Grade 06 - Unit 01 -Earth's Systems (nj doe gr7 unit 8)

Content Area: **Science**
Course(s):
Time Period: **Generic Time Period**
Length: **55 days Sept. , Oct., Nov**
Status: **Published**

Stage 1: Desired Results

Unit Overview/ Rationale

Students examine geoscience data in order to understand processes and events in Earth's history. Important crosscutting concepts in this unit are *scale, proportion, and quantity*, *stability and change*, and *patterns* in relation to the different ways geologic processes operate over geologic time. An important aspect of the history of Earth is that geologic events and conditions have affected the evolution of life, but different life forms have also played important roles in altering Earth's systems. Students understand how Earth's geosystems operate by modeling the flow of energy and cycling of matter within and among different systems. Students investigate the controlling properties of important materials and construct explanations based on the analysis of real geoscience data. Students are expected to demonstrate proficiency in *analyzing and interpreting* data and *constructing explanations*. They are also expected to use these practices to demonstrate understanding of the core ideas.

Earth operates as a set of complex, dynamic, and interconnected systems, and is a part of the all-encompassing system of the universe.

Earth's composition is unique, is related to the origin of our solar system, and provides us with the raw resources needed to sustain life. The earth's interior layers and surface features come together to form a spherical earth comprised of minerals and rocks.

Standards & Indicators

Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Eart history. *[Clarification Statement: Emphasis is on how analyses of rock formations and the fossils they contain are used to establi events in Earth's history. Examples of Earth's major events could range from being very recent (such as the last Ice Age or the ea sapiens) to very old (such as the formation of Earth or the earliest evidence of life). Examples can include the formation of moun basins, the evolution or extinction of particular living organisms, or significant volcanic eruptions.] [Assessment Boundary: Asses recalling the names of specific periods or epochs and events within them.]* **(MS-ESS1-4)**
Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process. *[Clarification Stat the processes of melting, crystallization, weathering, deformation, and sedimentation, which act together to form minerals and of Earth's materials.] [Assessment Boundary: Assessment does not include the identification and naming of minerals.]* **(MS-ESS2**

Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and scales. *[Clarification Statement: Emphasis is on how processes change Earth's surface at time and spatial scales that can be larg motions or the uplift of large mountain ranges) or small (such as rapid landslides or microscopic geochemical reactions), and hou processes (such as earthquakes, volcanoes, and meteor impacts) usually behave gradually but are punctuated by catastrophic ev geoscience processes include surface weathering and deposition by the movements of water, ice, and wind. Emphasis is on geos shape local geographic features, where appropriate.]* **(MS-ESS2-2)**
Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evi motions. *[Clarification Statement: Examples of data include similarities of rock and fossil types on different continents, the shap (including continental shelves), and the locations of ocean structures (such as ridges, fracture zones, and trenches).] [Assessmen Paleomagnetic anomalies in oceanic and continental crust are not assessed.]* **(MS-ESS2-3)**

SCI.6-8.MS-ESS2-1	Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.
SCI.6-8.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.6-8.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.6-8.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.

Big Ideas - Students will understand that…

Within this unit, students will use the geologic time scale to organize Earth's 4.6-billion-year-old history. They will cite specific textual evidence from science and technical texts to support analysis of rock strata to show how the geologic time scale is used to organize Earth's 4.6-billion-year-old history. They will use analysis of rock formations and the fossils they contain to establish relative ages of major events in Earth's history. Examples of Earth's major events could include the Ice Age or the earliest fossils of Homo sapiens, or the formation of Earth and the earliest evidence of life. Emphasis should be on analyses of rock strata providing only relative dates, not an absolute scale. Students can use variables to represent numbers or quantities and write expressions when solving problems while constructing their explanations. Examples can include the formation of mountain chains and ocean basins, the evolution or extinction of particular living organisms, or significant volcanic eruptions. *[Note: Assessment does not include recalling the names of specific periods or epochs and events within them.]*

Students will develop and use models to describe the cycling of Earth materials and the flow of energy that drives this process. This energy comes from the heat of the core of the Earth, which is transferred to the mantle. Convection currents within the mantle then drive the movement of tectonic plates. Emphasis is on the processes of melting, crystallization, weathering, deformation, and sedimentation, which act together to form minerals and rocks through the cycling of Earth's materials. Students can generate models to demonstrate the rock cycle, with specific focus on the processes causing change. Students can analyze pictures and rock samples that demonstrate various processes of melting, crystallization, weathering, deformation, and sedimentation. *[Note: Students are not identifying and naming minerals within this unit].*

Students will construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales. Emphasis is on how processes change Earth's surface at time and spatial scales that can be large (such as slow plate motions or the uplift of large mountain ranges) or small (such as rapid landslides or microscopic geochemical reactions). Further emphasis is on how many geoscience processes (such as earthquakes, volcanoes, and meteor impacts) usually behave gradually but are punctuated by catastrophic events. Students can gather data and plot volcanoes and earthquakes in order to collect evidence to support the idea that these interactions among Earth's systems have shaped Earth's history and will determine its future. Additional examples can include changes on Earth's surface from weathering and deposition by the movements of water, ice, and wind. Emphasis is also on geoscience processes that shape local geographic features, such as New Jersey's Ridge and Valley Province, Highlands, Piedmont, and Coastal Plain.

Students convey ideas, concepts, and information through the selection, organization, and analysis of relevant content, and they may use multimedia components and visual displays. Students can also compare and contrast the information gained from experiments, simulations, video, or multimedia sources showing evidence of past plate motion with that gained by reading a text on the same topic. They use informative/explanatory texts to examine evidence for how geoscience processes have changed and reason abstractly and quantitatively when analyzing this evidence. They may integrate quantitative or technical information expressed in a flowchart, diagram, model, graph, or table. They can also use variables to represent numbers or quantities and write expressions when solving problems while constructing their explanations.

Students will analyze and interpret data on the distribution of fossils and rocks, and they will look at the continental shapes and sea floor structures to provide evidence of past plate motions. Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart. Tectonic processes continually generate new ocean sea floor at ridges and destroy old sea floor at trenches. Examples of the data include similarities of rock and fossil types on different continents, the shapes of the continents (including continental shelves), and the locations of ocean structures (such as ridges, fracture zones, and trenches). Students may use numerical relationships, symbols, and words while analyzing patterns in rates of change on Earth's crust. Students can use variables to represent numerical data and write expressions or construct simple equations and inequalities when solving a problems involved in the analysis of data about past plate motions. Applying interpreted data on the distribution of fossils and rocks, continental shapes, and sea floor structures, students can provide evidence of past plate motions. *[Note: Students are not analyzing paleomagnetic anomalies in oceanic and continental crust in this unit]*.

Essential Questions - What provocative questions will foster inquiry and transfer of learning

How and why is Earth constantly changing?

How do Earth's major systems interact?

Why do the continents move and what causes earthquakes and volcanoes?

How would you organize earth's natural objects and materials into groups?

How do we know that the Earth is approximately 4.6-billion-year-old history?

What drives the cycling of Earth's materials?

Do all of the changes to Earth systems occur in similar time scales?

How is it possible for the same kind of fossils to be found in New Jersey and in Africa?

Content - Students will know…

- The geologic time scale is used to organize Earth's 4.6-billion-year-old history.
- Rock formations and the fossils they contain are used to establish relative ages of major events in Earth's history.
- The geologic time scale interpreted from rock strata provides a way to organize Earth's history.
- Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale.
- Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.
- Energy drives the process that results in the cycling of Earth's materials.
- The processes of melting, crystallization, weathering, deformation, and sedimentation act together to form minerals and rocks through the cycling of Earth's materials.
- All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems.
- Energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms.
- Explanations of stability and change in Earth's natural systems can be constructed by examining the changes over time and processes at different scales, including the atomic scale.

- Geoscience processes have changed Earth's surface at varying time and spatial scales.
- Processes change Earth's surface at time and spatial scales that can be large or small; many geoscience processes usually behave gradually but are punctuated by catastrophic events.
- Geoscience processes shape local geographic features.
- The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years.
- Interactions among Earth's systems have shaped Earth's history and will determine its future.
- Water's movements—both on the land and underground—cause weathering and erosion, which change the land's surface features and create underground formations.

Skills - Students will be able to…

- Construct a scientific explanation based on valid and reliable evidence from rock strata obtained from sources (including the students' own experiments).
- Construct a scientific explanation based on rock strata and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.
- Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.
- Construct a scientific explanation for how geoscience processes have changed Earth's surface at varying time and spatial scales based on valid and reliable evidence obtained from sources (including the students' own experiments).
- Construct a scientific explanation for how geoscience processes have changed Earth's surface at varying time and spatial scales based on the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.
- Collect evidence about processes that change Earth's surface at time and spatial scales that can be large (such as slow plate motions or the uplift of large mountain ranges).
- Collect evidence about processes that change Earth's surface at time and spatial scales that can be small (such as rapid landslides or microscopic geochemical reactions), and how many geoscience

processes (such as earthquakes, volcanoes, and meteor impacts) usually behave gradually but are punctuated by catastrophic events.

Stage 2: Assessment Evidence

Assessment

End of Unit Assessments (multiple choice and constructed responses)

Mini-lab Performance-based Assessments (rubrics)

Essential Questions Responses

Page Keeley Science Probes (formative assessments)

Chapter 2 assessments including tests and quizzes

Chapter 4 assessments including tests and quizzes

Chapter 7 assessments including tests and quizzes

MiniLabs

Inquiry Labs

Essential Question Responses

Lab activity worksheets

Performance Assessment: Develop a model to show the cycling of Earth's materials through the rock cycle

Earth's Structure Foldable

Stage 3: Learning Plan

Learning Activities

Academic vocabulary activities: journals, e-flash cards, puzzles, origins, word parts, e-games

Mini-labs (student engagement)

Launch labs (teacher demo)

Inquiry labs (use of inquiry skills)

Interactive technology: classroom presentations, science videos, transparencies, visual literacy models, whiteboard

Reading Strategies: make tables, guiding questions, organize ideas, illustrate ideas, quick answers, make lists, make outlines, infer meaning, compare and contrast

Rock Cycle Journey: This is an activity out of one of the DLESE Teaching boxes. The Teaching Box is titled Mountain Building. This activity is from Lesson 4 Activity #2 called Rock Cycle Journey. Stations are set up to represent different parts of the rock cycle. There is a die at each station. Students begin at one point and roll the die. The students record on their data sheet what happens to them (the rock). The student may end up staying where they are at or going to another station. Students continue individually through a set number of rolls of the dice. Students then look at their data and answer some questions. At the very end they share their information with others.
Interactives-Dynamic Earth: Dynamic Earth is an interactive website where students can learn about the structure of the Earth, the movements of its tectonic plates, as well as the forces that create mountains, valleys, volcanoes and earthquakes. This site consists of four sections with both embedded assessments to check progress and a final summative assessment. Each section explores one aspect of the earth's structure and the movement of its tectonic plates. The instructions are simple and are located on each screen. Students will view animations, read explanations, and use their mouse to drag and drop the earth's continents into the correct places, highlight features on a map and cause earth's tectonic plates to move. At various points, students will check their knowledge by taking a quick quiz or playing a game to see how much they have learned about the Dynamic Earth. This website does have teacher information tabs located as related resources.

MODIFICATIONS FOR ALL:

- Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.
- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.

- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.

Accommodations for students with IEPs and learning difficulties:

-visual sentence frames using academic vocabulary for discussion

-graphic organizers and sentence starters

-graphic organizers for comparing and contrasting 3 types of rocks

-Model using examples of rocks to classify according to characteristics

-Model the structure and layers of the Earth by using a diagram

-Use visuals to show important vocabulary for students to make connections

-Draw pictures for vocabulary words for visual learners

-Have students share their text to text, text to world, and text to self connections

-One on one teacher support for comprehension and fluency

- Modeling and scaffolding to highlight specific vocabulary and key concepts

-close reading chapters/chunks

-rereading key sections for fluency and comprehension

-colored overylays and reading windows to reduce visual distractions

-Sentence starters for writing assignments

-Vocabulary word banks and strategies (Say it, Define it, Act it)

-Think alouds and Think-Pair-Share

-Modified tests/quizzes

-Use of technology to allow students to be read the text, allow for highlighter use, and stop students to think about key ideas/concepts

-Closed notes packet

For ELL students:

-visuals for vocabulary

-word wall

-additional word work such as illustrating vocabulary and playing vocabulary games

-partner reading

-choral reading

-Think-aloud while modeling writing

-analyze sample summaries before writing

-color-coded sticky notes for close reading to identify which sticky notes pertain to vocabulary

-questions about text, etc.

-When students make an error in speaking, answer or restate what they said using the correct form without drawing attention to the mistake.

For gifted students:

-Have students complete extended research projects on a related issue of their choice as it pertains to a content area

-Students perform a written/oral presentation to describe in detail the layers of the Earth and present to classmates.

-Students classify rocks according to classification, do extensive research and explain how we use those rocks in our everyday life.

Resources

Glencoe Earth and Space iScience, McGraw Hill, 2012

Chapter 2

Chapter 4

Chapter 7

Chapter 9

ConnectEd.Mcgraw-hill.com resources

NJDOE Model Curriculum

Quizlet.com

Padlet.com

ebackpack.com

Page Keeley Science Probes

Brain POP shorts

Various literature selections connected to science topics

Unit Reflections and Teacher Notes

The "Create Your Own Rock Cycle Performance Assessment" works well as a research/ teaching tool to introduce Earth's history