

Science	SCI.V.4.2	Grade: 2
<p><u>Strand:</u> Using Scientific Knowledge in Earth Science - Galaxy and Universe</p> <p><u>Standard:</u> All students will describe and explain how objects in the solar system move</p> <p><u>Benchmark:</u> Describe the motion of the Earth around the Sun and the Moon around the Earth.</p> <p>Constructing & Reflecting:</p> <p>SCI.I.1.1 - Generate reasonable questions about the world based on observation.</p> <p>SCI.I.1.2 - Develop solutions to problems through reasoning, observation, and investigation.</p> <p>SCI.I.1.3 - Manipulate simple devices that aid observation and data collection.</p> <p>SCI.I.1.5 - Develop strategies and skills for information gathering and problem solving.</p> <p>SCI.II.1.1 - Develop an awareness of the need for evidence in making decisions scientifically.</p> <p>SCI.II.1.2 - Show how science concepts can be illustrated through creative expression such as language arts and fine arts.</p> <p>SCI.II.1.4 - Develop an awareness of and sensitivity to the natural world.</p>		
<p>Vocabulary / Key Concept</p> <ul style="list-style-type: none"> • Spin • Rotation • Orbit • Length of day • Nighttime • Daytime • Month • Year • Observed movement of the sun across the sky. • Observed movement of the Moon from day to day • Moon • Calendar • Revolve • Revolution 	<p>Context</p> <ul style="list-style-type: none"> • Describe the motion of the Earth around the Sun and the Moon around the Earth. • Outdoor observation of the earth’s and Sun’s motions. • Outdoor observation of the Sun’s and stars’ motions during the night and the Moon’s motion over several days. 	

Knowledge and Skills

Benchmark Clarification:

- The Earth travels around the Sun while the Moon travels around the Earth. This motion can be recorded on a calendar as months, years, and Moon's phases. The motion of one body around another body is called revolution/revolving. The path that the Earth and Moon take as they revolve is called an orbit.

Students will:

- Describe the motion of the Earth around the Sun as revolving in an orbit
- Explain that the motion of the Earth around the Sun follows a path called an orbit and can be measured as one year
- Describe the motion of the Moon around the Earth
- Explain that the motion of the Moon around the Earth follows a path called an orbit and can be measured as one month

Note: This motion is not rotation/rotating/spinning on an axis. The Earth spins on its axis once every twenty-four hours and is measured as a day or day and night. A entrenched misconception, present in college, is that rotation and revolution are synonymous. Having students spin in place and then walking around a central point are good ways to differentiate the two concepts. A fun activity is having students both spin and walk around a central point, mimicking the actual rotation and revolution of the earth around the sun.

Resources

Coloma Resources:

The big book and manual "Out in Space":
Solar System Poster

Books:

What Makes Day and Night?

Moon

Stars

Sun Model

Earth Model

Theme Units: (in Kits)

Gets Lost in Space

Out of this World

Videos

Other Resources:

- Michigan Teacher Network Resources
<http://mtn.merit.edu/mcf/SCI.V.4.E.2.html>
- NASA – Starchild – The Solar System – LOTS of information and games, beautiful site!
http://starchild.gsfc.nasa.gov/docs/StarChild/colar_system_level1/activity.html
- NASA kids – The Moon – EXCELLENT resource – current moon phase, games, planet info, and more!!!
<http://kids.msfc.nasa.gov/earth/moon/>
- NASA – Space link – Our Solar System – Curriculum Materials – OUTSTANDING resource! -
<http://www.spacelink.msfc.nasa.gov/Instructional.Materials/Curriculum.Support/Space.Science/Our.Solar.System/.index.html>
- Theology page – American Museum of Natural History – Astronomy – AWESOME site! EXCELLENT lessons, information, games, graphics and more!
<http://ology.amnh.org/astronomy/>

Instruction

Benchmark Question: Describe the motion of the Earth around the Sun and the Moon around the Earth.

Focus Question: How does the moon move around the Earth?

The teacher will pose the focus question.

Students, working in small groups, will design a model of how the Moon moves around the Earth.

Students will collect the materials they need and will create their models. Groups will have some time to practice how they will present their models. Teachers should avoid “correcting” misconceptions at this point.

Each group will present their model. After presentations, the class will discuss similarities and differences among the models. The teacher may guide discussion to correct student misconceptions through inquiry. Groups then will be allowed to alter their presentations and to make corrections. The groups then will present their models again.

Assessment

Students will draw and label a diagram of the earth’s rotation around the sun. Students will write about their drawing.

(Give students rubric before activity.)

Scoring Rubric

Criteria	Apprentice	Basic	Meets	Exceeds
Correctness of moon’s orbit	Draws moon’s orbit incorrectly.	Draws moon’s orbit correctly.	Draws moon’s orbit correctly.	Draws moon’s orbit correctly, and includes Earth’s orbit around Sun.
Completeness of labels	None/Few labels or title for diagram.	Some labels and title for diagram.	Many labels and title for diagram.	All labels and title for diagram.

Teacher Notes:

Describe and explain how objects in the solar system move.

Students often think that the phases of the moon are caused by the earth's shadow on the moon or by the shadow cast on the moon's surface by clouds. Modeling the position of the sun, earth and moon while the students observe the moon phases may help students understand how the system works together. In order to understand the phases of the moon, students also need to understand the idea that light reflects and that the moon is not its own source of light. Deep understanding of all these ideas is difficult for some students because of their lack of knowledge of the relative size, motion and distance of the sun and other solar system objects from the earth. Modeling of the earth, moon and sun may help students realize that the moon can be visible in the day as well as the night, depending on its position.

In order to understand the day/night cycle, students must first accept that the sun is stationary and that the earth turns on its axis. The apparent movement of the sun across the sky leads novice astronomers to think about the movement of the sun rather than the movement of the earth. This is not difficult to understand given that for 1500 years professional astronomers thought similarly. Common terms like sunrise and sunset support the idea that the sun moves around the earth.

Moving beyond the solar system, farther out into the universe, we know that students have difficulty understanding certain aspects of stars. They might assume that stars are all the same size and that the brightness of stars depends on how far they are from the earth. In fact, the brightness of most stars like our sun is more dependent on the mass of the star, larger stars burning brighter. Students also need to maintain their night sky observations to realize that the stars appear to move across the sky. The constellations visible in the night sky change as the seasons of the year change, due to the position of the Earth in its orbit. This cycle of constellations has been used for centuries as a means for navigation and telling time.

The movement of the solar system objects and of all objects in the universe is caused by gravity. Elementary students, in general, may not see gravity as a force and attribute the falling of objects to some feature of the object. High school students frequently have difficulty understanding the interaction of gravitational forces. These issues are critical when learning about the universe and must be attended to in teaching.

The scale of the solar system and the overwhelming immensity of the universe are difficult to understand. Young students and some adults find it hard to fully comprehend distances to other planets, or the sun. They may also not fully realize the enormous size differences among the planets in our solar system and other celestial bodies. The elementary and middle school years focus primarily on our solar system and the objects in it. Identifying the differences among the sun, the earth and the moon, understanding how the sun, the earth and the moon move together, comparisons of the earth to other planets, and describing how those other planets move with regard to the sun, are all critical ideas for the elementary and middle school years.

Discussion of the relative sizes of planets and distances between solar system objects is begun at the middle school level with the introduction of key concepts of relative size and relative distance. The high school student is prepared to discuss more abstract concepts regarding the universe. High school is the appropriate time to compare our sun to other stars and how to describe how our solar system moves in the universe. These concepts begin to build the idea of the age of the universe and methods used to determine that age.