4th Grade Unit 1 - Weathering and Erosion

Content Area: **Science**
Course(s): **Science Grade 4**
Time Period: **MP1**
Length: **22 days**
Status: **Published**

NJSLS - Science

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.
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.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-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-ESS2-2	Analyze and interpret data from maps to describe patterns of Earth's features.
SCI.4-ESS3-2	Generate and compare multiple solutions to reduce the impacts of natural Earth processes and climate change have on humans.

Science and Engineering Practices

Constructing Explanations and Designing Solutions

Identify the evidence that supports particular points in an explanation. (4-ESS1-1)

Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution. (4-ESS3-2)(3-5-ETS1-2)

Planning and Carrying Out Investigations

Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (4-ESS2-1)

Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. (3-5-ETS1-3)

Analyzing and Interpreting Data

Analyze and interpret data to make sense of phenomena using logical reasoning. (4-ESS2-2)

Disciplinary Core Ideas

ESS1.C: The History of Planet Earth

Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed. (4-ESS1-1)

ESS2.A: Earth Materials and Systems

Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)

ESS2.B: Plate Tectonics and Large-Scale System Interactions

The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges. Maps can help locate the different land and water features areas of Earth. (4-ESS2-2)

ESS2.E: Biogeology

Living things affect the physical characteristics of their regions. (4-ESS2-1)

ESS3.B: Natural Hazards

A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts. (4-ESS3-2)

ETS1.B: Developing Possible Solutions

Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. (3-5-ETS1-2)

At whatever stage, communicating with peers about proposed solutions is an important part of the design

process, and shared ideas can lead to improved designs. (3-5-ETS1-2)

Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved. (3-5-ETS1-3)

ETS1.C: Optimizing the Design Solution

Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. (3-5-ETS1-3)

Crosscutting Concepts

Patterns

Patterns can be used as evidence to support an explanation. (4-ESS1-1, 4-ESS2-2)

Cause and Effect

Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1, 4-ESS3-2)

Influence of Science, Engineering, and Technology on Society and the Natural World

Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. (3-5-ETS1-2)

Rationale and Transfer Goals

In this unit of study, students develop understandings of the effects of weathering and the rate of erosion by water, ice, wind, or vegetation. The crosscutting concepts of patterns and cause and effect are called out as organizing concepts. Students demonstrate grade-appropriate proficiency in planning and carrying out investigations and constructing explanations. Students are also expected to use these practices to demonstrate an understanding of the core ideas. Students then use their knowledge of natural Earth processes to generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.

Enduring Understandings

Earth's components form systems that continually interact, affecting the Earth regionally and globally.

Earth's fossil layers can be used to order events that have occurred throughout Earth's history.

Different regions of the Earth have different geological features.

The Earth's natural processes have effects on humans.

Essential Questions

How can evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation be observed or measured?

What can rock formations tell us about the past?

What can maps tell us about the features of the world?

In what ways can the impacts of natural Earth processes on humans be reduced?

Content - What will students know?

- Cause and effect relationships are routinely identified, tested, and used to explain change.
- Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around.

- Rainfall helps to shape the land and affects the types of living things found in a region.
- Living things affect the physical characteristics of their regions.
- Science assumes consistent patterns in natural systems.
- Patterns can be used as evidence to support an explanation.
- Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes.
- The presence and location of certain fossil types indicate the order in which rock layers were formed.
- Maps help locate the different land and water features of Earth.
- The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns.
- Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans.
- Major mountain chains form inside continents or near their edges.
- Engineers improve existing technologies or develop new ones to increase benefits, decrease known risks, and meet societal demands.
- A variety of hazards result from natural processes (e.g. earthquakes, floods, tsunamis, volcanic eruptions).
- Humans cannot eliminate hazards, but they can take steps to reduce their impacts.
- Research on a problem should be carried out before beginning to design a solution.
- Testing a solution involves investigating how well it performs under a range of likely conditions.
- At whatever stage, communicating with peers about proposed solutions to a problem is an important part of the design process and shared ideas can lead to improved designs.
- Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved.
- Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints.

Skills - What will students be able to do?

- Identify patterns of change in Earth processes.
- Understand the effects of weather and the rate of erosion by water, ice, wind, or vegetation.

- Recognize the cause and effect relationships among the forces that cause change in rocks, soil, and landform.
- Construct explanations of changes that occur over time to Earth materials.
- Make observations of their local environment to observe the types of living things that are common in the region.
- Demonstrate how wind, water, and ice cause change to the surface of the Earth.
- Build and use models to simulate the effects of wind on Earth materials.
- Observe the ways in which plants affect the weathering and erosion of Earth materials.
- Make observations about local landforms.
- Use topographic maps of Earth's land and ocean floor in order to locate features such as mountains, mountain ranges, deep ocean trenches, and other ocean floor structures.
- Analyze data to show that there is a noticeable pattern of earth events occurring along boundaries.
- Engage in the engineering process in order to generate and compare multiple solutions that reduce the impacts of natural Earth processes on humans.

Activities - How will we teach the content and skills?

- Mystery Science The Birth of Rocks Anchor Phenomenon
- Mystery Science The Birth of Rocks Lesson 1
- Mystery Science The Birth of Rocks Lesson 2
- Mystery Science The Birth of Rocks Lesson 3
- Mystery Science The Birth of Rocks Lesson 4
- Mystery Science The Birth of Rocks Lesson 5

Evidence/Assessments - How will we know what students have learned?

- Identify, test, and use cause and effect relationships in order to explain change.
- Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon.
- Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation

for changes in landscape over time.

- Mystery Science Grade 4 The Birth of Rocks: Lesson 1 Assessment
- Mystery Science Grade 4 The Birth of Rocks: Lesson 2 Assessment
- Mystery Science Grade 4 The Birth of Rocks: Lesson 3 Assessment
- Mystery Science Grade 4 The Birth of Rocks: Lesson 5 Assessment
- Mystery Science Grade 4 The Birth of Rocks: Performance Task
- Daily Exit Tickets
- Daily Formative Assessment
- Grade 4 Science Unit 1 Benchmark

Spiraling for Mastery

Content or Skill for this Unit	Spiral Focus from Previous Unit	Instructional Activity
Students of all ages may hold the view that the world was always as it is now, or that any changes that have occurred must have been sudden and comprehensive.	• Grade 2: Water is found in the ocean, rivers, lakes, and ponds. Water exists as solid ice and in liquid form. • Grade 2: Maps show where things are located. One can map the shapes and kinds of land and water in any area. • Grade 2: Wind and water can change the shape of the land.	2-ESS1-1 Activities 2-ESS2-1 Activities 2-ESS2-2 Activities 2-ESS2-3 Activities

Key Resources

Mystery Science

Glaciers, Water, and Wind, Oh My!

Bill Nye Erosion Video

Explaining Glaciers, Accurately

Engineering for the Three Little Pigs

Testing Model Structures: Jell-O Earthquake in the Classroom

Getting the Right Angle on the Story

21st Century Life and Careers

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

Career Readiness, Life Literacies, & Key Skills

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

Interdisciplinary Connections/Companion Standards

NJSLS ELA

NJSLSA.R4. Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

NJSLSA.W7. Conduct short as well as more sustained research projects, utilizing an inquiry-based research process, based on focused questions, demonstrating understanding of the subject under investigation.

NJSLS Mathematics

4.MD.A Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.

4.MD.B Represent and interpret data.