

Grade 7 Science, Quarter 3, Unit 3.1
Space Science

Overview

Number of instructional days: 20 (1 day = 50 minutes)

Content to be learned

- Identify technological advances made by scientists and cultures that have contributed to our understanding of the earth as part of the solar system.
- Use a model of the earth, sun, and moon system to demonstrate rotation.
- Use a model of the earth, sun, and moon system to demonstrate revolution.
- Recreate phases of the moon using a model of the earth, sun, and moon system.

Essential questions

- How have varying cultures/scientists used technology throughout history to understand the solar system?
- How can we distinguish between rotation and revolution of the earth, sun, moon system?

Processes to be used

- Create a timeline showing advances in technology used to observe and understand our solar system.
- Explain the rotation of the earth in relation to the moon and sun.
- Explain the revolution of the earth in relation to the moon and sun.
- Use models and/or illustrations of the moon's phases.

- What causes the change in moon phases within a lunar month?

Written Curriculum

Grade Span Expectations

ESS2 - The earth is part of a solar system, made up of distinct parts that have temporal and spatial interrelationships.

ESS2 (5-8) NOS –7

Explain how technological advances have allowed scientists to re-evaluate or extend existing ideas about the solar system.

ESS2 (7-8) -7 Students demonstrate an understanding of how technological advances have allowed scientists to re-evaluate or extend existing ideas about the solar system by...

7a identifying major discoveries from different scientists and cultures and describing how these discoveries have contributed to our understanding of the solar system (e.g. timeline, research project, picture book).

ESS2 (5-8) SAE+ POC –8

Explain temporal or positional relationships between or among the Earth, sun, and moon (e.g., night/day, seasons, year, tides) or how gravitational force affects objects in the solar system (e.g., moons, tides, orbits, satellites).

ESS2 (7-8)-8 Students demonstrate an understanding of temporal or positional relationships between or among the earth, sun, and moon by ...

8a using or creating a model of the earth, sun, and moon system to show rotation and revolution.

8c using or a model of the earth, sun, and moon to recreate the phases of the moon.

ESS3 - The origin and evolution of galaxies and the universe demonstrate fundamental principles of physical science across vast distances and time

No further targets for EK ESS3 at the 5-8 Grade Span

The GSEs listed below are assessed at the local level only

ESS3 (7-8)-9 Students demonstrate an understanding of the structure of the universe by...

9a describing the universe as containing many billions of galaxies, and each galaxy contains many billions of stars.

Clarifying the Standards

Prior Learning

Within grades 3 and 4, students recognized that the sun is the center of our solar system; the earth is one of several planets that orbit the sun; and the moon orbits the earth. Also students recognized that it takes approximately 365 days for the earth to orbit the sun. In grades 5 and 6, students learned the relationship between or among the earth, sun, and moon by using models to describe the relative motion/position of the earth, sun, and moon. Students demonstrated an understanding of gravitational relationships between

or among objects of the solar system by defining the earth's gravity as a force that pulls any object on or near the earth toward its center without touching it.

Current Learning

Students identify major discoveries from different scientists and cultures and describe how these discoveries have contributed to our understanding of the solar system (by creating a timeline, research project, or picture book).

Future Learning

Eighth-grade students will describe the relationship between mass and the gravitational force among objects in the solar system. They will also describe the relationship between distance and the gravitational force among solar-system objects. Students will explain that the sun's gravitational pull holds the earth and other planets in their orbits, just as the planets' gravitational pulls keeps their moons in orbit. Students will explain night and day, seasons, year, and tides as a result of the regular and predictable motion of the earth, sun, and moon.

Additional Research Findings

According to *Making Sense of Secondary Science*, research shows 25 percent of adults polled thought that our sun was a planet (p. 174).

Benchmarks for Science Literacy states, "People are not able to see how the solar system is constructed. With the help of technology such as telescopes, we can understand the solar system and Copernicus' idea of it being heliocentric. A model is necessary to make sense of the solar system. Students need to understand first that the earth is a sphere" (p. 67).

According to *Atlas of Science Literacy*, vol. 1, "in order to understand the phases of the moon, students need to first understand the concept of light reflection. How the moon gets its light from the sun is a challenging concept" (p. 44).

Notes About Resources and Materials

Prentice Hall Science Explorer, Astronomy Topics

- Rotation & Revolution p. 14–17
- Phases of the Moon p. 24–27
- Activity: Phases of the Moon p. 30–31

Astronomy Online Resources

- Astronomers
<scienceworld.wolfram.com/biography/topics/Astronomers.html>
- Nicolaus Copernicus
<www.lucidcafe.com/library/96feb/copernicus.html>
<www.fact-index.com/n/ni/nicolaus_copernicus.html>
- Solar System—Fact Sheets
<nssdc.gsfc.nasa.gov/planetary/planetfact.html>
- Galileo Galilei
<www.lucidcafe.com/library/96feb/galileo.html>
<www.fact-index.com/g/ga/galileo_galilei.html#Astronomy>
- Johannes Kepler
<www.fact-index.com/j/jo/johannes_kepler.html>
- Moon Phases and Cycles
<scienceworld.wolfram.com/astronomy/topics/MoonPhasesandCycles.html>
- Sir Isaac Newton
<www.lucidcafe.com/library/95dec/newton.html>
- Scienceworld—Planet Color, Atmosphere, and Composition
<scienceworld.wolfram.com/astronomy/topics/Planets.html>
- Atmosphere and Surface (Bottom)—Planet Data, Atmosphere, Composition
<pds.jpl.nasa.gov/planets/special/planets.htm>
- Solarviews—Planet Information, Views
<www.solarviews.com/eng/homepage.htm>
- Planetary Systems—Planet Information
<www.windows.ucar.edu>
- Astrophysics spectator—Planet Information
<www.astrophysicspectator.com>

- Inner Planets and Asteroids—Inner Orbits Diagram
<ssd.jpl.nasa.gov/?ss_inner>
- Outer Planets & Asteroids—Outer Orbits Diagram
<ssd.jpl.nasa.gov/?ss_outer>
- Our Solar System—Planet Sizes
<www.sciencemonster.com>
- NASA—Earth, etc.—Technology, News
<www.nasa.gov>
- Solar System Discovery—Timeline
<www.nineplanets.org/history.html>
- Astronomical Timeline
<www.rundetaarn.dk/engelsk/observatorium/timeline.htm>

Grade 7 Science, Quarter 3, Unit 3.2
Processes That Shape the Earth

Overview

Number of instructional days: 20 (1 day = 50 minutes)

Content to be learned

- Evaluate how the slow processes of weathering, erosion, and/or mountain building have changed and will change the earth over time.
- Evaluate how the abrupt processes of erosion, volcanoes, and/or earthquakes have changed and will change the earth over time.
- Investigate the effect of flowing water on landforms over time.

Essential questions

- How can the slow process of erosion change the earth over time?
- How can the abrupt process of erosion change the earth over time?

Processes to be used

- Analyze the slower processes of weathering, erosion, and mountain building.
- Analyze the effects of weathering, erosion, and mountain building.
- Analyze the rapid processes of erosion, volcanoes, and/or earthquakes.
- Analyze effects of erosion, volcanoes and/or earthquakes.
- Investigate the effect of flowing water on landforms.

- How do slow and abrupt earth processes differ?
- How does flowing water affect landforms over time?

Written Curriculum

Grade Span Expectations

ESS1 - The earth and earth materials as we know them today have developed over long periods of time, through continual change processes.

ESS1 (5-8) POC –3

Explain how earth events (abruptly and over time) can bring about changes in Earth’s surface: landforms, ocean floor, rock features, or climate.

ESS1 (7-8)–3 Students demonstrate an understanding of processes and change over time within earth systems by ...

3a evaluating slow processes (e.g. weathering, erosion, mountain building, sea floor spreading) to determine how the earth has changed and will continue to change over time.

3b evaluating fast processes (e.g. erosion, volcanoes and earthquakes) to determine how the earth has changed and will continue to change over time.

3c investigating the effect of flowing water on landforms (e.g. stream table, local environment).

Clarifying the Standards

Prior Learning

In grades K–4, students were introduced to the topic of weather and the use of tools to extend their senses and gather data. In grades 5 and 6, students demonstrated an understanding of processes and change over time within earth systems by describing events and the effects they may have on climate (e.g., El Niño, deforestation, glacial melting, and an increase in greenhouse gases).

Current Learning

Students learn about both the abrupt and slow processes that change the earth’s surface and continue to change the earth’s surface over time. Abrupt processes include erosion, volcanoes, and earthquakes. Slow processes include weathering, erosion, and mountain building. Students investigate the effects of the flow of water over time on landforms.

Future Learning

In grade 8, students will learn how the slow process of sea-floor spreading changes the earth’s surface and continues to change the earth’s surface over time. Within grades 9 through 11, they will also investigate how convection circulations within the mantle cause plate movement and seismic activity. Students will explore how physical and chemical processes—such as sea-floor spreading, the hydrologic cycle, weathering, and element cycling—alter the earth’s crust.

Additional Research Findings

According to the *Atlas of Science Literacy*, vol. 1, researchers have stated that students may erroneously maintain the belief that the earth has always been as it is. They believe that any changes must have occurred suddenly and completely. However, students had no previous formal instruction on those particular topics. Often, middle-school students are not able to “construct coherent explanations” of volcanic and earthquake causes if merely taught by traditional means” (p. 50).

According to *Benchmarks for Science Literacy*, “students often find it difficult to comprehend the significance of the long-term effects of water and wind erosion, sediment deposition, slow movement of the continental plates, and the slow formation of mountains. Students find the general topics of earthquakes, volcanoes, and floods more interesting than the actual role each of these events play in the shaping of the earth. Also, the concept of geologic time will be difficult for students” (pp. 71–73).

Notes About Resources and Materials

Suggested book

Prentice-Hall, Inc. (2000). *Science Explorer: Inside Earth*. Upper Saddle River, NJ: Prentice-Hall.

Suggested websites

- FossWeb.com—Earth history
<<http://www.fossweb.com/modulesMS/EarthHistory/index.html>>
- National Geographic—Natural disasters
<<http://www.nationalgeographic.com/environment/natural-disasters/forces-of-nature/>>
- National Geographic—Erosion and weathering
<<http://www.nationalgeographic.com/science/earth/the-dynamic-earth/weathering-erosion-article/>>
- National Geographic—Mountain building
<<http://www.nationalgeographic.com/science/earth/surface-of-the-earth/>>
- Geology.com—Erosion
<<http://www.geology.com/teacher/erosion.shtml>>
- Science-teachers.com—Erosion
<http://www.science-teachers.com/erosion_worksheets.htm>