

Lesson Topic: Unit 2 Part 1 Solar System and Role of Gravity

Grade level: 6th

Length of lesson: 7 class periods 50-60 minutes

Content Standards

MS- ESS1-2: Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.

MS-ESS1-3: Analyze and interpret data to determine scale properties of objects in the solar system.

Big Ideas:

Earth's place in the universe affects life on Earth
What is the role of gravity in the motions of objects in our Solar System?

Essential Question(s):

- How does Earth's location affect life on Earth?
- What is the role of gravity in our Solar System?
- How does size of a planet affect its gravity?

Student objectives (outcomes):

Students will be able to:

- Describe rotations and revolution.
- Distance from the sun and elliptical orbits.
- Distance from the sun in astronomical units.
- Describe the relationship between the size of planet and its gravity.

Assessment Evidence

Performance Task(s):

- Planet Research Presentation

Other Evidence:

- Science Journal for collecting notes and demonstrating understanding of essential questions using peers presentations and personal notes.

Learning Plan

Learning Activities:

- Teach Vocabulary Concepts: Astronomical Unity, Rotation and Rotational period, Revolution, Orbit, Ellipse, Gravity, Planetary System
- Research and compare other objects in our Solar System to Earth
 - Planets, Asteroid Belt, Pluto/Kuiper Belt, and Comets
 - Research Questions should address:
 - Distance from the sun
 - Diameter
 - Rotational Period (length of day)
 - Orbital Period (length of Year)
 - Gravity compared to Earth
 - Atmospheric Composition
 - Moons
 - Average Temperature
 - Existence of water
- Gravity Lab (Inquiry)
 - (Harcourt Science 6th Grade pg. D84)
 - Discovery Ed Orbits and Gravity
 - Website: sciencegamecenter.org

Resources:

- Challenger Center Mission to Mars (Use online resources provided through Challenger Center Educator's Site)
- Harcourt Science (Old Adoption)
- Discovery Ed (Videos with blackline masters, lesson plans, Board Builder, etc) (KPBSD site)
- SmartBoard Exchange
- Digital Pipeline (KPBSD site)
- Worldbook (KPBSD site)
- Teacher Pay Teacher Units - Gay Miller "Earth's Systems" and "Earth's Places in the Universe"
- nasa.gov (significant resources)
- betterlesson.com
- <http://www.bozemanscience.com/ngs-ess1a-the-universe-its-stars>
- <http://www.bozemanscience.com/ngs-ess1b-earth-the-solar-system>
- <http://concord.org/stem-resources/grade-level/middle-school>

Students who demonstrate understanding can:

- 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-ESS1-3. Analyze and interpret data to determine scale properties of objects in the solar system.**[Clarification Statement: 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.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p>Developing and Using Models Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.</p> <ul style="list-style-type: none"> Develop and use a model to describe phenomena. (MS-ESS1-1),(MS-ESS1-2) <p>Analyzing and Interpreting Data Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis. Analyze and interpret data to determine similarities and differences in findings. (MS-ESS1-3)</p>	<p>ESS1.A: The Universe and Its Stars</p> <ul style="list-style-type: none"> 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) <p>ESS1.B: Earth and the Solar System</p> <ul style="list-style-type: none"> 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 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) 	<p>Patterns</p> <ul style="list-style-type: none"> Patterns can be used to identify cause-and-effect relationships. (MS-ESS1-1) <p>Scale, Proportion, and Quantity</p> <ul style="list-style-type: none"> 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) <p>-----</p> <p>Connections to Engineering, Technology, and Applications of Science Interdependence of Science, Engineering, and Technology</p> <ul style="list-style-type: none"> 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) <p>-----</p> <p>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),</p>

Common Core State Standards Connections:

ELA/Literacy -

- RST.6-8.1** Cite specific textual evidence to support analysis of science and technical texts. (MS-ESS1-3)
- 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** Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points. (MS-ESS1-1)

Mathematics -

- MP.2** Reason abstractly and quantitatively. (MS-ESS1-3)
- MP.4** Model with mathematics. (MS-ESS1-1),(MS-ESS1-2)
- 6.RP.A.1** Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. (MS-ESS1-1),(MS-ESS1-3)
- 7.RP.A.1** Recognize and represent proportional relationships between quantities. (MS-ESS1-1),(MS-ESS1-3)

