

Earth History

Students investigate rocks and fossils to discover clues that reveal Earth's history. They explore sedimentary rocks and fossils from the Grand Canyon, consider the processes that created them, and compare evidence discovered in the rocks to present-day geologic processes and contemporary life-forms. The students use these data to make inferences about past organisms, environments, and events that occurred on Earth over its history. Students engage in further exploration of the constructive and destructive processes that have shaped the New Jersey landscape.

Essential Questions: How are earth processes similar to those that occurred in the past?
 How do fossils provide evidence of past life and environmental conditions?
 How is the earth composed?
 How are earth materials cycled and what effect does this process have on the earth's surface?

Unit Length: 9-12 weeks

Resources: FOSS Earth History Module
 FOSS Earth History Resources
 FOSS Earth History Notebook
Prentice Hall Science Explorer Earth Science Textbook

NJCCCS: 5.8.6C 1- Summarize the process involved in the rock cycle and describe characteristics of the rocks involved.

5.8.6D 1- Utilize various tools such as map projections and topographical maps to interpret features of Earth's surface.

5.8.8C1- Explain how Earth's landforms and materials are created through constructive and destructive processes.

5.8.8C 2- Show how successive layers of sedimentary rock and the fossils contained in them can be used to confirm the age, history, changing life forms, and geology of Earth.

Science Content (Declarative Conceptual Knowledge)	NJCCCS
Students Will Know and Understand:	
Earth processes that we see today are similar to those that occurred in the past.	5.8.8C 1
Fossils provide important evidence of how life and environmental conditions have changed.	5.8.8C 2
Solid Earth is layered with a lithosphere, hot convecting mantle, and dense metallic core.	5.8.8C 1
Landforms are the result of a combination of constructive forces (crustal deformation, volcanic eruption, and deposition of sediments) and destructive forces (weathering and erosion).	5.8.8C 2
The rock cycle involves old rocks that break down to form the source of sediments	5.8.6C 1

that are buried, compacted, heated, and often crystallized into new rocks.	
The rock cycle creates three types of rocks; igneous, sedimentary, and metamorphic.	5.8.6C 1

Thinking Processes (Procedural Knowledge)	NJCCCS
Students Will Be Able To:	
Make observations and generate evidence to support an idea.	5.8.6D 1
Share study results with others for critical review.	5.8.6D 1
Make inferences based on evidence.	5.8.6D 1
Use photographic and video images of rocks and landforms to gather data.	5.8.6D 1
Observe, describe, and compare rocks using appropriate tools.	5.8.6C 1
Generate questions to guide further study.	5.8.6C 1
Use scientific methods to identify and name types of rocks.	5.8.6C 1
Correlate rock samples from two different locations.	5.8.6C 1
Investigate how sand can be made from larger rocks.	5.8.8C 1
Model the formation of layers of sandstone and shale in an ancient environment.	5.8.8C 2
Relate the process of weathering, erosion, and deposition, to the formation of sedimentary rock.	5.8.8C1
Create a personal timeline from birth to present.	5.8.8C 2
Create a timeline of geologic events and prehistoric life.	5.8.8C 2
Determine the relative age of rocks.	5.8.8C 2
Use index fossils to correlate rock layers in three locations.	5.8.8C 2
Compare various events and fossils to derive a faunal succession over geologic time.	5.8.8C 2
Make inferences from fossil evidence that contribute to an understanding of fossil succession.	5.8.8C 2
Observe and compare the properties of igneous, sedimentary, and metamorphic rock.	5.8.6C 1
Relate the formation processes of the three types of rocks to develop the rock cycle.	5.8.6C 1
Relate the size of crystals in igneous rocks to environmental variables.	5.8.6C 1

Weather and Water

Students investigate the properties of Earth’s atmosphere and the processes that produce weather, including energy transfer, atmospheric pressure, and water cycle. They study principles that govern temperature, wind, humidity, precipitation, and severe weather. Students collect and analyze local and global weather data using instruments and reports from various media. They investigate fresh water as a vital resource.

Essential Questions: How is the atmosphere composed?
 How do global patterns of atmospheric movement affect weather and climate?
 How can technology be used to help interpret and predict weather patterns?
 How does water circulate through the Earth’s crust, oceans, and atmosphere?

Unit Length: 9-12 weeks

Resources: FOSS Weather and Water Module
 FOSS Weather and Water Resources
 FOSS Weather and Water Notebook
Prentice Hall Science Explorer Earth Science Textbook

NJCCCS: 5.7.6B 1- Recognize that heat flows through materials or across space from warmer objects to cooler ones.

5.7.8B 1- Recognize that the sun is a major source of the Earth’s energy and that solar energy includes visible, infrared and ultraviolet radiation.

5.7.8B 3- Describe how heat can be conducted through materials or transferred across space by radiation and know that if the material is a fluid, convection currents may aid the transfer of heat.

5.8.6B 2- Describe and illustrate the water cycle.

5.8.8B1- Describe conditions in the atmosphere that lead to weather systems and how these systems are represented on weather maps.

Science Content (Declarative Conceptual Knowledge)	NJCCCS
Students Will Know and Understand:	
Heat energy is transferred in many ways; radiation, conduction, and convection.	5.7.8B 3
Heat moves in predictable ways, flowing from warmer objects to cooler ones, until both reach the same temperature.	5.7.6B 1
The Sun is a major source of energy for changes on Earth’s surface.	5.7.8B 1
Seasonal temperature changes are due to the position of the Earth in relation to the Sun and the angle at which the Sun’s rays reach the Earth.	5.9.8A 3
The atmosphere is a mixture of nitrogen, oxygen, and trace gases including carbon dioxide and water vapor. The atmosphere has different properties at different locations.	5.8.8B 1
Clouds, formed by the condensation of water vapor, affect weather and climate.	5.8.8B1

Global patterns of atmospheric movement include local weather. Oceans have a have a major effect on climate because water in the oceans holds a large amount of heat.	5.8.8B 1
Water circulates through Earth's crust, oceans, and atmosphere in the water cycle.	5.8.6B 2

Thinking Processes (Procedural Knowledge)	NJCCCS
Students Will Be Able To:	
Describe weather instruments and the weather factors that they measure.	5.8.8B 1
Use weather instruments to measure temperature, atmospheric pressure, humidity, wind direction, and wind speed.	5.8.8B 1
Conduct experiments to determine that air has mass.	5.8.8B 1
Explain how experimental results provide evidence that air has mass.	5.8.8B 1
Use a molecular model to compare a gas at standard pressure and a gas under increased pressure.	5.8.8B 1
Graph monthly day-length data for a single location to look for a pattern.	5.7.8B 1
Analyze sunlight data and consider explanations.	5.7.8B 1
Use a Sun-Earth model to identify relationships involving the tilt of Earth's axis, Earth's rotation, and Earth's revolution around the sun.	5.7.8B 1
Collect and analyze temperature data measuring the heating and cooling of different earth materials.	5.7.6B 1
Describe heat transfer in terms of molecular activity.	5.7.8B 3
Describe how the atmosphere is heated.	5.7.8B 3
Describe how materials of different densities interact.	5.7.6B 1
Observe how heating and cooling of fluids moves air in a system.	5.7.8B 3
Explain how energy transfer drives the process of convection.	5.7.8B 3
Infer that water vapor is part of the air by observing condensation on surfaces.	5.8.6B 2
Determine dew point by observing at what temperature condensation occurs.	5.8.6B 2
Predict cloud formation from dew point and temperature data.	5.8.8B 1
Engage in simulations to follow the movement of a molecule of water through the water cycle.	5.8.6B 2
Explain with words and drawings how evaporation, condensation, precipitation and other processes produce many variations of the water cycle.	5.8.6B 2
Apply pressure to a system and observe the compression of gas.	5.8.8B 1
Build an anemometer and use it to gather data.	5.8.8B 1
Interpret a pressure map.	5.8.8B 1
Describe the relationship between changing air pressure and wind.	5.8.8B 1
Explain how differential heating of Earth by the Sun creates local winds.	5.8.8B 1
Model and explain what happens when two air masses of different densities meet.	5.8.8B 1
Explain how a global temperature increase could affect the water cycle and Earth's climate.	5.8.6B 2

Planetary Science

Throughout time, humans have been fascinated by the vastness that is beyond the Earth and have felt compelled to make sense of our place in the universe. Students will examine the history and technology of planetary science that has created our current understanding of the solar system and beyond. They will investigate Sun, Earth, and Moon relationships to explain such phenomena as the day, the year, seasons, moon phases, eclipses and tides. A further exploration of objects in the solar system helps students compare characteristics of stars, planets, and lesser bodies to those of Earth.

Essential Questions: How does gravity govern the movement of objects in the solar system?
How do these movements explain such phenomena as the day, the year, seasons, moon phases, eclipses, and tides?
What are the physical characteristics of the planets and other objects in the solar system?
How can planetary science be studied?

Unit Length: 9-12 weeks

Resources: FOSS Planetary Science Module
FOSS Planetary Resources
FOSS Planetary Notebook
Prentice Hall Science Explorer Earth Science Textbook

NJCCCS: 5.1.8B 1- Identify questions and make predictions that can be addressed by conducting investigations.

5.2.8B 1- Describe the impact of major events and people in the history of science and technology.

5.2.8B 2- Describe the development and exponential growth of scientific knowledge and technological innovations.

5.3.8D 1- Represent and describe mathematical relationships among variables using graphs and tables.

5.7.8B 4- Show that light is reflected, refracted and absorbed when it interacts with matter.

5.8.6D 1- Utilize various tools such as map projections and topographical maps to interpret features of Earth's surface.

5.8.8D 1- Utilize data gathered from emerging technologies to create representations and describe processes of change on the Earth's surface.

5.9.6A 1- Explain how the motions of Earth, Sun, and Moon define units of time including days, months, and years.

5.9.6A 2- Recognize that changes in the Earth's position relative to the sun produces differing amounts of daylight seasonally.

5.9.6B 1- Using models, demonstrate an understanding of the scale of the solar system that shows distance and size relationships among the sun and planets.

5.9.6B 2- Recognize that the Sun's gravitational pull holds the planets in their orbits and that the planets' gravitational pull holds their moons in their orbits.

5.9.6C 1- Observe and record short-term and long-term changes in the positions of the constellations in the night sky.

5.9.6C 2- Observe that the planets appear to change their position against the background of stars.

5.9.8A 1- Investigate the Earth, Moon, and Sun as a system and explain how the motion of these bodies results in the phases of the moon and eclipses.

5.9.8A 2- Explain how the regular and predictable motions of the Earth and Moon produce tides.

5.9.8A 3- Explain how the tilt, rotation, and orbital pattern of the Earth relative to the sun produce seasons and weather systems.

5.9.8B 1- Describe the physical characteristics of the planets and other objects within the solar system and compare Earth to the rest of the planets.

5.9.8C 1- Understand the Sun is a star, and that it shares characteristics with other stars.

5.9.8D 1- Know the universe consists of many billions of galaxies each including billions of stars.

Science Content (Declarative Conceptual Knowledge)	NJCCCS
Students Will Know and Understand:	
Elevation is the distance above Earth's surface, as measured from mean sea level.	5.8.6D 1
Frame of reference is important in describing locations on Earth.	5.8.6D 1
Curved surfaces create horizons, which interrupt the line of sight.	5.7.8B4
The lengths of shadows cast by identical objects vary from place to place on Earth.	5.7.8B4
Locations on Earth are described in degrees of longitude and latitude.	5.8.6D 1
Illuminated opaque objects cast shadows on the side away from the source of light.	5.7.8B 4
The Sun, a star, is the light source in our system.	5.9.8C 1
Changes in the Earth's position relative to the sun produces differing amounts of daylight seasonally.	5.9.6A 2
Earth rotates counterclockwise about every 24 hours, causing day and night.	5.9.6A 1
The Moon's appearance changes predictably over the course of a 28-day period.	5.9.6A 1
The Moon can be observed during different times of the day and night.	5.9.8A1
Regular and predictable motions of the Earth and moon produce tides.	5.9.8A 2
The Moon has characteristics different from that of the Earth.	5.9.8B 1
The Moon revolves around Earth and rotates on its axis; half of the Moon is lit by the Sun at all times.	5.9.8A 1
Motions of the Sun, Earth and Moon explain the day, year, seasons, eclipses, and Moon phases.	5.9.8A 1 5.9.8A 3
Each planet has unique characteristics.	5.9.8B 1
Stars maintain their relationships to one another; planets, comets, and asteroids move with respect to the stars.	5.9.8C 1
From the Earth, the positions of the constellations appear to change in the night sky.	5.9.6C 1
The planets appear to change against the background of stars.	5.9.6C 2
The Sun's gravitational pull holds the planets in their orbits and the planets' gravitational pull holds their moons in their orbits.	5.9.6B 2

Stars share characteristics with other stars.	5.9.8C 1
The universe consists of many billions of galaxies, each including billions of stars.	5.9.8D 1
Technology and space exploration has enhanced our understanding of space.	5.2.8B 1 5.2.8B 2

Thinking Processes (Procedural Knowledge)	NJCCCS
Students Will Be Able To:	
Observe an area and create a map to represent that area.	5.8.6D 1
Interpret representations of human-made and natural structures in aerial photographs.	5.8.8D 1
Relate information from different frames of reference.	5.8.8D 1
Use models and simulations to make observations, gather evidence, and draw conclusions about the shape of Earth.	5.8.8D 1
Make shadow observations, collect and organize information, graph shadow data, and describe and explain the resulting relationship.	5.3.8D 1
Use models to relate Earth's motions to the Sun.	5.9.8A 3
Communicate how to determine the directions of Earth's rotation.	5.1.8A 2
Use astronomical data to determine local noon.	5.8.8D 1
Investigate the convention of time zones with maps and globes.	5.8.6D 1
Observe and record the Moon's appearance for a month.	5.9.8A 1
Observe photos of the Moon, describe major surface features, and communicate a list of questions.	5.9.8B 1
Relate the origin of features of the Moon through a myth.	5.9.8B1
Design and conduct experiments to relate impact variables to resulting landforms.	5.1.8B
Relate evidence and understanding of processes to construct explanations about the lunar surface.	5.9.8B 1
Interpret lunar features from photographs and determine size relationships using mathematics.	5.3.8D 1
Describe a sequence of events that explains the formation of lunar maria.	5.9.8B 1
Construct a scale model of the Earth/Moon system.	5.9.6A 1
Describe the sequence and timing of events that will result in a successful Moon mission.	5.9.8B 1
Compare and describe day and night on Earth and the Moon.	5.9.6A 1
Make inferences about the origins of the Moon by comparing different theories	5.9.8B 1
Use models and simulations to explain Moon phases and eclipses.	5.9.8A 1
Predict the positions and motions of the dynamic Sun/Earth/Moon system that account for the day, year, seasons, and phases of the moon.	5.9.6A 1&2
Communicate how the Moon influences tides on Earth.	5.9.8A 2
Using tide and moon charts, predict when neap and spring tides will occur.	5.9.8A 2
Observe and record the position of stars and constellations in the night sky.	5.9.6C 1&2
Use a star chart to locate and identify constellations.	5.9.6C 1
Review the current knowledge about the planets and propose a planetary tour to apply the knowledge.	5.9.6B 1
Communicate understanding of the solar system.	5.9.6B 2
Research and create a timeline for historic milestones in space exploration.	5.2.8B
Research and communicate knowledge of a person that has made contributions to our understanding of space science.	5.2.8B