Integrating Space Science in the K-5 Curriculum

The physical science strand of the curriculum develops understanding of Earth, astronomical, and planetary systems.

Kindergarten Benchmarks:

- Ask questions that relate to the natural world.
- Describe similarities and differences in observations.

Sun Investigations:

1. Observe daily NASA image and count sunspots

First Grade Benchmarks:

- Identify basic phenomena (sun, moon, stars) and change in the sky (sunrise, sunset, seasonal).

Sun and Stars Investigations:

1. Observe the Sun
   - Identify features using the Astroscan, daily NASA solar image and sun poster
2. Explore the Milky Way
   - Compare the number of stars to grains of salt
   - Estimate the number of stars in the Milky Galaxy
     - Make a salt grain model of the galaxy
     - Find the Sun's place in the galaxy
     - Investigate the concept of scale by creating a personal galactic address

Second Grade Benchmarks:

- Understand light and sound behave in similar ways.
- Understand light travels and can be reflected, refracted, or absorbed.

Light Investigations:

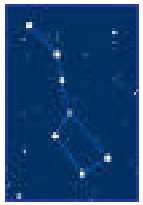
1. Make a spectroscope
   - Use diffraction grating to create rainbow glasses
   - Observe differences in the spectrum of light from different sources
2. Investigate invisible light using a television remote
3. Explore the Doppler effect
4. Find out why the sky is blue

Third Grade Benchmarks:

- Know common objects in the solar system and explain their relationships.
- Identify and describe the patterns of movement of objects in space.

Sun and Solar System Investigations:

1. Model the Solar System
   - Create a head to toe scale model
   - Compute distances for models at different scales
   - Build a stepping stone model
   - Find the weight of a can of soda on each planet
2. Observe the Sun
   - Record sunspot observations
   - Make a flipbook of sunspot observations to observe solar rotation
   - Estimate the size of sunspots
3. Identify features on the solar surface
4. Investigate the solar cycle to discover patterns in sunspot counts



Fourth Grade Benchmarks:

- Compare physical and chemical properties of matter, mixtures and compounds.
- Describe the composition, properties, functions, and processes of the atmosphere.

Stars and Solar System Investigations:

1. Investigate cosmic recycling
   - Identify different kinds of stars and their role in producing the elements on Earth
   - Play Star Power card games
2. Compare climate and sunspot activity
   - Learn how to use tree ring data
   - Evaluate connections between the solar cycle and climate change

3. Compare the weather systems of Mars, Earth and Venus
   - Make connections between weather factors: temperature, air pressure and humidity
   - Compare the composition of each planet's atmosphere
   - Model the planets' atmospheres

Fifth Grade Benchmarks:

- Understand concepts associated with moving objects and describe their interactions.
- Identify various types of energy and describe how it is transferred and transformed.

Stars Investigations:

1. Investigate black holes
   - Compare features to familiar objects
   - Model effect of gravity on moving objects
   - Demonstrate the law of conservation of angular momentum

Resources for Implementing Investigations

Every CFSD elementary school library homepage has INVESTIGATIONS IN SPACE SCIENCE as a hot button link.

Online Resources

http://www.cfsd.k12.az.us/~vvwww/hotspots2.html

- Lesson plans
- Print ready posters, activity sheets, and playing cards
- List of web links by topic for student research and teacher information
- Interactive activities to extend learning

Materials and Equipment

(available for checkout at Ventana Vista Library)

- 4 Astroscan telescopes for sunspot observations
- Solar filter equipped Celestron telescope for solar surface observations

- Celestron NexStar8 telescope with GPS and computer driven mount for locating objects in the night sky
- *Starry Night* software for real and virtual observations
- Specialty materials for demonstrations and for stepping stone solar system model.

www.cfsd.k12.az.us/~vvwww/SUNWEB/NASA%3ACFSD.html

Opportunities for Space Science Collaboration

Assistance with implementation and training is available by request.

Principal Investigator
Jill Bechtold,
UA Department of Astronomy

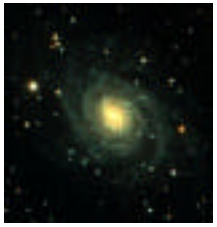
Chandra X-ray Center

CFSD Team

Members
Charlotte Ackerman, Sunrise Drive School
Jennifer Barnes, Sunrise Drive School
Aura Flora, Sunrise Drive School
Karissa Hagler, Canyon View School
Caryl Jones, Ventana Vista School
Rick Porter, Sunrise Drive School
Colette Price, Ventana Vista School

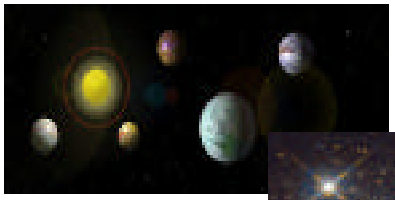
Inservice Training

- Scholarships to UA Astronomy Camp for Educators.
- Summer workshop to develop materials.



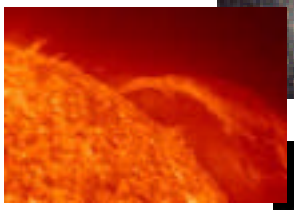
Investigations In Space Science

A Guide to K-5 Implementation



Solar System

Stars



Light

Sun

For the past three years teachers from the Catalina Foothills School District have received NASA Education and Public Outreach grant funds to create opportunities for students to:

- **Connect classroom learning to real life research questions;**
- **Develop skill in data collection and analysis;**
- **Access extraordinary information resources;**
- **Pose new questions to extend learning;**

This collaboration has resulted in a collection of classroom space science investigations that address national and state science standards and district content area benchmarks.