Space Systems

Objectives

Students will investigate and understand that the planets have characteristics and a specific place in the solar system.

4.5.a planets rotate on their axes and revolve around the sun

4.5.b planets have characteristics and a specific order in the solar system

4.5.c the sizes of the sun and planets can be compared to one another

Our classroom kits include *Our Journey to Mars & Moon Activity Book* which was created through generous funding from the United States Air Force Office of Scientific Research in 2015. We include this activity book for students to complete specific pages that align with the VA Standards of Learning (SOL) for Science: Earth and Space Systems 4.5 & 4.6. The kit activities include activities and excerpts from our Mission Team programming.

Activity One from Exploring the Solar System Mission Team Plan
The solar system consists of an average star we call the sun, the eight planets Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, and Pluto. It includes the satellites (or moons) of the planets, numerous comets, asteroids, meteoroids, and the interplanetary medium like dust and gas, which permeates interplanetary space. On page 4 in the activity book, *Our Journey to Mars,* color and name the planets in order. To remember the order, try making a mnemonic device—a sentence that helps people remember something, often in a silly way.

Activity Two from Telescope Principles Mission Team Plan
Telescopes are used to study astronomical objects at large distances from Earth that are too dim to be seen or detected and/or too small or fuzzy to see details. Most modern observatories use reflectors because mirrors are lighter than lenses. Use the step-by-step instructions below to assemble a refractor telescope. A larger copy is provided so you can make copies for your students. Objects viewed will appear closer and upside down. There are five planets that can be seen with the naked eye from Earth: Mercury, Venus, Mars, Jupiter, and Saturn. On rare occurrences, all five can be seen at the same time. Students can observe these planets better with their refracting telescope. Galileo was able to see Venus with his.

Build a Telescope

What can you see?

Materials

Eyepiece container,
small ring,
small lens (eyepiece),
carboard tube,
large lens (objective)

Procedure

1. There are three pieces. Take the small lens and put it in the back end of the eye piece container.
2. Set the small ring on top of the eyepiece lens (it will only fit one way as it is graduated. If it doesn't go in easy, flip it around.) Snap the ring down in place. You have just completed the first lens. Place the eyepiece on the small cardboard tube.
3. Next, let's put together the objective lens. Insert the clear lens inside the back of the lens holder. Set the objective lens inside the lens holders.
4. Place the large objective lens cover to the telescope.

Space Systems Teacher's Guide

Objectives

VA SOL 4.6.
Students will investigate and understand that there are relationships among Earth, the Moon, and the sun.

4.6.a the motions of Earth, the Moon, and the sun.

4.6.b the causes for Earth's seasons

4.6.c the causes for the four major phases of the Moon and the relationship to the tide cycles

4.6.d the relative size, position, age, and makeup of Earth, the Moon, and the sun

Activity Three from Exploring the Solar System Mission Team Plan
The Sun is the only source of light in our solar system. It is a typical star. Its spectral classification is "G2 V." G2 means it is a yellow-white star, and the roman numeral V means it is a "main sequence" dwarf star (by far the most common) as opposed to supergiant, sub-dwarf, etc. While we see other stars in the sky, these are not in our solar system. Scientists are still discovering new stars and planets, but they believe the closest star to Earth is Proxima Centauri, the North Star, 4.3 light years away. Students can experiment with sunlight on a bright day, using the sun paper in this kit. ***Never look directly at the Sun!*** On a sunny day, use the sun paper in the kit, and make sun print pictures. First, collect items such as toys or nature items. If possible, place the paper on a book or cardboard and arrange the things on the paper in a dark place (this avoids light activating the paper). If available, place an acrylic sheet over it (but this is optional). Then, place the paper outside in direct sunlight. Wait five minutes. Your paper should turn white. Once it does, run the paper under tap water. Let dry.

Activity Four from Astronomy Mission Team Plan: Constellations are patterns in star clusters. For centuries, stories that explained the universe and influenced how people acted surrounded the patterns people saw in them. In ancient times, people believed they were animals and people placed in the sky. To help find constellations, make the planisphere (star finder) in this kit. Then, tell students to use their telescopes at night to see them closer.

Quick Facts about Telescopes

- In 1608, Dutch lens maker Hans Lippershey sought a patent for a telescope design. Some historians believe he stole the idea from another lens maker in his town, Zacharias Jansen or children playing nearby his shop.
- In 1609, Italian scientist and inventor Galileo Galilei popularized the telescope as a tool of astronomers. He used the telescope to make astronomical observations and discovered that the moon had craters, Venus had phases like our moon, Jupiter's moos, and sunspots. These discoveries supported such ideas as the planets orbiting the Sun; thus, changing the way people viewed the universe.
- Eighty years after Galileo, English astronomer and mathematician Sir Isaac Newton developed the reflector telescope. Instead of using a lens to gather light, Newton used a curved, metal mirror (primary mirror) to collect the light and reflect it to a focus.
- Scientists, however, faced problems with viewing celestial bodies from telescopes on Earth. Therefore, NASA built five Great Observatories to help scientists better understand the universe. They are the Hubble Space Telescope (HST), The Chandra X-Ray Observatory (Chandra), the Compton Gamma Ray Observatory (GRO), the Space InfraRed Telescope Facility (SIRTF), and most recently, the James Webb Space Telescope (JWT). The JWST was launched on December 25th, 2021, and is the largest, most powerful telescope ever to be launched.

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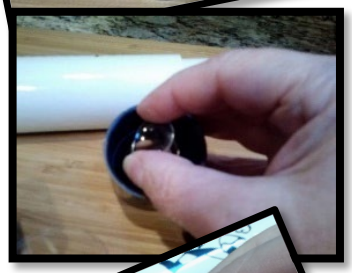

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The Federation of Galaxy Explorers is a 501(c)(3) non-profit organization that aims to educate, guide, and prepare the next generation to accept the challenge of expanding humankind's presence in space.

Our volunteers provide engaging space science and engineering programs to students in grade 3rd through high school. Through our programs, we promote space-flight awareness beginning at an early age and connect essential educational support figures and materials with students throughout their developmental paths. We focus on five Core Science Themes: rocketry, space citizenship, Earth science, engineering, and space science to address the fundamental aspects of STEM education throughout our programs. These themes help Explorers connect to the science and technology shaping their lives. Many of our alumni have continued to study at such colleges as MIT, Carnegie Mellon, and Embry-Riddle, to pursue STEM fields such as aerospace engineering, computer science, and computer engineering.

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