

# PUBLIC UNDERSTANDING OF PLANETARY SCIENCE

12 March 2006  
Lunar and Planetary Institute  
Houston, Texas

## *A Few Resources*

<http://cfa-www.harvard.edu/sed/resources.html>

Resources from the Science Education Department of the Harvard Smithsonian Center for Astrophysics, including:

### **A Private Universe (K-12 science)**

<http://www.learner.org/resources/series28.html>

A powerful collection of video clips of students' astronomical ideas (seasons and moon phases) and how they change (or don't) with classroom instruction.

### **Minds of Our Own (K-12 science)**

Video presentation of students' surprising preconceptions about science concepts (atmospheric gases, photosynthesis, light, electricity) and new educational approaches to developing deeper science understanding. (Private Universe Project in Science video series including Minds of Our Own and other resources: <http://www.learner.org/resources/series29.html>)

### **Beyond the Solar System: Expanding the Universe in the Classroom (8-12 science)**

<http://universeforum.org/btss>

Video exploration of the structure and evolution of the universe and the nature of science designed for 8-12 educators and their students. The video includes clips of students preconceived ideas about stars, galaxies and the Big Bang, exploration of the science concepts, classroom strategies, and extensive resources.

### **Digital Video Library**

<http://www.hsdvl.org>

The Science Media Group offers an extensive collection of digital video materials to enhance the understanding and teaching of K-12 learning goals. Video clips include clinical interviews with students (friction, light, gravity, electricity, the human heart, and more), demonstrations, case studies of research and instruction, and interviews with experts. The materials are searchable and can be correlated to state and national standards.

### **Private Universe Project "Teachers Lab"**

<http://www.learner.org/teacherslab/pup/>

Designed for classroom teachers, this site begins with a 5-question conceptual assessment survey of the visitor's ideas about lunar phases and seasons. The information is presented with a discussion of typical responses. Classroom activities are presented and a forum is available for educators to share their questions, ideas, and experiences.

### **Essential Science for Teachers: Earth and Space Science**

<http://www.learner.org/resources/series195.html>

These professional development materials for K-6 educators explore Earth and space science through real-world examples, demonstrations, animations, and interviews with scientists. In-depth interviews with children uncover their ideas about the topic at hand. The eight one-hour video programs are accompanied by print and Web materials that provide in-class activities and homework explorations.

**How Do Visitors Understand the Universe?:** Dussault, M., 1999, Association of Science Technology Centers Newsletter,  
<http://www.astc.org/resource/visitors/universe.htm>

A growing body of educational research has convincingly shown that many people—adults and children alike—hold inaccurate (but not essential) ideas about basic astronomical concepts ... It is important, first, for creators of educational experiences to be aware of students' alternative ideas, and second, to treat these ideas not as unfortunate errors, but rather as stepping-stones to scientific understanding. Students must be given concrete experiences and opportunities to grapple with their own theories directly by manipulating models and by discussing their ideas with others.

**Astronomy and Space Science Concept Inventory: National Student Assessment Project:** Sadler, P. et al., in preparation.

<http://www.mos.org/nessie/education-research.php>

Astronomy education research articles from the New England Space Science Initiative in Education, including:

**Learning About the Earth's Shape and Gravity: A Guide for Teachers and Curriculum Developers:** Agan, L. and Sneider, C., 2004, The Astronomy Education Review, Volume 2, p. 90-117.

<http://aer.noao.edu/AERArticle.php?issue=4&section=2&article=4>

The scientific model of the Earth in space--consisting of the spherical Earth and gravity concepts--is one of the first models that children encounter in their science classes. Children's understanding of these concepts is essential for further conceptual development in astronomy. This article provides a thorough review of educational research concerning children's development of Earth shape and gravity concepts in the context of national standards and the history of science. Based on this review, the authors recommend instructional approaches at appropriate grade levels to enable students to fully grasp these fundamental concepts.

**Learning about Phases of the Moon and Eclipses: A Guide for Teachers and Curriculum Developers:** Kavanagh, C., Agan, L., and Sneider, C., 2005, The Astronomy Education Review, Volume 4, p. 19-52.

<http://aer.noao.edu/AERArticle.php?issue=7&section=2&article=2>

Misconceptions about Moon phases and eclipses are widespread and resistant to change, even among adults. In the most prevalent misconception, children and adults confuse the explanations for phases and eclipses by assuming that lunar phases occur when the Moon enters the Earth's shadow. Research has found approaches based on a constructivist view of learning to be very effective with students in grades five and above. While much research needs to be done, the studies reported here offer ideas for how teachers and curriculum developers can help students achieve the goals outlined in the National Science Education Standards.

*Coming Soon:*

**The Reasons for the Seasons**

**Stars, Galaxies, and the Universe**

**Earth, Moon, and Stars:** Sneider, C., 1998, GEMS Series, Lawrence Hall of Science, University of California, Berkeley

In this research-based classroom module, children in grades 5-8 explore the Earth, gravity, and astronomy (moon phases, eclipses, stars). The activities involve real-world sky gazing, modeling, and assessment.  
<http://www.lawrencehallofscience.org/gems/GEM250.html>

**Science and Engineering Indicators 2006 - Chapter 7: Science and Technology: Public Attitudes and Understanding**

<http://www.nsf.gov/statistics/seind06/c7/c7h.htm>

**Bad Astronomy**

<http://www.badastronomy.com/index.html>

This is the ultimate stop for discussion of a wide variety of misconceptions and analysis of bad astronomy (and good) in the movies, news, and television. The huge number of topics presented include why we have seasons, Moon phases, astrology, the Apollo Moon landings (yes, we did go to the Moon), bad idioms, standing an egg on end during the vernal equinox, and more!

**Astronomy Education Review**

<http://aer.noao.edu/>

A free, online resource for those interested in astronomy and space science education. Articles explore educational research, teaching strategies, useful resources, and more. The site also includes conference announcements and other opportunities. Article submissions are welcome.

**Making Sense of Secondary Science: Research into Children's Ideas:** Driver, R., A. Squires, P. Rushworth et. al., 1994, Routledge.

**Understanding Models in Earth and Space Science:** Gilbert, S. and Ireton, S., 2003, NSTA Press, Washington, D.C., 124 pages.

Using models is a common form of communication in education. This guide helps science teachers present complex concepts through multiple models; develop students' awareness of the way they think, learn, and communicate through models; engage students in actively building and analyzing models of the systems they study; and involve students in refining models.

Comins, N., 2001, **Heavenly errors: Misconceptions about the real nature of the Universe:** Columbia University Press, New York.

University professor Comins shares over a thousand astronomical misconceptions and explores the nature of misconceptions, how and why we acquire them, and ways to avoid them.