Subject: Earth Science	Grade:11	Unit #: 4	Title: Uplifting Forces

UNIT OVERVIEW

STAGE ONE: Identify Desired Results

Established Goals/Standards

2.1b
2.1j
2.1k
2.1l
2.1m
2.1n
2.1o
3.1a
3.1b

Long-Term Transfer Goal

At the end of this unit, students will use what they have learned to independently…
Apply their understanding of the concepts of plate tectonics by developing a press release explaining catastrophic events that could have happened at designated locations during specific geologic periods empowering students to transfer that understanding of the "why" behind geologic phenomena that occur today.

At the end of the school year, students will use what they have learned to independently…
Apply their cumulative understandings to design and carry out an investigation, then create a presentation to the community sharing their findings that either support or debunk scientists' claim that Rochester, NY was once underneath water.

Meaning

Enduring Understandings

Students will understand that…

U1. Earth may be considered a huge machine driven by two engines, one internal and one external. These heat engines convert heat energy into mechanical energy.

U2. Global climate is determined by the interaction of solar energy with Earth's surface and atmosphere. This energy transfer is influenced by dynamic processes such as cloud cover and Earth rotation, and the positions of mountain ranges and oceans.

U3. Earth's internal heat engine is powered by heat from the decay of radioactive materials and residual heat from Earth's formation.

U4. Differences in density resulting from heat flow within Earth's interior caused the changes explained by the theory of plate tectonics: movement of the lithospheric plates; earthquakes; volcanoes; and the deformation and metamorphism of rocks during the formation of young mountains.

U5. Observation and classification have helped us understand the great variety and complexity of Earth materials. Minerals are the naturally occurring inorganic solid elements, compounds, and mixtures from which rocks are made.

Essential Questions

Students will consider such questions as…

1. What makes a theory viable?
2. How does variation in density create change on Earth's surface?

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U6. We classify minerals on the basis of their chemical composition and observable properties. Rocks are generally classified by their origin (igneous, metamorphic, and sedimentary), texture, and mineral content.

U7. Rocks and minerals help us understand Earth's historical development and its dynamics. They are important to us because of their availability and properties. The use and distribution of mineral resources and fossil fuels have important economic and environmental impacts. As limited resources, they must be used wisely.

Acquisition

What knowledge will students learn as part of this unit?

1. The transfer of heat energy within the atmosphere, the hydrosphere, and Earth's interior results in the formation of regions of different densities. These density differences result in motion.
2. Properties of Earth's internal structure (crust, mantle, inner core, and outer core) can be inferred from the analysis of the behavior of seismic waves (including velocity and refraction).
3. Analysis of seismic waves allows the determination of the location of earthquake epicenters, and the measurement of earthquake magnitude; this analysis leads to the inference that Earth's interior is composed of layers that differ in composition and states of matter.
4. The outward transfer of Earth's internal heat drives convective circulation in the mantle that moves the lithospheric plates comprising Earth's surface

What skills will students learn as part of this unit?

1. Students will be able to use classification charts and scientific tools such as a glass plate, unglazed ceramic tile, and HCl to identify a variety of rocks and minerals.
2. Students will be able to read a seismograph and use the information to locate epicenters.
3. Students will be able to locate epicenters through the use of triangulation.
4. Use models to represent and revise their thinking overtime.
5. Making qualitative and quantitative observations
6. Making predictions
7. Asking questions based on observation and data
8. Use and become proficient with certain tables and diagrams in the Earth Science Reference Tables

		5. The lithosphere consists of separate plates that ride on the more fluid asthenosphere and move slowly in relationship to one another, creating convergent, divergent, and transform plate boundaries. These motions indicate Earth is a dynamic geologic system 6. These plate boundaries are the sites of most earthquakes, volcanoes, and young mountain ranges. 7. Compared to continental crust, ocean crust is thinner and denser. New ocean crust continues to form at mid-ocean ridges. 8. Earthquakes and volcanoes present geologic hazards to humans. Loss of property, personal injury, and loss of life can be reduced by effective emergency preparedness 9. Many processes of the rock cycle are consequences of plate dynamics. These include the production of magma (and subsequent igneous rock formation and contact metamorphism) at both subduction and rifting regions, regional metamorphism within subduction zones, and the creation of major depositional basins through down-warping of the crust. 10. Many of Earth's surface features such as mid-ocean ridges/rifts, trenches/subduction zones/island arcs, mountain ranges (folded, faulted, and volcanic), hot spots, and the magnetic and age patterns in surface bedrock are a consequence of forces associated with plate motion and interaction. 11. Plate motions have resulted in global changes in geography, climate, and the patterns of organic evolution.	

		12. Minerals have physical properties determined by their chemical composition and crystal structure. 13. Minerals can be identified by well-defined physical and chemical properties, such as cleavage, fracture, color, density, hardness, streak, luster, crystal shape, and reaction with acid. 14. Chemical composition and physical properties determine how minerals are used by humans. 15. Minerals are formed inorganically by the process of crystallization as a result of specific environmental conditions. These include: • cooling and solidification of magma • precipitation from water caused by such processes as evaporation, chemical reactions, and temperature changes • rearrangement of atoms in existing minerals subjected to conditions of high temperature and pressure. 16. Rocks are usually composed of one or more minerals. 17. Rocks are classified by their origin, mineral content, and texture. 18. Conditions that existed when a rock formed can be inferred from the rock's mineral content and texture 19. The properties of rocks determine how they are used and also influence land usage by humans.	

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STAGE TWO: Determine Acceptable Evidence	
	Assessment Evidence
Criteria for/to assess understanding: *(This is used to build the scoring tool.)* **Rubric attached**	Performance Task focused on Transfer: For this performance task students will apply their understanding of plate tectonics and its implications of change on Earth's surface throughout Earth's geologic history. Students will infer paleoclimate for specific locations during given periods and discuss specific hazards due to location in reference to plate features. They will also discuss ways to eliminate risk. They will represent all of this in a form of a press release that is meant to inform/warn. This will also include a reflection in which they tie the relevancy into present day.
	Other Assessment Evidence: • Daily bridge activities • Daily summary narratives • Ticket out the door, daily closure questions • Two formal NYS style assessments. • Other formative assessment practices • Gallery Walks

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T, M, A *(Code for Transfer, Meaning Making and Acquisition)*	**STAGE THREE: Plan Learning Experiences**	
	Learning Events:	Evidence of learning: *(formative assessment)*

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Meets the Standard of Excellence 5	Significant information is presented about all of the following: • Distribution of volcanoes and earthquakes on local, state, regional, and global scales. • Patterns in the timing of volcanic eruptions and earthquakes at the local, state, regional, and global scales. • How volcanic eruptions and earthquakes are linked to plate tectonic processes. • How volcanoes and earthquakes change other Earth systems. • The threats posed by volcanoes and earthquakes to humans, and ways to reducing their risk. • Inferences made of paleoclimate are correctly supported by evidence and correctly describe the processes of plate tectonics All the information is accurate and appropriate. The writing is clear and interesting.
Approaches the Standard of Excellence 4	Significant information is presented about most of the following: • Distribution of volcanoes and earthquakes on local, state, regional, and global scales. • Patterns in the timing of volcanic eruptions and earthquakes at the local, state, regional, and global scales. • How volcanic eruptions and earthquakes are linked to plate tectonic processes. • How volcanoes and earthquakes change other Earth systems. • The threats posed by volcanoes and earthquakes to humans, and ways to reducing their risk. • Inferences made of paleoclimate are correctly supported by evidence and correctly describe the processes of plate tectonics All the information is accurate and appropriate. The writing is clear and interesting.
Meets an Acceptable Standard 3	Significant information is presented about most of the following: • Distribution of volcanoes and earthquakes on local, state, regional, and global scales. • Patterns in the timing of volcanic eruptions and earthquakes at the local, state, regional, and global scales. • How volcanic eruptions and earthquakes are linked to plate tectonic processes. • How volcanoes and earthquakes change other Earth systems. • The threats posed by volcanoes and earthquakes to humans, and ways to reducing their risk. • Inferences made of paleoclimate are correctly supported by evidence and correctly describe the processes of plate tectonics Most of the information is accurate and appropriate. The writing is clear and interesting
Below Acceptable Standard and Requires Remedial Help 2	Limited information is presented about the following: • Distribution of volcanoes and earthquakes on local, state, regional, and global scales. • Patterns in the timing of volcanic eruptions and earthquakes at the local, state, regional, and global scales. • How volcanic eruptions and earthquakes are linked to plate tectonic processes. • How volcanoes and earthquakes change other Earth systems. • The threats posed by volcanoes and earthquakes to humans, and ways to reducing their risk. • Inferences made of paleoclimate are correctly supported by evidence and correctly describe the processes of plate tectonics Most of the information is accurate and appropriate. Generally, the writing does not hold the reader's attention.
Basic Level that Requires	Limited information is presented about the following:

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Remedial Help or Demonstrates a Lack of Effort 1	• Distribution of volcanoes and earthquakes on local, state, regional, and global scales. • Patterns in the timing of volcanic eruptions and earthquakes at the local, state, regional, and global scales. • How volcanic eruptions and earthquakes are linked to plate tectonic processes. • How volcanoes and earthquakes change other Earth systems. • The threats posed by volcanoes and earthquakes to humans, and ways to reducing their risk. • Inferences made of paleoclimate are correctly supported by evidence and correctly describe the processes of plate tectonics Little of the information is accurate and appropriate. The writing is difficult to follow.