



8th Grade Earth Science

Approved by KSD Board of Education: (May 19, 2025)

Course Description:

In 8th grade Earth Science, students delve into the dynamic processes shaping our planet and beyond. Through a combination of hands-on experiments, engaging discussions, and real-world applications, students explore the intricate interplay of Earth's systems.

Grade Level: 8th Grade

Unit Scope and Sequence

Unit 1: Earth's Place in the Universe

Unit 2: Earth's Changing Surface

Unit 3: Water Cycling, Weather, and Climate

Unit 4: Human Impact on the Earth

Unit 5: Density and Thermal Energy

Course Enduring Understandings:

- Earth's place in the solar system affects its relationship to the sun and moon, and it dictates the seasons we experience.
- There is a predictable relationship between water, weather, and climate.
- Evidence of Earth's geosystems explain changes in the Earth's surface.
- Human activities have a lasting impact on Earth's systems.

Course Essential Questions:

- How does Earth's place in the universe explain sun-moon relationships and seasons?
- How does the hydrologic cycle use energy and gravity to move?
- How can we explain and predict weather?
- What causes the different climates on Earth?
- How and why does the Earth's surface change over time?
- How have human activities influenced Earth's systems?

8th Grade Earth Science

Unit 1: Earth's Place in the Universe

Students will explore our solar system and the affects of gravity, size and distance on the phenomenon that exist within it. They will create models to explain the relationship between the moon, sun, and Earth as well as the seasons we see throughout the year. Finally, they will analyze data from human technologies to determine scale properties within our solar system.

Unit Essential Learning Targets	
<i>Enduring Understandings</i>	<i>Essential Questions</i>
• The Earth-sun-moon system has an essential impact on day/night cycles, lunar phases, and eclipses of the sun and moon. • The tilt of the Earth on its axis along with its movement around the sun determine seasons we encounter throughout the year. • Earth has scale properties that can be compared to other objects in our solar system, our galaxy, and the observable universe.	• Why does the motion of the moon around the Earth affect what we see here on Earth? • What is the reason for seasons at various points on Earth throughout the year? • What impact does the relationship between the sun, Earth, and moon have on the Earth's organisms and environment? • Why do objects orbit other object in our solar system and the universe? • How does size and distance affect the motion of objects in our solar system and the universe?
<i>Students must know:</i>	<i>Students must be able to:</i>
• The definitions of the following: rotation, revolution, direct sunlight, indirect sunlight, axis, elliptical orbit, season, summer solstice, winter solstice, equinox, solar eclipse, lunar eclipse, umbra, penumbra, gravity, mass, weight, inertia, solar system, and orbit.	• Develop and use a model (physical, graphical, or conceptual) to explain the sun-moon-Earth system including: day and night cycles, lunar phases, and eclipses of the sun and moon. • Develop and use a model to explain the reason for seasons including the Earth's tilt, the resulting directional angle of sunlight, and the cyclical patterns of seasons across the year. • Develop and use a model (physical or conceptual) to describe the role of gravity in our solar system and in the Milky Way galaxy. • Analyze data (including statistical information, drawings, models and photographs) to determine scale properties of objects in the universe with a focus on Earth-based instruments, space-based telescopes, and spacecraft.

8th Grade Earth Science Unit 1: Earth's Place in the Universe

Missouri Learning Standards

Priority Standard: Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons (6-8.ESS1.A.1).

Priority Standard: Develop and use a model of the Earth-sun system to explain the cyclical pattern of seasons, which includes the Earth's tilt and directional angle of sunlight on different areas of Earth across the year (6-8.ESS1.A.2).

Priority Standard: Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system (6-8.ESS1.A.3).

Priority Standard: Analyze and interpret data to determine scale properties of objects in the solar system (6-8.ESS1.B.1).

Priority Standard: Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved (6-8.ETS1.B.3).

8th Grade Earth Science

Unit 2: Earth's Changing Surface

Students will use geologic data to engage in learning around Earth's geosystems and changes that occur as a result of changes in the Earth.

Unit Essential Learning Targets	
Enduring Understandings	Essential Questions
• Energy flows and matter cycles, producing physical and chemical changes in Earth's materials. • Energy from Earth's interior drives convection, which cycles Earth's crust (creating and recycling rock materials). • Supported by evidence (rock strata, fossils, continental shapes, and seafloor structures), Earth's tectonic plates are in motion, causing changes at their boundaries. • Plate movements happen gradually over large time scales, and geoscience processes result from energy buildup over time and can cause catastrophic events. • Geoscience processes shape Earth's geographic features. • Rock strata, including the distribution of rocks and fossils, continental shapes and seafloor structures provide evidence of 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, such as ice ages, extinction, and significant volcanic eruptions.	• How have Earth's interacting systems shaped it's history and help determine its future? • How and why is Earth constantly changing? • Why do the continents move, and what causes earthquakes and volcanoes? • How do people reconstruct and date events in Earth's planetary history? • What have scientists learned about Earth's past by studying rocks and fossils? • What does fossil evidence reveal about historical eras? • How do rocks change? • How do Earth's major systems interact?
Students must know:	Students must be able to:
• The following definitions: melting, crystallization, weathering, sedimentation, mid-ocean ridge, subduction, convection, sedimentary rock, igneous rock, metamorphic rock, tectonic plates, uplift, landslides, earthquakes, fossils, superposition, relative dating, absolute dating, geologic time scale, compaction, cementation, ocean trench, mountain building, and volcanoes.	• Develop and use a model to describe and explain the movement of Earth's tectonic plates. • Research, collect and analyze data to provide evidence of past plate motion. Use a Claim-Evidence-Reasoning format. • Provide evidence from rock formations and fossils to establish relative ages of major events in Earth's history. • Construct an explanation based on evidence for how both large processes (plate motion, uplift), small processes (landslides) and catastrophic events on Earth's surface have changed the surface over time.

8th Grade Earth Science Unit 2: Earth's Changing Surface

Missouri Learning Standards

Priority Standard: Construct a scientific explanation based on evidence from rock strata for how the geological time scale is used to organize Earth's 4.6-billion-year-old history (6-8.ESS1.C.1).

Priority Standard: Develop and use a model to illustrate that energy from the Earth's interior drives convection which cycles Earth's crust leading to melting, crystallization, weathering and deformation of large rock formations, including generation of ocean seafloor at ridges, submergence of ocean seafloor at trenches, mountain building and active volcanic chains (6-8.ESS2.A.1).

Priority Standard: Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales (6-8.ESS2.A.2).

Priority Standard: Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions (6-8.ESS2.B.1).

Priority Standard: Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved (6-8.ETS1.B.3).

8th Grade Earth Science

Unit 3: Water Cycling, Weather, and Climate

Students will explore the relationships between water, weather, and climate; they will use data to predict weather. Additionally, they will demonstrate the effects of changes in thermal energy in a system.

Unit Essential Learning Targets	
<i>Enduring Understandings</i>	<i>Essential Questions</i>
• The cycling of water through Earth's systems is driven by energy from the sun and the force of gravity. • Motions and complex interactions of air masses result in changes in weather conditions. • Unequal heating and Earth's rotations causes patterns of atmospheric and oceanic circulation that determine regional climates.	• How does water cycle through Earth's systems? • How do interactions between air masses cause weather at a fixed location to change over time? • How can weather be predicted? • How does latitude, altitude, and geographical land distribution determine regional climates? • How is atmospheric circulation impacted by unequal heating and the rotation of the Earth? • How is oceanic circulation impacted by unequal heating and the rotation of the Earth?
<i>Students must know:</i>	<i>Students must be able to:</i>
• The following definitions: wind, air pressure, convection cells, jet stream, Coriolis effect, relative humidity, dew point, maritime tropical air mass, maritime polar air mass, continental tropical air mass, continental polar air mass, warm front, cold front, stationary front, occluded front, El Nino, La Nina, temperature, precipitation, condensation, transpiration, ground water, runoff, and evaporation.	• Design and develop a model that describes and explains the cycling of water through Earth's systems. • Develop and use a model that describes and explains the motions of air masses and weather patterns. • Develop and use a model that describes and explains atmospheric and oceanic circulation and how this determines regional climates. • Research, collect and analyze weather pattern data to make predictions (including weather map data and diagrams) or obtained through lab experiments. Use a Claim-Evidence-Reasoning format.

8th Grade Earth Science

Unit 3: Water Cycling, Weather, and Climate

Missouri Learning Standards

Priority Standard: Design and develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity (6-8.ESS2.C.1).

Priority Standard: Research, collect, and analyze data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions (6-8.ESS2.C.2).

Priority Standard: Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates (6-8.ESS2.C.3).

Priority Standard: Develop a model that describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed (6-8.PS1.A.4).

Priority Standard: Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved (6-8.ETS1.B.3).

8th Grade Earth Science

Unit 4: Human Impact on the Earth

Students will explore the significant ways in which human activities continue to influence Earth's systems. Attention will be given to the impacts of water and land usage, pollution, fossil fuels, depleting non-renewable resources, population size, and per-capita resource consumption.

Unit Essential Learning Targets	
<i>Enduring Understandings</i>	<i>Essential Questions</i>
• The location of natural resources is determined by past geoscience events, and the distribution of these resources are significantly changing as a result of removal by humans. • Data on natural hazards can be used to inform and develop technologies designed to mitigate their effects. • Human activity and natural processes have caused a change in global temperatures over the last century. • Increases in human population and per capita consumption of natural resources impact Earth's systems. • Scientists monitor human impact on the environment to inform ways to minimize those impacts. • Science describes the consequences of increases in human populations and consumption of natural resources.	• How are Earth's resources distributed throughout the globe? • How have past and current geoscience processes impacted where Earth's resources are located? • How do humans impact the environment? • How can humans reduce their impact on the environment? • How do scientists use data and technology to predict future catastrophic events? • What factors have caused global temperature to change in the past century? • How does an increasing global population and consumption of natural resources impact the Earth's systems?
<i>Students must know:</i>	<i>Students must be able to:</i>
• The definitions of the following: renewable, nonrenewable, and natural hazards.	• Identify factors that have impacted global temperature. • Develop a method for monitoring human impact on the environment. • Research, collect and analyze data on natural hazards. • Research, collect and analyze data on the relationship between human population and consumption of natural resources. • Construct an explanation for why natural resources are distributed where they are throughout the Earth. • Analyze and interpret data using a Claim-Evidence-Reasoning format.

8th Grade Earth Science Unit 4: Human Impact on the Earth

Missouri Learning Standards

Priority Standard: 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 (6-8.ESS3.A.1).

Priority Standard: Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects (6-8.ESS3.B.1).

Priority Standard: Analyze data to define the relationship for how increases in human population and per-capita consumption of natural resources impact Earth's systems (6-8.ESS3.C.1).

Priority Standard: Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment (6-8.ESS3.C.2).

Priority Standard: Analyze evidence of the factors that have caused the change in global temperatures over the past century (6-8.ESS3.D.1).

Priority Standard: Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions (6-8.ETS1.A.1).

Priority Standard: Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of a problem (6-8.ETS1.B.1).

Priority Standard: Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success (6-8.ETS1.B.2).

8th Grade Earth Science

Unit 5: Density and Thermal Energy

Students will explore thermal energy transfer. Specific attention will be given to the relationship between temperature, particle motion, and state of a pure substance. Additionally, students will investigate materials to minimize or maximize thermal energy transfer.

Unit Essential Learning Targets	
<i>Enduring Understandings</i>	<i>Essential Questions</i>
- There is a relationship between temperature, particle motion, and the state of a pure substance when thermal energy is added or removed. - Materials can minimize or maximize thermal energy transfer (such as conductors and insulators) and can be used to design and engineer devices for reducing or maximizing thermal energy transfer (ex: solar ovens).	- What is energy? - How does the addition or removal of thermal energy change particle motion, temperature, and the state of a pure substance?
<i>Students must know:</i>	<i>Students must be able to:</i>
The definitions of: convection, conduction, radiation, and density.	Develop and use models to describe and explain thermal energy transfer particle motion, and states of matter (including convection, conduction, and radiation).

8th Grade Earth Science Unit 5: Density and Thermal Energy

Missouri Learning Standards

Priority Standard: Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer (6-8.PS3.A.3).

Priority Standard: Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions (6-8.ETS1.A.1).

Priority Standard: Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of a problem (6-8.ETS1.B.1).

Priority Standard: Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success (6-8.ETS1.B.2).