



Tested & Approved STEM Activities

# Space Science Programming

---

## Teacher's Guide

### Collaborate with us!

- Send students home with flyers or link to the library from your classroom website.
- Plan an event with us, or encourage students to volunteer!

Please contact \_\_\_\_\_ at \_\_\_\_\_ to discuss  
how we can work together to increase the community's STEM engagement!

# Classroom Connections

---

There are a variety of websites with space science activities for different grade levels:

- **NASA Wavelength:**  
Catalogue of activities and resources  
[nasawavelength.org](http://nasawavelength.org)
- **Lunar and Planetary Institute:**  
Educator Resources  
[www.lpi.usra.edu/education/resources/](http://www.lpi.usra.edu/education/resources/)
- **Project Spectra! @LASP:**  
Activities about light and spectra  
[lasp.colorado.edu/education/spectra/index.htm](http://lasp.colorado.edu/education/spectra/index.htm)



## Younger elementary students (K-2)

These students are eager to learn about space, and can:

- Listen to or read different cultural stories about the night sky.
- Observe changes in the sky—the daily motions of the Sun, the changing appearance of the Moon, and the appearance of planets such as Venus.
- Compare the physical properties of objects in the solar system, such as states of matter, temperatures, and sizes.

## Older elementary students (grades 3-5)

These students are able to integrate objects such as planets and stars into systems, and can:

- Model the sizes and distances of objects in the solar system, as well as their orbits.
- Categorize the planets, their moons, the comets, and asteroids as objects within the solar system, and stars as objects within the galaxy.
- Measure and record patterns of change in appearances of the Moon, the positions of the Sun during the day, and certain constellations in different seasons.

## Middle school students (grades 6-8)

These students are able to analyze spatially challenging concepts such as lunar phases and seasons, and can:

- Model lunar phases and seasons and describe their causes.
- Apply physical concepts of density, mass and gravity, and composition to objects within the solar system and galaxy.
- Compare characteristics of Earth and other planetary objects, such as interior structure, surface features such as volcanoes and craters, magnetic fields, and weather patterns.

# Student Research

---

Middle school and high school student may conduct their own research or science fair projects using online space science data, such as:

- **Eyes on the Solar System:** [solarsystem.nasa.gov/eyes/](http://solarsystem.nasa.gov/eyes/)  
Students can observe solar system objects and planetary missions and their positions in the solar system.
- **MicroObservatory Robotic Telescope Network:** [mo-www.cfa.harvard.edu/OWN/index.html](http://mo-www.cfa.harvard.edu/OWN/index.html)  
Students use a network of automated telescopes over the internet to investigate the wonders of the deep sky from their classrooms or after-school centers.
- **Zooniverse:** [www.zooniverse.org](http://www.zooniverse.org)  
This citizen science site provides opportunities for people around the world to contribute to real discoveries in fields ranging from astronomy to zoology.
- **JMARS:** [jmars.asu.edu/](http://jmars.asu.edu/)  
This site is a geospatial information system to provide mission planning and data-analysis tools to NASA's orbiters, instrument team members, students of all ages, and the general public.
- **Planetary Data System:** [pds.jpl.nasa.gov/tools/data-search/](http://pds.jpl.nasa.gov/tools/data-search/)  
A website that accesses a variety of catalogues with planetary data.
- **Galaxies and Cosmos Explorer Tool (GCET):** [www.as.utexas.edu/gcet/browser.html](http://www.as.utexas.edu/gcet/browser.html)  
Hubble images of background galaxies can be analyzed.
- **Exoplanets Encyclopedia:** [exoplanet.eu/catalog.php](http://exoplanet.eu/catalog.php)  
This catalogue of discovered planets is sortable by several different factors.
- **World Wide Telescope:** [www.worldwidetelescope.org/Home.aspx](http://www.worldwidetelescope.org/Home.aspx)  
This site utilizes images and data to explore high resolution images of the universe in multiple wavelengths.

## **Other Useful Websites:**

### **Solar System Exploration**

[solarsystem.nasa.gov](http://solarsystem.nasa.gov)

### **StarChild**

[starchild.gsfc.nasa.gov](http://starchild.gsfc.nasa.gov)

### **Amazing Space**

[amazingspace.org](http://amazingspace.org)

# Connections to Science Standards

---

The concepts and activities within the *STAR\_Net* space science exhibits and library programming resources connect to a variety of the Next Generation Science Standards.

## **Space Science: Disciplinary Core Ideas**

- **ESS1.A: The universe and its stars:**  
The solar system is part of the Milky Way, which is one of many billions of galaxies.
- **ESS1.B: Earth and the solar system:**  
The solar system contains many varied objects held together by gravity.

## **Science & Engineering Practices**

- Asking questions and defining problems
- Developing and using models
- Planning and carrying out investigations
- Analyzing and interpreting data
- Obtaining, evaluating, and communicating information

## **Crosscutting Concepts**

- Patterns
- Scale, proportion, and quantity
- Systems and system models.
- Structure and function

# Key Space Science Concepts

---

## How We Explore Space

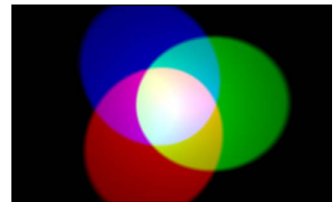
Scientists and engineers use a variety of methods to gather data about space:

- Telescopes, which use mirrors and lenses to collect light.
- Robotic missions to other places in our solar system.
- Instruments to examine magnetic fields, gravity, particles, light, and more.



## Light

- White light can be broken into different colors of the spectrum.
- There are some types of light that we can't see, including radio, infrared, ultraviolet, x-ray, and gamma rays.
- Our Sun and other stars give off all these different types of light.
- Examining details about light can tell us about an object's temperature, motion, composition, and more.



## The Solar System

- This includes the Sun and everything that orbits it: planets and their moons, asteroids, and comets, dust, and lots of empty space.
- The distances between the planets' orbits is very large compared to the sizes of the planets.
- Asteroids and comets can and have hit the Earth and other planets and moons throughout the history of the solar system, exploding and leaving craters.
- Meteorites are pieces of asteroids, comets, and other objects that have fallen onto Earth's surface.



Science-Technology Activities &  
Resources For Libraries

A product of the Science-Technology Activities and Resources for Libraries (STAR\_Net) program. Visit our website at [www.starnetlibraries.org](http://www.starnetlibraries.org) for more information on our educational programs. Developed by the Lunar and Planetary Institute/Universities Space Research Association November 2016



This material is based upon work supported by the National Science Foundation under Grant No. DRL-1421427. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation.