7th Grade - Science - Unit 1: Astronomy

Unit: Science, Grade(s) 7
Astronomy: Space Science
Duration: 9 Weeks

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 does 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

click Resources
http://www.ck12.org/book/Physics-From-Stargazers-to-Starships/

click Resources
https://www.ck12.org/earth-science/History-of-Astronomy/

NASA educator materials
http://www.nasa.gov/audience/foreducators/index.html
Building a Scale Solar System
http://www.exploratorium.edu/ronh/solar_system/

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

Gravity Reading

Video on Earth’s Formation

Space Science Institute Resources
http://www.spacescience.org/educationresources.php

Tides Reading
http://home.hiwaay.net/~krcool/Astro/moon/moontides/

Lunar and Solar Eclipse Reading and Diagram

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

Seasons Reading and Diagram
http://spaceplace.nasa.gov/seasons/en/

Links to Space Science Lesson Plans
http://sunearthday.nasa.gov/2006/educators/lp_68.php

Seasons Reading and Diagram
http://www.windows2universe.org/earth/climate/cli_seasons.html&edu=elem

Rotation vs. Revolution Reading

Mapping the Sky Text

Telescopes Reading
http://science.howstuffworks.com/telescope.htm

"In the Sky this Month"
http://stardate.org/nightsky/bgguide/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.