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| **Subject:** Science | **Grade:** 6 | **Unit ID:**  |
| **Unit 1:** Earth, Sun, and Moon Systems | **Length:** 3-4 weeks |
| ***Stage 1: Desired Results*** |
| **Standards:****Content Standards:****6.MS-ESS1-1a** Develop and use a model of the Earth-Sun-Moon system to explain the causes of lunar phases and eclipses of the Sun and Moon.Clarification Statement: Examples of models can be physical, graphical, or conceptual and should emphasize relative positions and distances.**6.MS-ESS1-5 (MA)** Use graphical displays to illustrate that Earth and its solar system are one of many in the Milky Way galaxy, which is one of billions of galaxies in the universe.Clarification Statement: Graphical displays can include maps, charts, graphs, and data tables**.****6.MS-PS2-4.** Use evidence to support the claim that gravitational forces between objects are attractive and are only noticeable when one or both of the objects have a very large mass.Clarification Statement: Examples of objects with very large masses include the Sun, Earth, and other planets. State Assessment Boundary: Newton’s law of gravitation or Kepler’s laws are not expected in state assessment.**6.MS-ETS1-5 (MA).** Create visual representations of solutions to a design problem. Accurately interpret and apply scale and proportion to visual representations.\*Clarification Statements: Examples of visual representations can include sketches, scaled drawings, and orthographic projections. Examples of scale can include ¼ʺ = 1ʹ0ʺ and 1 cm = 1 m.**6.W.1** Write arguments to support claims with clear reasonsa. Introduce claim(s) and organize the reasons and evidence clearly.b. Support claim(s) with clear reasons and relevant evidence and demonstrating an understanding of the topic.c. Use words, phrases, and clauses to clarify the relationships among claim(s) and reasons.d. Establish and maintain a formal style.e. Provide a concluding statement or section that follows from the argument presented.**6.W.9**Draw evidence from informational texts to support analysis, reflection, and research.**Practice Standards/Concepts & Skills:**1.Asking questions (for science) and defining problems (for engineering)2.Developing and using models3.Planning and carrying out investigations4.Analyzing and interpreting data6.Constructing explanations (for science) and designing solutions (for engineering)7.Engaging in argument from evidence8.Obtaining, evaluating, and communicating information |
| **Overview:**The changing relative positions of the moon, Earth, and sun cause the phases of the moon. Earth and its solar system are one of many in the Milky Way galaxy, which is one of billions of galaxies in the universe. The strength of the force of gravity between two objects depends on two factors: the masses of the objects and the distance between them.**FOCUS LANGUAGE GOALS:*****Students will be able to independently use their learning to…**** Explaining the positioning of the Earth, moon, and sun at each phase
* Distinguish between waxing and waning
* Identify the cyclic phases of the moon
* Engage in sustained, complex and successful scientific inquiry.
* Engage in public discourse of scientific and technical issues in the news or the community.
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| **Understandings*** The change in relative positions of the Sun, Earth and Moon account for phases of the moon and eclipses.
* There are observable predictable patterns of movement in the Sun, Earth, and Moon system.
* Earth is part of a solar system, which is part of a galaxy, which is one of billions of galaxies that make up the universe.
 | **Essential Questions*** Why is it important to understand how gravity affects objects in the universe?
* What makes up the solar system and how did it form?
* What causes moon phases and eclipses?
* What is a star system?
* What are the major types of galaxies?
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| **Knowledge:** *Students will ...***Content:*** Strength and force of gravity depends on mass and distance
* Inertia and gravity keeps the planets in orbit around the sun
* Motions of Earth and the moon and their position relative to the sun result in phases of the moon, lunar and solar eclipses
* Mur Solar System is part of the Milky Way Galaxy, which, in turn, is one of many galaxies in the known Universe
* Most stars are members of groups of two or more stars, called star systems.
* Astronomers classify most galaxies into the following types: spiral, elliptical, and irregular.

**Language:*** list language knowledge

**Vocabulary:** [**(see definition of CCSS tiered vocabulary)**](https://drive.google.com/open?id=0B1oO5U3iU008Q1ZGaEpFeFpLVnc)

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| **Tier 1** | **Tier 2** | **Tier 3** |
| Everyday words introduced | Words that differ by context | Words specific to content area |

Content Vocabulary:Prior Knowledge Vocabulary:Rotation - Rotação(PT)Revolution - Revolução(PT)AxisChapter 1: Earth and the Universe (Pearson)* force - força
* gravity - gravidade
* law of universal gravitation - lei da gravitação universal
* mass - massa
* weight -peso
* inertia - inércia
* Newton’s first law of motion - Primeira lei de Newton
* solar system - sistema solar
* astronomical unit - unidade astronômica
* planet - planeta
* dwarf planet - planeta anão
* planetesimal
* phase - fase
* eclipse
* solar eclipse - eclipse solar
* umbra
* penumbra
* lunar eclipse - eclipse lunar
* binar star - estrela binária
* eclipsing binary - binária eclipsante
* open cluster - aglomerado aberto
* globular cluster - aglomerado globular
* galaxy - galáxia
* spiral galaxy - galáxia espiral
* elliptical galaxy - galáxia elíptica
* irregular galaxy - galáxia irregular
* quasar
 | **Skills**: *Students can ...***Content:*** Constructing graphical displays to illustrate that the Earth and its solar system are part of the Milky Way galaxy, which is one of billions of galaxies in the universe. (MS-ESS1-5)
* Using evidence (e.g., measurements, observations, patterns) to support an explanation of Earth’s place in the universe. (MS-ESS1-5)
* Developing and using models to describe lunar phases and eclipses of the sun and moon. (MS-ESS1-1a)

Iinvestigating how mass affects the period of revolution which can be engineered through the development of an object, tool, process or system and includes multiple criteria and constraints, including (MS-PS2-4) * Writing arguments to support claims from the investigation with clear reasons (W.1)

**Language:*** list language knowledge
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| ***Stage 2: Assessments*** |
| **CURRICULUM EMBEDDED PERFORMANCE ASSESSMENT (PERFORMANCE TASKS)** * You are an astronomer. Your task is to develop and use a model of the Earth-sun-moon system to help explain the causes of the lunar phases and eclipses of the sun and moon. Your model will be displayed in the Science Museum for student exploration.

**OTHER EVIDENCE**: Formative Assessments:* research notes/science notebooks
* draft of argumentative essay
* responses to guiding questions (verbal and written)
* lab reports
* observations and completed work samples from group work
* homework

Summative Assessments:* presentation/display of the CEPA
* unit test
* Quizzes
* [Astronomy WebQuest](https://docs.google.com/document/d/1TyWs-4hBjCmrXBN-nO8gOEdG2sgiQ34Me0N_JOSG2bg/edit?usp=sharing)
* [Foldable Project - Moon Phases](https://docs.google.com/document/d/1DEtZMgRngiF6fesHpyQ28rKIdmUJPQk6AXZ0YzqLzeo/edit?usp=sharing)
* [Songcop Lyrics-Moon Phases Mr. Parr](https://www.youtube.com/watch?v=HkvlrWpsnuQ)
* [Phases of the Moon-Do Now](https://docs.google.com/presentation/d/1SbXaz2y04x07GlDOxo65x37BUDwNBGz_ldIeKIiiv6k/edit?usp=sharing)
* [Speeding Around the Sun Lab](https://docs.google.com/document/d/1XUlIQWHcGCI8Jj0NzkRlKZNckCsdzj6SavV1Ksc-mnQ/edit?usp=sharing)
* [Mass vs. Period of Revolution Lab](https://docs.google.com/document/d/15MpPj0GhqjjZAUEOa0DraAL1IrfILeF_WKRFwbFiMLw/edit?usp=sharing)
* [Mass, Distance, and Revolution open Response](https://docs.google.com/document/d/1-vfqxrEkDQaWDQO2-Oj7ic1o2U4eo3CDvGeI5FSqSFQ/edit?usp=sharing)

**Self-Assessment:** * [Self Assessment](https://docs.google.com/document/d/13FLlPtHOl-lFx9V8Rqcmith5vFgWpJvIZbrTicEeGts/edit?usp=sharing)

 **Practice MCAS Questions:*** Multiple Choice Questions

[http://www.doe.mass.edu/mcas/2017/release/Gr5-Sci.pdf question 4, 13, 17](http://www.doe.mass.edu/mcas/2017/release/Gr5-Sci.pdf)[http://www.doe.mass.edu/mcas/2016/release/Gr8-Sci.pd question 14](http://www.doe.mass.edu/mcas/2016/release/Gr8-Sci.pd)[http://www.doe.mass.edu/mcas/2015/release/Gr5-Sci.pdf question 6](http://www.doe.mass.edu/mcas/2015/release/Gr5-Sci.pdf)[http://www.doe.mass.edu/mcas/2014/release/Gr5-Sci.pdf question 3, 16](http://www.doe.mass.edu/mcas/2014/release/Gr5-Sci.pdf)[http://www.doe.mass.edu/mcas/2013/release/g8sci.pdf question 13, 15 and 17](http://www.doe.mass.edu/mcas/2013/release/g8sci.pdf) * Open Response Question

[http://www.doe.mass.edu/mcas/2013/release/g8sci.pdf question9](http://www.doe.mass.edu/mcas/2013/release/g8sci.pdf) |
| ***Stage 3: Learning Plan*** |
| **Summary of Key Learning Events and Instructions:****Pre-Assessments of Requisite Knowledge, Possible Pre- or Mis-conceptions**[**Pre-Assessment**](https://docs.google.com/document/d/1WHdEv_XIAvgkjQu_GTESI_IO-3bQQT3ElLrOEtVq6JA/edit?usp=sharing)**Possible misconceptions*** The Earth is the center of the solar system.
* The solar system contains only the sun, planets and the moon.
* The Sun goes around the Earth.
* The moon can only be seen during the night.
* The planets orbit in circles around the sun.
* The moon gives off its own light.

**Learning Events:****Hook Question**: Are we alone in the universe?**Earth’s Place in the Universe- (Suggested length = 1 Week (55 minutes a day X 5)** Engage students with activities to discover that the Earth is one part of the solar system, which is part of the Milky Way Galaxy which is part of the universe **6.MS-ESS1-5 (MA)**Engage students with activities to discover that the universe consists of billions of galaxies **6.MS-ESS1-5 (MA)**Resources for Lesson 1:* [A Map of the Milky Way Galaxy](http://www.atlasoftheuniverse.com/milkyway.html)
* [Solar System Lesson Plans](http://www.theteachersguide.com/solarsystem.htm)
* [Solar System Study Jams](http://www.scholastic.com/teachers/activity/solar-system-6-studyjams-interactive-science-activities)
* [Teach Engineering- Solar System](https://www.teachengineering.org/curricularunits/view/cub_solar_curricularunit)

**Hook Question**: Why don’t the planets crash into each other? **Gravity and Motion- (Suggested length = 1 Week (55 minutes a day X 5)**Engage students with activities to understand the strength of the force of gravity. (The force of gravity between two objects depends on the masses of the object and the distances between them.)Gravity is the attractive force between all objects in space **6.MS-PS2-4. (MA)**Factors that affect the force of gravity (mass and distance) **6.MS-PS2-4. (MA)**Working definition of inertia (inertia is the tendency of an object to resist a change in motion) **6.MS-PS2-4. (MA)**Inertia and gravity combine to keep objects in space in orbit (mass of sun is so large it keeps everything in orbit) **6.MS-PS2-4. (MA)**Resources for Lesson 2:* [Gravity Labs/Demos (The $20.00 Challenge)](http://www.thirteen.org/edonline/ntti/resources/lessons/gravity/b.html)

**Motion of the Earth, Moon, and Sun (Suggested length = 1 Week (55 minutes a day X 5)**Engage students with activities that include developing and using models, to show how the Earth, Moon and Sun interact.Gravity and inertia create the Moon, and Earth’s elliptical orbit **6.MS-PS2-4.**The relative positions of the Moon, Earth and sun cause phases and eclipses **6.MS-ESS1-1a (MA)**Resources for Lesson 3:* [Making Models: Earth, Sun, and Moon](https://www.teacherspayteachers.com/Product/Space-Model-of-Earth-Moons-orbit-565681)
* [Scale Model: Sun and Earth](http://sunearthday.nasa.gov/2007/materials/solar_pizza.pdf)
* [How Do Earths Rotation and Revolution work?](http://www.cpalms.org/Public/PreviewResourceLesson/Preview/46329)

**Phases and Eclipses (Suggested length = 1 Week (55 minutes a day X 5)** Engage students with activities to understand that the changing relative positions of the Earth, sun, and moon causes phases and eclipses.Solar eclipses occur when the moon passes directly between the sun and Earth. **6.MS-ESS1-1a (MA)**Lunar eclipses occur when the Earth is between the sun and the moon **6.MS-ESS1-1a (MA)**Resources for Lesson 4:* + [Google Slide Show - Moon Phases](https://docs.google.com/presentation/d/1sVA5iiYZJ33n3xRRYrxbZJcXoAtc7fnzCJLs5nLTJVI/edit?usp=sharing)
	+ [Moon resources](http://www.neok12.com/Moon.htm)
	+ [Eclipses-Cootie Catchers](https://www.teacherspayteachers.com/Product/Eclipses-Activity-Scoot-Unit-Review-Game-1900591)
	+ Moon observation journal
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| **Instructional Notes:****Sociocultural implications**[***Guide****: think about the interaction of the student (including his/her identity, knowledge, culture, proficiency in English and home languages, literacy level, academic readiness, beliefs, values, and experiences) with the given academic contexts (including register, genre/text type, and task/situation, and the student’s relationship to other participants’ identities and social roles) - delete*]**Connections to Prior Knowledge*** list

**Connections to Future Knowledge*** list

**Common Misconceptions*** list

**Instructional Strategies*** list
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| **Resources:****Open Resources:** [**Next Generation Science Standards**](http://ngss.nsta.org/)  [OER Commons](https://www.oercommons.org/)**Videos:** * [**Into to Solar System Hook**](http://safeyoutube.net/w/euDb)
* [**Moon Phases**](http://safeyoutube.net/w/auDb)
* [**Milky Way Galaxy**](http://safeyoutube.net/w/buDb)
* [**Exploring our Solar System**](http://safeyoutube.net/w/t9B)
* [**The Power of Ten**](http://safeyoutube.net/w/cuDb)

**Books:*** **Next Time You See the Moon** by Emily Morgan
* **The Moon** by Margaret W. Carruthers

**The Universe! A Kids Book About Space. Galaxies, Stars, and Nebulas. (Facts, Pictures & Information)** by Robert Cameron |