



7th Grade - Science - Unit 1: Astronomy

Unit: Science, Grade(s) 7

Astronomy: Space Science

Duration: 9 Weeks

Unit

Scope and Sequence

Astronomy

Topic: Space Science

Duration: 9-10 Weeks

Performance Objectives

SWBAT:

- compare the size, composition and surface features of planets IOT describe how a planet's features are affected by its distance from the Sun.
- develop and use a model of the Earth-sun-moon system IOT describe the patterns of Earth's rotation and revolution in relation to the Sun and Moon.
- develop and use a model of the earth-sun-moon system IOT describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.
- compare and contrast characteristics of celestial bodies found in the solar system (e.g., moons, asteroids, comets, meteors, inner and outer planets). IOT describe how they differ from earth.
- identify and describe instruments that are used to study the universe IOT explain how telescopes, satellites, etc. have advanced our understanding of space.
- develop and use a model IOT describe the role of gravity in the motions within galaxies and the solar system.
- analyze and interpret data IOT determine scale properties of objects in the solar system.

Key Terms and Definitions

astronomy - the study of the universe

refracting telescope - a telescope that uses a set of lenses to gather and focus light from distant objects

reflecting telescope - a telescope that uses a curved mirror to gather and focus light from distant objects

constellation - a region of the sky that contains a recognizable star pattern and that is used to describe the location of objects in space

zenith - the point in the sky directly above an observer on Earth

horizon - the line where the sky and the Earth appear to meet

light-year - the distance that light travels in one year: about 9.46 trillion kilometers

apparent magnitude - the brightness of a star as seen from the Earth

absolute magnitude - the brightness that a star would have at a distance of 32.6 light years from Earth

light-year - the distance that light travels in one year; about 9.46 trillion kilometers

parallax - an apparent shift in the position of an object when viewed from different locations

red giant - a large, reddish star late in its life cycle

white dwarf - a small, hot, dim star that is the leftover center of an old star

supernova - a gigantic explosion in which a massive star collapses and throws its outer layers into space

neutron star - a star that has collapsed under gravity to the point that the electrons and protons have smashed together to form neutrons

pulsar - a rapidly spinning neutron star that emits rapid pulses of radio and optical energy

black hole - an object so massive and dense that even light cannot escape its gravity



cosmology - the study of the origin, properties, processes, and evolution of the universe

quasar - a very luminous, star-like, object that generates energy at a high rate; quasars are thought to be the most distant objects in the universe

Big Bang Theory - the theory that states that the universe began with the tremendous explosion about 13.7 billion years ago

sunspot - the dark area of the photosphere of the sun that is cooler than the surrounding areas and that has a strong magnetic field

orbit - the path that a body follows as it travels around another body in space

revolution - the motion of a body that travels around another body in space; one complete trip along an orbit

nova - a variable star that suddenly increases in brightness to several times its normal magnitude and returns to its original appearance in a few weeks to several months or years.

system - a group of related objects that work together to achieve a desired result.

Essential Questions

How do the scientific contributions from historical figures help inform scientific endeavors today?

How can data from instruments, such as telescopes or spacecraft, help us to determine scale properties of objects in the solar system?

How can a model be used to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons?

How can a model be used to describe the role of gravity in motions within galaxies and the solar system?

Starting Points

In this unit, students will build upon the foundational knowledge they learned about Space Science in elementary schools. Most recently, students should have completed an astronomy unit in 5th grade which focused on the movement of planets and other objects in space, the phases on the moon, and the seasons. Despite their previous learnings, students may still enter middle school with some strong misconceptions about what causes the moon to appear illuminated, why the sun appears to move across the sky, and what causes the seasons. It will be important to uncover and address these misconceptions at the beginning of and throughout the unit.

Middle school students can examine the Earth's place in relation to the solar system, Milky Way galaxy, and universe. There is a strong emphasis on a systems approach, using models of the solar system to explain astronomical and other observations of the cyclic patterns of eclipses, tides, and seasons. There is also a strong connection to engineering through the instruments and technologies that have allowed us to explore the objects in our solar system and obtain the data that support the theories that explain the formation and evolution of the universe.

Instructional Resources

Unit Assessment Questions

[Click here](#) for assessment questions aligned to each objective in this unit. Use these questions as planning tools, formative assessment items, exit slip questions, or unit test questions.

Gravity Exploration Activity

<http://sciencespot.net/Media/gravlab.pdf>

Moon Phases Activity

<http://sciencespot.net/Media/moonphases.pdf>

Intro to Telescopes Reading

<http://www.kidsastronomy.com/telescopes.htm>

ck12 Resources

<http://www.ck12.org/book/Physics-From-Stargazers-to-Starships/>

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ck12 Resources

<https://www.ck12.org/earth-science/History-of-Astronomy/>

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NASA educator materials

<http://www.nasa.gov/audience/foreducators/index.html>

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Building a Scale Solar System

http://www.exploratorium.edu/ronh/solar_system/

Smithsonian Resources

http://www.smithsonianeducation.org/educators/lesson_plans/universe/index.html

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Gravity Reading

http://www.cosmos4kids.com/files/universe_gravity.html

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Video on Earth's Formation

<http://channel.nationalgeographic.com/videos/the-birth-of-earth/>

Space Science Institute Resources

<http://www.spacescience.org/educationresources.php>

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Tides Reading

<http://home.hiwaay.net/~krcool/Astro/moon/moontides/>

Lunar and Solar Eclipse Reading and Diagram

http://www.ducksters.com/science/physics/lunar_and_solar_eclipses.php

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Eclipse Reading

<http://www.nasa.gov/audience/forstudents/5-8/features/what-is-an-eclipse-58/#.VY65Neth0b0>

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Seasons Reading and Diagram

<http://spaceplace.nasa.gov/seasons/en/>

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Links to Space Science Lesson Plans

http://sunearthday.nasa.gov/2006/educators/lp_68.php

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Seasons Reading and Diagram

http://www.windows2universe.org/earth/climate/cli_seasons.html&edu=elem

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Rotation vs. Revolution Reading

<http://www.differencebetween.net/science/difference-between-earth's-rotation-and-revolution/>

Mapping the Sky Text

http://skyserver.sdss.org/dr1/en/astro/mapsky/mapping_the_sky.asp

Telescopes Reading

<http://science.howstuffworks.com/telescope.htm>

"In the Sky this Month"

<http://stardate.org/nightsky/bgide/what>

Eligible Content:

- S8.D.3.1.1 Describe patterns of earth's movements (i.e., rotation and revolution) in relation to the moon and sun (i.e., phases, eclipses, and tides)
- S8.D.3.1.2 Describe the role of gravity as the force that governs the movement of the solar system and universe.
- S8.D.3.1.3 Compare and contrast characteristics of celestial bodies found in the solar system (e.g., moons, asteroids, comets, meteors, inner and outer planets).

PA Standards

- 3.4.7.D. Describe essential ideas about the composition and structure of the universe and the earth's place in it.
- 3.4.7.D.1. Compare various planets' characteristics.
- 3.4.7.D.2. Describe basic star types and identify the sun as a star type.



- 3.4.7.D.3. Describe and differentiate comets, asteroids and meteors.
- 3.4.7.D.4. Identify gravity as the force that keeps planets in orbit around the sun and governs the rest of the movement of the solar system and the universe.
- 3.4.7.D.5. Illustrate how the positions of stars and constellations change in relation to the Earth during an evening and from month to month.
- 3.4.7.D.6. Identify equipment and instruments that explore the universe.
- 3.4.7.D.7. Identify the accomplishments and contributions provided by selected past and present scientists in the field of astronomy.
- 3.4.7.D.8. Identify and articulate space program efforts to investigate possibilities of living in space and on other planets.

Next Generation Science Standards

- 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.
- 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.

Enrichment Opportunity - Carver Science Fair

Encourage your students to conduct an investigation to enter into the Carver Science Fair this year. This Philadelphia tradition has been going for 37 years. Please see this website for more information: www.carversciencefair.org.

Additional Properties

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