy of moving water depends on the mass of water in motion and its velocity. The greater the mass and velocity, the greater the energy.

Investigation 2: Part 3 – Schoolyard Erosion and Deposition

Students consider whether erosion and deposition are happening in their own schoolyard. They look for evidence of erosion and for locations where deposition is in evidence. They simulate a rainstorm by pouring water on various outdoor surfaces.

Content:

- Erosion is the transport (movement) of weathered rock material (sediments) by moving water or wind.
- Deposition is the settling of sediments when the speed of moving water or wind declines.

Investigation 2: Part 4 – Fossil Evidence

Students think about what happens to and in sediments over long periods of time as sediments layer on top of each other. Students watch a video, make models, and read an article to learn about how sedimentation processes can result in fossils. They learn how fossils provide evidence of life and landscapes from the past.

Content:

- Fossils provide evidence of organisms that lived long ago as well as clues to changes in the landscape and past environments.

Investigation 3: Mapping Earth's Surface

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Investigation 3: Part 1 – Making a Topographic Map

Students build a model mountain of Mount Shasta by stacking and orienting six foam layers. They trace outlines of the six pieces onto paper, creating a topographic map of the mountain.

Content:

- A topographic map uses contour lines to show the shape and elevation of the land.
- The change in elevation between two adjacent contour lines is always uniform.
- The closer the contour lines, the steeper the slope and vice versa.

Investigation 3: Part 2 – Drawing a Profile

Students use their topographic maps to produce two-dimensional profiles, or cross-sections, of their foam mountain. The profile reveals a side view of Mount Shasta, a dormant volcano. Students gather information about volcanoes from a video.

Content:

- A profile is a side view or cross-section of a landform.
- A profile can be drawn from information given on a topographic map.

Investigation 3: Part 3 – Mount St. Helens Case Study

Students compare two topographic maps and have a short debate about whether or not they show the same mountain. After learning that the two topo maps are the same mountain, they draw profiles of Mount St. Helens before and after its devastating eruption in 1980. Students watch a USGS video that explains how scientists were involved in predicting the eruption.

Content:

- Catastrophic events have the potential to change Earth's surface quickly.
- Scientists and engineers can do things to reduce the impacts of natural Earth processes on humans.

Investigation 4: Natural Resources

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Investigation 4: Part 1 – Introduction to Natural Resources

Students review what they have learned in the module about soils, rocks, and landforms. They write a story or draw a concept map to bring the ideas together. They focus on earth materials as renewable and nonrenewable natural resources by viewing and discussing a video.

Content:

- Natural resources are natural materials taken from the environment and used by humans.
- Some natural resources are renewable (sunlight, air and wind, water, soil, plants, and animals) and some are nonrenewable (minerals and fossil fuels).
- Geoscientists study earth materials in part to help humans use those resources wisely.
- Alternative sources of energy include solar, wind, and geothermal energy.

Investigation 4: Part 2 – Making Concrete

Students focus on the earth resources that make up a very important material used for walkways, buildings, and bridges – concrete. The class uses local natural resources to make one concrete stepping stone.

Content:

- Concrete is an important building material made from earth materials (limestone to make cement, sand and gravel for aggregates, and water for mixing).

Investigation 4: Part 3 – Earth Materials in Use

Students go on a walk around the school and schoolyard, searching for earth materials in use. They search for various objects and structures and consider what natural resources were used to construct them.

Content:

- Rocks and minerals are natural resources important for shelter and transportation.
- Earth materials are resources for artists.
- Scientists and engineers work together to improve how people use natural resources.

Modifications/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

- Extended Time
- Frequent Breaks
- Highlighted Text
- Interactive Notebook
- Modified Test
- Oral Directions
- Peer Tutoring
- Preferential Seating
- Re-Direct
- Repeated Drill / Practice
- Shortened Assignments
- Teacher Notes
- Tutorials
- Use of Additional Reference Material

- Use of Audio Resources

High Preparation Differentiation

- Alternative Assessments
- Choice Boards
- Games and Tournaments
- Group Investigations
- Guided Reading
- Independent Research / Project
- Interest Groups
- Learning Contracts
- Leveled Rubrics
- Literature Circles
- Menu Assignments
- Multiple Intelligence Options
- Multiple Texts
- Personal Agendas
- Project Based Learning (PBL)
- Stations / Centers
- Think-Tac-Toe
- Tiered Activities / Assignments
- Varying Graphic Organizers

Low Preparation Differentiation

- Choice of Book / Activity
- Cubing Activities
- Exploration by Interest (using interest inventories)
- Flexible Grouping
- Goal Setting With Student
- Homework Options
- Jigsaw
- Mini Workshops to Extend Skills
- Mini Workshops to Re-teach
- Open-ended Activities
- Think-Pair-Share by Interest
- Think-Pair-Share by Learning Style

- Think-Pair-Share by Learning Style
- Think-Pair-Share by Readiness
- Use of Collaboration
- Use of Reading Buddies
- Varied Journal Prompts
- Varied Product Choice
- Varied Supplemental Materials
- Work Alone / Together

Horizontal Integration- Interdisciplinary Connections

New Jersey Student Learning Standards for Mathematics

N-Q.A.Reason quantitatively and use units to solve problems.

1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays
2. Define appropriate quantities for the purpose of descriptive modeling.
3. Choose the level of accuracy appropriate to limitations on measurement when reporting quantities.

N-CN.A. Perform arithmetic operations with complex numbers.

1. Know there is a complex number.
2. Use the commutative, associative, and distributive properties.

A-SSE.A. Interpret the structure of expressions

1. Interpret expressions that represent a quantity in terms of its context.

A-SSE.B. Write expressions in equivalent forms to solve problems.

1. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.

F-IF.A. Understand the concept of a function and use functional notation.

1. Understand that a function from one set to another set.

F-IF.B Interpret functions that arise in applications in terms of the context.

F-IF.C. Analyze functions using different representations

S-ID.A. Summarize, represent, and interpret data on a single count or measurement variable

1. Represent data with plots on a real number line.

S-ID.B. Summarize, represent, and interpret data on two categorical and quantitative variables.

S-ID.C. Interpret linear models.

S-IC.A. Understand and evaluate random processes underlying statistical experiments.

S-IC.B. Make inferences and justify conclusions from surveys, experiments, and observational studies.

English Language Arts Standards – Grade 4

RI 1: Ask and answer questions about key details.

RI 2: Identify main topic and retell key details.

RI 3: Describe the connection between two ideas.

RI 4: Ask and answer questions about unknown words.

RI 5: Identify the front cover, back cover, and title page of a book.

RI 6: Distinguish their own point of view from that of the author of the text.

RI 7: Describe the relationship between illustrations and the text.

RI 8: Identify the reasons an author gives to support points.

RI 9: Identify similarities in and differences between text on the same topic.

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

W 2: Write informative /explanatory text.

W 5: Strengthen writing by revising and editing.

W 8: Gather information to answer a question.

W 9: Draw evidence from informational text to support reflection.

SL 1: Participate in collaborative conversations.

SL 2: Ask and answer questions about key details and request clarification.

SL 4: Describe with details.

SL 5: Add drawings or other visual displays to recounts of experiences.

L 3: Use knowledge of language and its conventions when writing, speaking, reading, or listening.

L 4: Determine or clarify the meaning of unknown or multiple meaning words and phrases.

L 5: Demonstrate understanding of word relationships and nuances in word meanings.

L 6: Use acquired words and phrases.

RF 4: Read text with purpose and understanding.

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

8.2.5.ED.1: Explain the functions of a system and its subsystems.

8.2.5.ED.2: Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models.

8.2.5.ED.3: Follow step by step directions to assemble a product or solve a problem, using appropriate tools to accomplish the task.

8.2.5.ED.4: Explain factors that influence the development and function of products and systems (e.g., resources, criteria, desired features, constraints).

8.2.5.ED.5: Describe how specifications and limitations impact the engineering design process.

8.2.5.ED.6: Evaluate and test alternative solutions to a problem using the constraints and trade-offs identified in the design process.

8.2.5.ITH.1: Explain how societal needs and wants influence the development and function of a product and a system.

8.2.5.ITH.2: Evaluate how well a new tool has met its intended purpose and identify any shortcomings it might have.

8.2.5.ITH.3: Analyze the effectiveness of a new product or system and identify the positive and/or negative consequences resulting from its use.

8.2.5.ITH.4: Describe a technology/tool that has made the way people live easier or has led to

a new business or career.
<p>8.2.5.NT.1: Troubleshoot a product that has stopped working and brainstorm ideas to correct the problem.</p> <p>8.2.5.NT.2: Identify new technologies resulting from the demands, values, and interests of individuals, businesses, industries, and societies.</p> <p>8.2.5.NT.3: Redesign an existing product for a different purpose in a collaborative team.</p> <p>8.2.5.NT.4: Identify how improvement in the understanding of materials science impacts technologies.</p>
<p>8.2.5.ETW.1: Describe how resources such as material, energy, information, time, tools, people, and capital are used in products or systems.</p> <p>8.2.5.ETW.2: Describe ways that various technologies are used to reduce improper use of resources.</p> <p>8.2.5.ETW.3: Explain why human-designed systems, products, and environments need to be constantly monitored, maintained, and improved.</p> <p>8.2.5.ETW.4: Explain the impact that resources, such as energy and materials used to develop technology, have on the environment.</p> <p>8.2.5.ETW.5: Identify the impact of a specific technology on the environment and determine what can be done to increase positive effects and to reduce any negative effects, such as climate change.</p>
8.2.5.EC.1: Analyze how technology has contributed to or reduced inequities in local and global communities and determine its short- and long-term effects.

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

9.2.5.CAP.1: Evaluate personal likes and dislikes and identify careers that might be suited to personal likes.

9.2.5.CAP.2: Identify how you might like to earn an income.

9.2.5.CAP.3: Identify qualifications needed to pursue traditional and non-traditional careers and occupations.

9.2.5.CAP.4: Explain the reasons why some jobs and careers require specific training, skills, and certification (e.g., life guards, child care, medicine, education) and examples of these requirements.

9.4 Life Literacies and Key Skills

9.4.5.Cl.1: Use appropriate communication technologies to collaborate with individuals with diverse perspectives about a local and/or global climate change issue and deliberate about possible solutions (e.g., W.4.6, 3.MD.B.3, 7.1.NM.IPERS.6).

9.4.5.Cl.2: Investigate a persistent local or global issue, such as climate change, and collaborate with individuals with diverse perspectives to improve upon current actions designed to address the issue (e.g., 6.3.5.CivicsPD.3, W.5.7).

9.4.5.Cl.3: Participate in a brainstorming session with individuals with diverse perspectives to expand one's thinking about a topic of curiosity (e.g., 8.2.5.ED.2, 1.5.5.CR1a).

9.4.5.Cl.4: Research the development process of a product and identify the role of failure as a part of the creative process (e.g., W.4.7, 8.2.5.ED.6).

9.4.5.CT.1: Identify and gather relevant data that will aid in the problem-solving process (e.g., 2.1.5.EH.4, 4-ESS3-1, 6.3.5.CivicsPD.2).

9.4.5.CT.2: Identify a problem and list the types of individuals and resources (e.g., school, community agencies, governmental, online) that can aid in solving the problem (e.g., 2.1.5.CHSS.1, 4-ESS3-1).

9.4.5.CT.3: Describe how digital tools and technology may be used to solve problems.

9.4.5.CT.4: Apply critical thinking and problem-solving strategies to different types of problems such as personal, academic, community and global (e.g., 6.1.5.CivicsCM.3).

9.4.5.DC.1: Explain the need for and use of copyrights.

9.4.5.DC.2: Provide attribution according to intellectual property rights guidelines using public domain or creative commons media.

9.4.5.DC.3: Distinguish between digital images that can be reused freely and those that have copyright restrictions.

9.4.5.DC.4: Model safe, legal, and ethical behavior when using online or offline technology (e.g., 8.1.5.NI.2).

9.4.5.DC.5: Identify the characteristics of a positive and negative online identity and the lasting implications of online activity.

9.4.5.DC.6: Compare and contrast how digital tools have changed social interactions (e.g., 8.1.5.IC.1).

9.4.5.DC.7: Explain how posting and commenting in social spaces can have positive or negative consequences.

9.4.5.DC.8: Propose ways local and global communities can engage digitally to participate in and promote climate action (e.g., 6.3.5.GeoHE.1).

9.4.5.IML.1: Evaluate digital sources for accuracy, perspective, credibility and relevance (e.g., *Social Studies Practice* - Gathering and Evaluating Sources).

9.4.5.IML.2: Create a visual representation to organize information about a problem or issue (e.g., 4.MD.B.4, 8.1.5.DA.3).

9.4.5.IML.3: Represent the same data in multiple visual formats in order to tell a story about the data.

9.4.5.IML.4: Determine the impact of implicit and explicit media messages on individuals, groups, and society as a whole.

9.4.5.IML.5: Distinguish how media are used by individuals, groups, and organizations for varying purposes. (e.g., 1.3A.5.R1a).

9.4.5.IML.6: Use appropriate sources of information from diverse sources, contexts, disciplines, and cultures to answer questions (e.g., RI.5.7, 6.1.5.HistoryCC.7, 7.1.NM. IPRET.5).

9.4.5.IML.7: Evaluate the degree to which information meets a need including social emotional learning, academic, and social (e.g., 2.2.5. PF.5).

9.4.5.TL.1: Compare the common uses of at least two different digital tools and identify the advantages and disadvantages of using each.

9.4.5.TL.2: Sort and filter data in a spreadsheet to analyze findings.

9.4.5.TL.3: Format a document using a word processing application to enhance text, change page formatting, and include appropriate images graphics, or symbols.

9.4.5.TL.4: Compare and contrast artifacts produced individually to those developed collaboratively (e.g., 1.5.5.CR3a).

9.4.5.TL.5: Collaborate digitally to produce an artifact (e.g., 1.2.5CR1d).

Vertical Integration- Discipline Mapping

ESS1 – Grade 1: Air and Weather

Grade 2: Pebbles, Sand, and Silt

Grade 5: Earth and Sun

Grade 7: Planetary Science

Grade 8: Earth's History; Heredity and Adaptations

ESS2- Kindergarten: Animals Two by Two; Trees and Weather

Grade 1: Air and Weather

Grade 2: Pebbles, Sand, and Silt

Grade 3: Water and Climate

Grade 5: Earth and Sun; Living Systems

Grade 7: Planetary Science

Grade 8: Earth's History

ESS3 - Kindergarten: Animals Two by Two; Trees and Weather

Grade 1: Air and Weather

Grade 3: Water and Climate

Grade 5: Earth and Sun

Grade 6: Weather and Water

Grade 7: Electromagnetic Force, Gravitational, and Kinetic Forces; Populations and Ecosystems

Grade 8: Earth's History

Preparation for high school science courses

Additional Materials

Visit FOSSWEB.com for list of websites and additional readings.