Unit Title: Earth History	**Content Area:** Earth Science	**Grade Level:** 8th Grade

Unit Summary: This unit allows for the students to be able to exercise their inferential thinking, and the study of the Earth history is made for this effort. It also develops their understanding of Earth history and the structures of Earth systems. The study of Earth's history enables students to use observations of present processes to infer past history of the Earth. The Grand Canyon's undisturbed horizontal sedimentary rock layers allow for these inferences through the study of individual rock types, formations, sequences, and use of index fossils. The Grand Canyon allows us to use the relative geologic time scale to understand vast amounts of time and the changes that have taken place in Earth's history.

This unit covers the following concepts:
- Earth processes we see today are similar to those that occurred in the past.
- Fossils provide important evidence of how life and environmental conditions have changed.
- Solid Earth is layered with a lithosphere, hot convecting mantle, and dense metallic core.
- Landforms are the result of a combination of constructive forces (crustal deformation, volcanic eruption, and deposition of sediments) and destructive forces (weathering and erosion.)
- The rock cycle involves old rocks that break down to form the source of sediments that are buried, compacted, heated, and often recrystallized into new rocks.

The Cross Cutting Concepts presented throughout the Unit are patterns; cause and effect; scale, proportion and quantity; energy and matter; and stability and change.

Scientific Practices that students will engage in are asking question and defining problems; developing and using models; engaging in argument from evidence; and obtaining, evaluating, and communicating information.

Unit Essential Questions:
- How do geologic events occurring today provide insight Earth's past?
- What evidence is provided by fossils in terms of environmental conditions and evolutionary changes?
- What processes change the features of Earth's landscapes and landforms?
- How do changes in one part of an Earth system affect other parts of the system?
- What evidence in terms of geological events support the theory of plate tectonics?

Unit Enduring Understandings:
- Earth's components form systems. These systems continually interact at different rates of time, affecting the shape of the Earth's surface regionally and globally.
- Changes in one part of an Earth system affect other parts of the system.
- Energy flow and movement of material from the Earth's interior causes geologic events on the Earth's surface.

Possible Student Misconceptions:
- Students often use the terms "rock" and "mineral" as the same thing.
- Students think that the property of color is a good way to identify rocks and minerals when, in fact, it is a poor way to do this.
- Students often have difficulty connecting sediments to sedimentary rocks. Furthermore, they often have the misconception that heat is involved in sedimentary rock formation and have this confused with metamorphic rocks.
- Students do not recognize the geologic way or sorting sediments by their sizes and the term boulder, gravel, sand, and clay referring to the size of sediments.
- Students have the misconception that a religious idea on the age of the Earth is scientifically based. Scientists use evidence to develop theories.
- Students have the misconception that scientific studies in the past are irrelevant.
- Students have the misconception that a rock is just a rock and that it provides no other information.
- Students have the misconception that fossils are the actual organisms that lived long ago.

NJCCCS: 5.4.8.B.1, 5.4.8.B.2, 5.4.8.C.2, 5.4.8.D.1, 5.4.8.D.2

NGSS Performance Expectations: *Students who demonstrate understanding can…*

- 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. Clarification Statement: Emphasis is on how analyses of rock formations and the fossils they contain are used to establish relative ages of major 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 earliest fossils of Homo sapiens) to very old (such as the formation of Earth or the earliest evidence of life). Examples can include the formation of mountain chains and ocean basins, the evolution or extinction of particular living organisms, or significant volcanic eruptions.
- MS-ESS2-1. Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process. Clarification Statement: 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.

- MS-ESS2-2. Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales. Clarification Statement: 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), and how many geoscience processes (such as earthquakes, volcanoes, and meteor impacts) usually behave gradually but are punctuated by catastrophic events. Examples of geoscience processes include surface weathering and deposition by the movements of water, ice, and wind. Emphasis is on geoscience processes that shape local geographic features, where appropriate.
- 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. Clarification Statement: Examples of 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).

Primary CCSS ELA/Literacy Connections: RST.6-8.1; RST.6-8.7; RST.6-8.9, WHST.6-8.2, SL.8.5	**Primary CCSS Mathematics Connections:** MP.2, 6.EE.B.6, 7.EE.B.4; 7.EE.B.6

Lesson Pace & Sequence

Lesson Title/Number: Pushing the Envelope (1)	**Learning Objective(s):** I will be able to differentiate between an observation and inference as well as make inferences based on evidence.	**Lesson Duration:** 2- 50 minute periods (100 minutes)

Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objectives(s)?*** ****Elements do not have to be in conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***
Elicit: How will you access students' prior knowledge?	Ask students to define in their own terms observation and inference, then have them share with the class.	• Quick Write			
Engage: How will you capture students' interest and get students' minds focused on the concept/topic?	Teacher will inform students that for the next few weeks they are Geological Detectives. Teacher will have a sample rock and ask students what they know about this rock, how did it form, and how do they know.	• FOSS Earth History TE	Asking questions and defining problems		

Explore: What hands-on/minds-on common experience(s) will you provide for students?	Students will receive old envelopes (provided by the teacher) and will be asked to use their inferential thinking skills to observe the envelop carefully and what they can about the history. Then, they will have to develop inferences about the envelopes.	• Teacher/ Student Provided	Planning and carrying out investigations.		
Explain: How will you help students connect their exploration to the concept/topic under investigation?	Students will have to work as a group to create observations and inferences about the origin of the envelopes provided to them.	• Teacher FOSS Kit- Lesson 1 "What HAPPENED to this envelope?" page 277	Planning and carrying out investigations.		
Elaborate: How will students apply their learning and develop a more sophisticated understanding of the concept/topic?	Teacher will give students	• Chart paper, Smart board			
Evaluate: How will students demonstrate their mastery of the learning objective(s)?	Completion of handout "What HAPPENED to this envelope?"				
Extend: How will students deepen their conceptual understanding through use in new context?	Students will have to apply these skills throughout the Unit.				