MS-Space Systems

Performance Expectation(s):

MS-ESS1-1.

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.

[Clarification Statement: Examples of models can be physical, graphical, or conceptual.]

MS-ESS1-2.

Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.

[Clarification Statement: Emphasis for the model is on gravity as the force that holds together the solar system and Milky Way galaxy and controls orbital motions within them. Examples of models can be physical (such as the analogy of distance along a football field or computer visualizations of elliptical orbits) or conceptual (such as mathematical proportions relative to the size of familiar objects such as students' school or state).] [*Assessment Boundary: Assessment does not include Kepler's Laws of orbital motion or the apparent retrograde motion of the planets as viewed from Earth.*]

MS-ESS1-3.

Analyze and interpret data to determine scale properties of objects in the solar system.

Emphasis is on the analysis of data from Earth-based instruments, space-based telescopes, and spacecraft to determine similarities and differences among solar system objects. Examples of scale properties include the sizes of an object's layers (such as crust and atmosphere), surface features (such as volcanoes), and orbital radius. Examples of data include statistical information, drawings and photographs, and models.] [*Assessment Boundary: Assessment does not include recalling facts about properties of the planets and other solar system bodies.*]

CCSS:

RST.6-8.1

Cite specific textual evidence to support analysis of science and technical texts. (MS-ESS1-3),(MS-ESS1-4)

RST.6-8.7

Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-ESS1-3)

SL.8.5

Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-ESS1-1),(MS-ESS1-2)

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models • Develop and use a model to describe phenomena. (MS-ESS1-1),(MS-ESS1-2) **Analyzing and Interpreting Data** • Analyze and interpret data to determine similarities and differences in findings. (MS-ESS1-3) **Constructing Explanations and Designing Solutions** • Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (MS-ESS1-4)	**ESS1.A: The Universe and Its Stars** • Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models. (MS-ESS1-1) • Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe. (MS-ESS1-2) **ESS1.B: Earth and the Solar System** • The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. (MS-ESS1-2),(MS-ESS1-3) • This model of the solar system can explain eclipses of the sun and the moon. Earth's spin axis is fixed in direction over the short-term but tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by	**Patterns** • Patterns can be used to identify cause-and-effect relationships. (MS-ESS1-1) **Scale, Proportion, and Quantity** • Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-ESS1-3),(MS-ESS1-4) **Systems and System Models** • Models can be used to represent systems and their interactions. (MS-ESS1-2) - ***Connections to Engineering,Technology, and Applications of Science*** **Interdependence of Science, Engineering, and Technology**

	the differential intensity of sunlight on different areas of Earth across the year. (MS-ESS1-1) • The solar system appears to have formed from a disk of dust and gas, drawn together by gravity. (MS-ESS1-2) **ESS1.C: The History of Planet Earth** 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. (MS-ESS1-4)	• Engineering advances have led to important discoveries in virtually every field of science and scientific discoveries have led to the development of entire industries and engineered systems. (MS-ESS1-3) - ***Connections to Nature of Science*** **Scientific Knowledge Assumes an Order and Consistency in Natural Systems** Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. (MS-ESS1-1),(MS-ESS1-2)

Resources:

FOSS Planetary Science Investigation 3 Day and Night
- Part 1 Introducing Day and Night
- Part 2 Day and Night with Globes
- Part 3 Timekeeping
- Part 4 Timezones
- Reading: Planetary Science Resources Book
  - Time zones of the Lower 48 States
  - World Time-Zone Map (data)
- Multimedia:
  - Day and Night Simulation (fossweb.com)

FOSS Planetary Science Investigation 5 Moon Craters
- Part 1 Moon Crater Controversy
- Part 2 Impact Simulations Variable Speed
- Part 3 Impact Simulations Variable Mass
- Part 4 Crater Analysis and Classification
- Part 6 Impacts on Earth
- Part 7 Origin of the Moon
- Reading: Planetary Science Resources Book
  - The Controversy about Lunar Crater Formation
  - Craters: Real and Simulated
  - The Crater that Ended the Reign of the Dinosaurs
  - Gene Shoemaker: The First Man on the Moon?
- Multimedia:
  - Crater Formation Animation (fossweb.com)
  - Moon Crate Locator Map (fossweb.com)
  - Mare Formation (fossweb.com)
  - Asteroids-Deadly Impact (Video)

FOSS Investigation 6 Mapping the Moon
- Part 1 Crater Survey
- Part 2 Scaling Lunar Features
- Reading: Planetary Science Resources Book
  -
- Multimedia
  - Earth Moon Comparison (Data)
  - Mare Formation (fossweb.com)
  -

FOSS Investigation 7 Landing on the Moon
- Part 1 The Kennedy Challenge
- Part 2 How Far/How Fast?
- Part 3 A Place to Land
- Part 4 Lunar Day and Night
- Part 5 A Trip to the Moon
- Reading: Planetary Science Resources Book
  - Sun, Planets, and Satellites by Size (Data)
  - Lunar Probes: Probing the Way for Apollo
  - Moon with Landing Sites (Data)
- Multimedia:
  - For All Mankind (Video)
  - Space Exploration, Moon before Apollo (fossweb.com)
  - Day/Nigh Simulation (fossweb.com)

FOSS Planetary Science Investigation 9 Phases of the Moon

- Part 1 Study Moon Logs
- Part 2 What Causes Moon Phases?
- Part 3 Thinking about Moon Phases
- Part 4 Moon Phase Puzzles
- Solar/Lunar Ecli[pse
- Reading: Planetary Science Resources Book
    - Moonrise/Sunrise (Data)
    - The Search for New Moons
- Multimedia:
- Lunar Calendar (fossweb.com)
- Day/Night Simulation (fossweb.com)
- Phases of the Moon (fossweb.com)
- Riverside Scientific New Moon

Seasons

FOSS Weather and Water Investigation 3

- Part 1 How Much Sunshine
- Part 2 Sun-Earth System
- Part 3 Sun Angle and Solar Heating
- Pasta Parallels
- Reading: Weather and Water Resources Book
    - Seasons
- Multimedia:
    - RSI Scientific Program Seasons (fossweb.com)
    - Brainpop: Seasons

Assessments: