



Grade 7 Science - Unit 3 - Geologic Processes

Unit Focus

This unit will begin with students examining "Why is Mt. Everest growing taller?" Students will need to apply their understanding of geologic processes to propose an answer to this mystery and justify their solution with scientific evidence. Throughout this unit, students will be exploring various geologic processes such as continental drift, plate tectonics, rock strata formation over time, distribution of Earth materials, earthquakes and volcanoes and apply their understanding of the processes to natural phenomena. Students will also discover the process of how a scientific theory evolves and becomes accepted by examining the history of geologic discoveries and how these understandings helped us to recognize patterns that allow us to predict future geologic events. Students will use maps and data to provide evidence for their claims as they explain how geologic processes shape the Earth, past, present and in the future.

This unit creates a picture of the geologic evolution of our planet. This unit answers the guiding question, "What processes cause the Earth's surface to change?"

Stage 1: Desired Results - Key Understandings

Standard(s)	Transfer	
<p>Next Generation Science Standards Performance Expectations: Middle School Earth and Space Sciences</p> <ul style="list-style-type: none"> • 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. (MSESS1-4) • Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process. (MS-ESS2-1) • Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales. (MS-ESS2-2) • Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions. (MS-ESS2-3) • Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes. (MS-ESS3-1) <p>Next Generation Science Standards (DCI) Science: 7</p>	<p><i>Students will be able to independently use their learning to...</i></p> <p>T1 Analyze qualitative and quantitative data to interpret patterns, draw conclusions, and/or make predictions. T2 Create models to explore complex systems, show mastery of key science concepts, and/or develop solutions through creation of a product open to testing and redesign.</p>	
	Meaning	
	Understanding(s)	Essential Question(s)
	<p><i>Students will understand that...</i></p> <p>U1 Tectonic processes continually shape the earth's surface. U2 All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. U3 The geologic time scale is interpreted from the analyses of rock strata and the fossil record. U4 The interactions of the planet's systems have shaped Earth's history and will determine its future.</p>	<p><i>Students will keep considering...</i></p> <p>Q1 How have natural processes such as plate movement shaped the surface of the earth? Q2 What does rock and fossil layering tell us about the age of the crust? Q3 How can I describe how the earth's surface moves using patterns and models?</p>
	Acquisition of Knowledge and Skill	
	Knowledge	Skill(s)
<p><i>Students will know...</i></p> <p>K1 Unless they have been disturbed by subsequent activity, newer rock layers sit on top of older rock layers, allowing for a relative ordering in time of the formation of the layers (i.e., older sedimentary rocks lie beneath younger sedimentary rocks.</p>	<p><i>Students will be skilled at...</i></p> <p>S1 Plot the location of volcanoes and/or earthquakes comparing it to the location of plate boundaries.</p>	

Stage 1: Desired Results - Key Understandings

- 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. (ESS1.6.C1)
- Tectonic processes continually generate new ocean sea floor at ridges and destroy old sea floor at trenches. (ESS1.6.C2)
- All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms. (ESS2.6.A1)
- 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. These interactions have shaped Earth's history and will determine its future. (ESS2.6.A2)
- 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. (ESS2.6.B1)
- Global movements of water and its changes in form are propelled by sunlight and gravity. (ESS2.6.C3)
- Water's movements-both on the land and underground-cause weathering and erosion, which change the land's surface features and create underground formations. (ESS2.6.C5)
- Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed unevenly around the planet as a result of past geologic processes. (ESS3.6.A1)
- Mapping the history of natural hazards in a region, combined with an understanding of related geologic forces can help forecast the

- K2** The fossil record can provide relative dates based on the appearance or disappearance of organisms (e.g., fossil layers that contain only extinct animal groups are usually older than fossil layers that contain animal groups that are still alive today, and layers with only microbial fossils are typical of the earliest evidence of life.
- K3** Specific major events (e.g. extensive lava flow, volcanic eruption, asteroid impacts) can be used to indicate periods of time that occurred before a given event from periods that occurred after it.
- K4** Using a combination of the order of rock layers, the fossil record, and evidence of major geologic events, the relative time ordering of events can be constructed as a model for Earth's history, even though the timescales involved are immensely vaster than the lifetimes of humans or the entire history of humanity.
- K5** The motion of the Earth's plates produces changes on a planetary scale over a range of time periods from millions to billions of years. Evidence for the motion of plates can explain largescale features of the Earth's surface (e.g. mountains, distribution of continents) and how they change.
- K6** Surface processes such as erosion, movement, weathering, and the deposition of sediment can modify surface features, such as mountains, or create new features, such as canyons. These processes can occur at spatial scales ranging from large to microscopic over time periods ranging from years to hundreds of millions of years.
- K7** Catastrophic changes can modify or create surface features over a very short period of time compared to other geoscience processes, and the results of those catastrophic changes are subject to further changes over time by processes that act on longer time scales (e.g. erosion of a meteor crater).
- K8** Surface features will continue to change in the future as geoscience processes continue to occur.
- K9** Regions of different continents that share similar fossils and similar rocks suggest that, in the geologic past, those sections of continent were once attached and have since separated.
- K10** The shapes of continents, which roughly fit together (like pieces in a jigsaw puzzle) suggest that those land masses were once joined and have since separated.
- K11** The separation of continents by the sequential formation of new seafloor at the center of the ocean is interred by age patterns in oceanic crust that increase in age from the center of the ocean to the edges of the ocean.
- K12** The distribution of seafloor structures (e.g., volcanic ridges at the centers of oceans, trenches at the edges of continents) combined with the patterns of ages of rocks of the seafloor (youngest ages at the ridge, oldest ages at the trenches) supports the interpretation that new crust forms at the

- S2** Explain and provide evidence about how glaciation has shaped our local environment.
- S3** Construct an explanation based on evidence or how geoscience processes have changed Earth's surface at varying time and spatial scales.
- S4** Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.
- S5** Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.
- S6** Use relationships identified in the data/information to hypothesize the relative age of specific rock layers, formations, or fossils, in a stratigraphic column or on a geologic map.

Stage 1: Desired Results - Key Understandings

<p>locations and likelihoods of future events. (ESS3.6.B1)</p> <p>Madison Public Schools Profile of a Graduate</p> <ul style="list-style-type: none"> Analyzing: Examining information/data/ evidence from multiple sources to identify possible underlying assumptions, patterns, and relationships in order to make inferences. (POG.1.2) 	<p>ridges and then moves away from the ridges as new crust continues to form and that the oldest crust is being destroyed at seafloor trenches.</p> <p>K13 Energy from the Earth's interior drive Earth processes that together cause matter cycling through different forms of Earth materials.</p> <p>K14 The Earth's internal heat energy drives processes such as melting, crystallization, and deformation that change the atomic arrangement of elements in rock and that move and push rock material to the Earth's surface where it is subject to surface processes like weathering and erosion.</p> <p>K15 Energy from the sun drives the movement of wind and water that causes the erosion, movement, and sedimentation of weathered Earth materials.</p> <p>K16 Given the right setting, any rock on Earth can be changed into a new type of rock by processes driven by the Earth's internal energy or by energy from the sun.</p> <p>K17 Changes on the Earth's surface are consistently occurring but that landforms appear stable to humans because they are changing on time scales much longer than human lifetimes.</p> <p>K18 Scientific Literacy Terminology: causation, correlation, fault lines, magnitude, epicenter, creep, constructive boundary, destructive boundary, continental drift, core, mantle, crust, continental crust, oceanic crust, convection current, upwelling, heat convection, heat conduction, heat transfer, heat radiation, thermal energy, pressure, density, plate tectonics, plate boundary, transport, collide, fault, fold, fossil, fossil record, rock strata, continent, earthquake, hot spot, fault, tsunami, volcanic eruption, magma, lava, igneous, sedimentary, metamorphic, mineral, Pangaea, lithosphere, asthenosphere, subduction, subduction zone, convergent, divergent, transform, compression, trench, sea floor spreading, layer, rock cycle, weathering, glaciation, erosion, deposition, sediment, ice wedge, landslides, melting, crystallization, deformation.</p>	
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