BOE Approved 8/18

Cliffside Park Public Schools

Science

Unit Name: Soils, Rocks, and Landforms (Earth Science)

Resource: FOSS Next Generation, Delta Education

Duration: Ten Weeks

Enduring Understanding

Soil and Weathering

- 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.
- The physical-weathering processes of abrasion and freezing break rocks and minerals into smaller pieces.
- Chemical weathering occurs when exposure to water and air changes rocks and minerals into something new.

Landforms

- Weathered rock material can be reshaped into new landforms by the slow processes of erosion and deposition.
- Erosion is the transport of weathered rock material by moving water or wind.
- Deposition is the settling of sediments when the speed of moving water or wind declines.
- 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.
- Catastrophic events have the potential to change Earth's surface quickly.

Mapping Earth's Surface

- A topographic map uses contour lines to show the shape and elevation of the land.
- A profile is a side view or cross-selection of a landform.

- A profile can be drawn from information given on a topographic map.
- The surface of Earth is constantly changing.
- 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.

Natural Resources

- Natural resources are natural materials taken from the environment and used by humans.
- Concrete is an important building material made from earth materials.
- Some natural resources are renewable and some are non renewable.
- Alternative sources of energy include solar, wind, and geothermal energy.
- Scientists and engineers work together to improve how people use natural resources.

Essential Questions

Soils & Weathering

- What is soil?
- What causes big rocks to break down into smaller rocks?
- How are rocks affected by acid rain?
- What's in our schoolyard soils?

Landforms

- How do weathered rocks pieces move from one place to another?
- How does slope affect erosion and deposition?
- How do floods affect erosion and deposition?
- Where are erosion deposition happening in our schoolyard?
- How do fossils get in rocks and what can they tell us about the past?

Mapping Earth's Surface

- How can we represent the different elevations of landforms?
- How can we draw a profile of a mountain from a topographic map?
- How can scientists and engineers help reduce the impacts that events like volcanic eruptions might have on people?
- What events can change Earth's surface quickly?

Natural Resources

- What are natural resources and what is important to know about them?

- How are natural resources used to make concrete?
- What does a wind sock tell us about the wind?
- How do people use natural resources to make or build things?

Focus of Standards

Student Outcomes	Skills	Assessments
Soils and Weathering ● I can investigate properties of soil by comparing four different soils. ● I can explore that soils are composed of essentially the same types of materials (inorganic earth materials and humus), but the amounts of the materials vary. ● I can investigate how rocks break into smaller pieces through physical and chemical weathering. ● I can explore and compare properties of local soils. **Landforms** ● I can observe that water moves earth materials from one location to another using stream tables. ● I can investigate the variables of slope and water quantity and plan and conduct their own stream-table investigations. ● I can observe evidence of erosion and deposition outdoors. ● I can hypothesize what happens to sediments over long periods of time as sediments layer on top of each other. ● I can explore the different processes that can result in fossils and how fossils provide evidence of life and landscapes from the	● Asking Questions and Defining Problems ● Developing and Using Models ● Classifying Information ● Observing Investigations ● Exploring New Ideas ● Planning and Carrying Out Investigations ● Analyzing and Interpreting Data ● Using Mathematics and Computational Thinking ● Constructing Explanations and Designing Solutions ● Engaging in Argument from Evidence ● Obtaining, Evaluating and Communicating Information	***Assessments:*** ● **Formative**: Notebook Entries: ○ Notebook Entries ○ Teacher Observation ○ Anecdotal Records/Notes ○ Science notebook ○ Embedded Assessment Notes ● **Summative Performance** ○ Foss Post-test on Soils, Rocks, and Landforms ○ Vocabulary check ● **Benchmark Assessments**: ○ Investigation Checks ○ Constructing models- Rock cycle ○ Constructing models- erosion and deposition over time ○ Analyzing models- Topography and elevation ○ Constructing models- molds, casts and fossils ● **Alternative:** ○ Conferences ○ Diagrams- rock cycle, volcanoes, changes over time due to erosion and deposition ○ Word Bank for vocabulary ○ Modeling ○ Illustrations of geography

ancient past. **Mapping Earth's Surface** ● I can construct landform models - mountain are to the study of topography by building models of a landforms—a mountain. ● I can use the topographer's tools to analyze the impact of the Mount St. Helens eruption and to learn about volcanoes. ● I can Investigate processes that cause rapid changes to Earth's surface: landslides, earthquakes, floods, and volcanoes. **Natural Resources** ● I can review what they have learned in Investigations 1–3. ● I can explore earth materials as renewable and nonrenewable natural resources and the importance of earth materials as resources. ● I can create a class stepping stone out of concrete. ● I can discover objects and structures within the schoolyard and consider what natural resources were used to construct them.		changes of the sahara- from watery paradise to dry desert.

NJ: Student Learning Standards: Science
NJ: Grade 4
Earth's Place in the Universe
4-ESS1-1. Identify evidence from patterns in rock formations and fossils in rock layers for changes in a landscape over time to support an explanation for changes in a landscape over time
Earth's Systems
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
Earth and Human Activity
4-ESS3-2. Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.

Engineering Design
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.
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.
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.

NJ: 2014 SLS: 21st Century Life and Careers
NJ: Grade 4
ELA: RI.4.1, RI.4.3, RI.4.4, RI.4.5, RI.4.7, RI.4.9
Math: 4.OA.1, 4.OA.2, 4.OA.3

Career Awareness, Exploration, And Preparation
Strand A: Career Awareness
9.2.4.A.1 Identify reasons why people work, different types of work, and how work can help a person achieve personal and professional goals.
9.2.4.A.2 Identify various life roles and civic and work-related activities in the school, home, and community.
9.2.4.A.3 Investigate both traditional and nontraditional careers and relate information to personal likes and dislikes.
9.2.4.A.4 Explain why knowledge and skills acquired in the elementary grades lay the foundation for future academic and career success.

NJ: 2014 SLS: Technology
NJ: Grades 3-5
8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
A. Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
8.1.5.A.3 Use a graphic organizer to organize information about problem or issue.
8.1.5.A.4 Graph data using a spreadsheet, analyze and produce a report that explains the analysis of the data.
D. Digital Citizenship: Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.
8.1.5.D.2 Analyze the resource citations in online materials for proper use.
E: Research and Information Fluency: Students apply digital tools to gather, evaluate, and use information.
8.1.5.E.1 Use digital tools to research and evaluate the accuracy of, relevance to, and appropriateness of using print and non-print electronic information sources to complete a variety of tasks.

8.2 Technology Education, Engineering, Design, and Computational Thinking
A. The Nature of Technology: Creativity and Innovation Technology systems impact every aspect of the world in which we live.
8.2.2.A.3 Identify a system and the components that work together to accomplish its purpose.

8.2.2.A.4 Choose a product to make and plan the tools and materials needed.
8.2.2.A.5 Collaborate to design a solution to a problem affecting the community.
B. Technology and Society: Knowledge and understanding of human, cultural and societal values are fundamental when designing technology systems and products in the global society.
C. Design: The design process is a systematic approach to solving problems.
8.2.5.C.1 Collaborate with peers to illustrate components of a designed system.
D. Abilities for a Technological World: The designed world is the product of a design process that provides the means to convert resources into products and systems.
8.2.5.D.1 Identify and collect information about a problem that can be solved by technology, generate ideas to solve the problem, and identify constraints and trade-offs to be considered.
8.2.5.D.2 Evaluate and test alternative solutions to a problem using the constraints and trade-offs identified in the design process to evaluate potential solutions.
8.2.5.D.4 Explain why human-designed systems, products, and environments need to be constantly monitored, maintained, and improved.
8.2.5.D.7 Explain the impact that resources such as energy and materials used in a process to produce products or system have on the environment.

Integration of Knowledge and Ideas
NJSLS.R7 Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.
RI.4.7. Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.
Research to Build and Present Knowledge
NJSLS.W7 Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.
W.4.7. Conduct short research projects that build knowledge through investigation of different aspects of a topic.
NJSLS.W9 Draw evidence from literary or informational texts to support analysis, reflection, and research.
W.4.9. Draw evidence from literary or informational texts to support analysis, reflection, and research.
W.4.9b. Apply grade 4 Reading standards to informational texts (e.g., “Explain how an author uses reasons and evidence to support particular points in a text”).

Career Ready Practices
CRP1. Act as a responsible and contributing citizen and employee.
CRP3. Attend to personal health and financial well-being.
CRP4. Communicate clearly and effectively and with reason.
CRP6. Demonstrate creativity and innovation.
CRP7. Employ valid and reliable research strategies.
CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
CRP11. Use technology to enhance productivity.
CRP12. Work productively in teams while using cultural global competence.

Core Instructional Materials:

- FOSS Next Generation: Soils, Rocks and Landforms (2016)

- **Supplemental Materials: (videos, leveled readers, Readworks, recommended books etc.)**
- **Videos: https://www.fossweb.com/moduledetail?dDocName=G3842595&classId=**
- **Recommended books: https://www.fossweb.com/additional-resources-books-xslt?dDocName=G4292315#non-fiction-books**

NJSLS: Science and Engineering Practices (Grade3-5)

Practice 1. Asking questions (for science) and defining problems (for engineering)

- Asking questions and defining problems in 3–5 builds on K–2 experiences and progresses to specifying qualitative relationships.
- Ask questions about what would happen if a variable is changed.
- Identify scientific (testable) and non-scientific (non-testable) questions.
- Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships.
- Use prior knowledge to describe problems that can be solved.
- 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.

Practice 2. 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.
- Identify limitations of models.
- Collaboratively develop and/or revise a model based on evidence that shows the relationships among variables for frequent and regular occurring events.
- Develop a model using an analogy, example, or abstract representation to describe a scientific principle or design solution.
- Develop and/or use models to describe and/or predict phenomena.
- Develop a diagram or simple physical prototype to convey a proposed object, tool, or process.

Practice 3. 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.
- 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.
- Evaluate appropriate methods and/or tools for collecting data.
- Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution.
- Make predictions about what would happen if a variable changes.
- Test two different models of the same proposed object, tool, or process to determine which better meets criteria for success.

Practice 4. 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.
- Represent data in tables and/or various graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate

relationships.
- Analyze and interpret data to make sense of phenomena, using logical reasoning, mathematics, and/or computation.
- Compare and contrast data collected by different groups in order to discuss similarities and differences in their findings.
- Analyze data to refine a problem statement or the design of a proposed object, tool, or process.
- Use data to evaluate and refine design solutions.

Practice 5. Using mathematics and computational thinking
- Mathematical and computational thinking in 3–5 builds on K–2 experiences and progresses to extending quantitative measurements to a variety of physical properties and using computation and mathematics to analyze data and compare alternative design solutions.
- Organize simple data sets to reveal patterns that suggest relationships.

Practice 6. Constructing explanations (for science) and designing solutions (for engineering)
- 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.
- Construct an explanation of observed relationships (e.g., the distribution of plants in the backyard).
- Use evidence (e.g., measurements, observations, patterns) to construct or support an explanation or design a solution to a problem.
- Identify the evidence that supports particular points in an explanation.

Practice 7. 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).
- Respectfully provide and receive criticism from peers about a proposed procedure, explanation, or model by citing relevant evidence and posing specific questions.
- Construct and/or support an argument with evidence, data, and/or a model.
- Use data to evaluate claims about cause and effect.

Practice 8. Obtaining, evaluating, and communicating information
- Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluating the merit and accuracy of ideas and methods.
- Read and comprehend grade-appropriate complex texts and/or other reliable media to summarize and obtain scientific and technical ideas and describe how they are supported by evidence.
- Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem.
- Communicate scientific and/or technical information orally and/or in written formats, including various forms of media and may include tables, diagrams, and charts

21st Century Themes
- **Health Literacy/Environmental Literacy** - learning about ecosystems allows students to take individual and collective action towards addressing environmental challenges.

21st Century Skills
Creativity and Innovation
- Critical Thinking and Problem Solving

- Communication and Collaboration

Interdisciplinary Connections
Fourth grade investigations follow a clear and coherent conceptual flow and a consistent instructional design. Students develop science knowledge by building a framework of concepts and supporting ideas.
NJSLS State Standards for ELA are introduced, developed, and practiced in the context of learning science content and engaging in the science and engineering practices. Students read and comprehend complex science texts related to their prior experience and knowledge. They write informational/explanatory texts, arguments to support claims, and narratives about experience in science. They engage in collaborative discussions about science and learn new vocabulary and language structures in context. The decision to use additional science texts, writing tasks, oral discourse opportunities, and vocabulary development activities is based on how well they address the science as well as the ELA standards.
ELA: Interdisciplinary Connections: NJSLS for ELA are introduced, developed, and practiced in the context of learning science content and engaging in the science and engineering practices.

- Read and comprehend complex science texts related to their prior experience and knowledge.
- Write informational/explanatory texts, arguments to support claims, and narratives about experience in science.
- Engage in collaborative discussions about science.
- Learn new vocabulary and language structures in context.

Math
The fourth grade program integrates mathematics with science in two ways throughout the grade 3 modules. In active investigations, students apply mathematics during data gathering and analysis. In addition, the Interdisciplinary Extensions at the end of each investigation usually include
a math problem of the week. These problems enhance the science learning by providing hypothetical data for students to analyze or in some way relate to the context of the investigation. The notes explain for the teacher the problem and describe how students might approach its solution. The problems are prepared for distribution to students on duplication masters in the Teacher Masters chapter of Teacher Resources.
Mathematical Practices
The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

- Make sense of problems and persevere in solving them.
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Model with mathematics.
- Use appropriate tools strategically.
- Attend to precision.
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning.

Differentiation/Accommodations/Modifications ***(Alternate Modes of Instruction and Support)***		
Modifications to Support Gifted and Talented Students	**Modifications to Support English Language Learners**	**Modifications to Support Our Learners (Students with IEPs/504s and At-Risk Learners)**
Newsela article: **Earth's Systems: Volcanoes** Lexile: 800L Recommended non fiction books https://www.fossweb.com/additional-resources-books-xslt?dDocName=G4292315#non-fiction-books Independent research- Rocks with Fossils- Investigating Earth's timeline Debate / Compare and contrast- Various sources of building materials from different sources of rock. Investigate- Artificial diamonds Provide appropriate challenge for wide ranging skills and development areas. Participate in inquiry and project-based learning units of study Assigning roles within partnerships Differentiated supports: content, process, product, environment	Newsela article: **Earth's Systems: Volcanoes** (Spanish version) Equipment photo cards (spanish and english) Modeling- rock cycle https://www.youtube.com/watch?v=EGK1KkLjdQY Visual cues- image gallery https://www.fossweb.com/additional-resources-image-galleries-xslt?dDocName=G4292315#image-galleries Researching geography and mining per native country Vocabulary log- Pronunciation/translation assistance https://dictionary.cambridge.org/us/ Vocabulary builder Thesaurus- https://www.thesaurus.com/ Native Language Translation (peer, online assistive technology, translation device, bilingual dictionary)	Newsela article: **Earth's Systems: Volcanoes** Lexile: 600L Equipment photo cards Visual cues- image gallery https://www.fossweb.com/additional-resources-image-galleries-xslt?dDocName=G4292315#image-galleries Observing different rocks per available collections recording observations. https://www.youtube.com/watch?v=EGK1KkLjdQY Using topographic maps and extrapolating possible flooding based on elevation. Word walls Review student individual educational plan and/or 504 plan. Establish procedures for accommodations and modifications for assessments as per IEP/504. Establish procedures for modification of classwork and homework as per IEP/504. Modify classroom environment to support academic and physical needs of the students as per IEP/504.

	Pair visual prompts with verbal presentations Front Load and immerse students in literacy and language experiences related to content Provide students with visual models, sentence stems, concrete objects, and hands-on materials. Model procedures for life skills. Collaboration between ELL and general education teacher to maximize learning	Provide appropriate accommodations, instructional adaptations, and/or modifications as determined by the IEP or 504 team. Differentiation through content, process, product, environment Provide Title I services to students not meeting academic standards in ELA and/or Math. Provide instructional adaptations and interventions in the general education classroom. Modify classroom environment to support student needs. Differentiated instruction Basic Skills Intensive individual intervention

Sources:
NJSLS Science Standards (2017): http://www.nj.gov/education/cccs/2016/science/
NJ: 2014 SLS: Technology: http://www.state.nj.us/education/cccs/2014/tech/8.pdf
NJSLS-S: Science and Engineering Practices: http://www.nj.gov/education/cccs/2016/science/3-5-ETS1.pdf
21st Century Life and Careers: http://www.state.nj.us/education/cccs/2014/career/9.pdf
Career Ready Practices: http://www.state.nj.us/education/cccs/2014/career/9.pdf
2015 FOSS Next Generation: www.FOSSweb.com