

ARES Education and Public Outreach

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<http://ares.jsc.nasa.gov/ares/education/index.cfm>

Local Education and Outreach

The ARES Directorate education team is charged with translating the work of ARES scientists into content that can be used in formal and informal K-12 education settings and assisting with public outreach. This is accomplished through local efforts and national partnerships. Local efforts include partnerships with universities, school districts, museums, and the Lunar and Planetary Institute (LPI) to share the content and excitement of space science research. Sharing astromaterials and exploration science with the public is an essential part of the Directorate's work. As a small enclave of physical scientists at a NASA Center that otherwise emphasizes human space operations and engineering, the ARES staff is frequently called upon by the JSC Public Affairs and Education offices to provide presentations and interviews. Scientists and staff actively volunteer with the JSC Speaker's Bureau, Digital Learning Network, and National Engineers Week programs as well as at Space Center Houston activities and events. The education team also participates in many JSC educator and student workshops, including the Pre-Service Teacher Institute and the Texas Aerospace Scholars program, with workshop presentations, speakers, and printed materials.

ARES scientists and staff attend local science fairs and give presentations at many schools, often bringing lunar and meteorite displays and images of Earth from space. Scientists mentor university faculty and students in programs sponsored by the NASA education and equal opportunity offices as well as LPI. The staff frequently provides tours of ARES research and curatorial laboratories to JSC personnel and visitors.

The ARES education team has strong partnerships with other institutions and participates in a variety of solar system educator workshops, staff presentations, and the Science Mission Directorate (SMD) Planetary Education and Public Outreach Forum. ARES education staff also present workshops for the Texas Space Grant Consortium (figure 1).

National Partnerships

Programs with a national reach are an important vehicle for ARES education efforts. With funding from the NASA Discovery and New Frontiers Mission Program, the Lunar and Meteorite Sample Education Disk Program, and SMD Education, the ARES education team is an active member of the NASA space science education community. The team is involved in the following national efforts to reach formal and informal educators:

- Providing content for NASA's Earth Observatory Web site
- Affiliation with Girl Scouts USA and the NASA Girl Scout Core Trainers

- Participation in educator workshops in conjunction with the Discovery and New Frontiers Program
- Organization of NASA Space Science Day Events
- Organization of classroom connection webinars and educator workshops offered through the Expedition Earth and Beyond Program



Figure 1.– Educators experience hands-on activities to share in their classrooms.

ARES continues to have a presence at state and national venues to provide science educators and after-school educators with workshops focused on ARES Directorate solar system exploration and research on topics including asteroids, the Moon, and Mars.

ARES Continuing Education Projects

ARES has five continuing education projects that reach a national audience – Earth Observations Education and Public Outreach, the Lunar and Meteorite Sample Education Disk Program, Expedition Earth and Beyond, NASA Discovery Program Education, and NASA Space Science Day continue to serve a large national audience.

Earth Observations Education and Public Outreach

Astronaut photography of Earth is extremely popular with students, teachers, and the general public, and this excitement is used to leverage interest in science and exploration. The ARES Directorate provides at least one annotated human spaceflight image per week to Earth Observatory, NASA's

flagship Earth science education Web site, at <http://earthobservatory.nasa.gov>. More than 1 million astronaut photographs of Earth are downloaded by educators and the public each month from the Gateway to Astronaut Photography of Earth, <http://eol.jsc.nasa.gov>. The photographs have proven to be popular with students, teachers, and the general public, and the site has received numerous educational citations.

Lunar and Meteorite Sample Education Disk Program

The Lunar and Meteorite Sample Education Disk Program is a long-standing program for the entire country. The program, which is available to schools, museums, planetariums, and libraries throughout the country, offers the loan of six lunar or meteorite samples encapsulated in a 6-in. diameter, clear Lucite disk to educators certified in the use of the samples. Distribution of the disks has made it possible for millions of people to examine the Apollo lunar and meteorite samples. The educational sample disks are accompanied by educational materials, including a teachers' guide and image support.

Certification and training of educators are an integral part of the program to borrow the disks. The ARES education team serves as trainers, delivering scientific background information, hands-on activities, and security information to NASA Aerospace Education Services Project (AESP) specialists and NASA Education Resource Center (ERC) educators, who prepare educators to use the disks. The nationwide Lunar and Meteorite Sample Education Disk Program is currently managed by the ARES Directorate.

Expedition Earth and Beyond

Expedition Earth and Beyond (EEAB) is an inquiry-based student geosciences program developed and led by the ARES Education Program. The program facilitates student-led, authentic research investigations that promote the study of Earth and planetary body comparisons.

EEAB uses astronaut photographs of the Earth collected during Space Shuttle missions as part of the ARES International Space Station (ISS) Crew Earth Observations (CEO) payload; the photographs are available online at the Gateway to Astronaut Photography of Earth Web site, <http://eol.jsc.nasa.gov>. The program provides a classroom-friendly structure that allows teachers in grades 5–12 to use these stunning images of Earth as part of research conducted in the classroom (figure 2). Student teams can also request that astronauts on the ISS acquire new CEO imagery that supports their research (figure 3). Students not only obtain and use current NASA data but actively participate in current NASA exploration.

ARES scientists also communicate directly with student teams to mentor them throughout their research, helping students as they conduct their research and providing a great motivational tool. Students share and present their research “live” to ARES and other participating scientists using distance-learning technologies. Experiences provided through EEAB allow students to model the process of science and help prepare them to become NASA's next generation of scientists and explorers.



Figure 2.— Students work on a research investigation.



CHARLESTON MIDDLE SCHOOL TEAM IMAGE

Juan de Nova Island and Reef, Mozambique Channel

Image ID: ISS027-E-11429 Acquired 4/19/11

Image courtesy of Crew Earth Observations and Image Science & Analysis Laboratory,
NASA Johnson Space Center



Figure 3.— CEO image acquired for a student research team.

Educator professional development workshops train hundreds of teachers to use inquiry-based, standards-aligned curricular materials designed to help students model the scientific process (figure 4). These materials enable teachers to replace previously used classroom curricula with more engaging, relevant, and inspiring activities that use the excitement of current exploration as the hook. Activities are designed to help students model the skills and practices used by Science, Technology Engineering, and Math (STEM) professionals.



Figure 4.– Teachers build a planetary comparison feature wall at the EEAB educator workshop.

Through EEAB, classrooms across the nation can connect with ARES scientists in several ways. Classroom connection webinars enable ARES scientists to conduct interactive presentations that allow participants to increase their knowledge of Earth, planetary comparisons, and science being conducted within the ARES Directorate. Webinars have focused on such topics as using Earth to make planetary comparisons, studying volcanos on Earth and in the solar system, viewing aurora from space, and more. To highlight ARES participation in the Mars Science Laboratory (MSL) mission, numerous webinars connected ARES with thousands of students across the nation (figure 5).

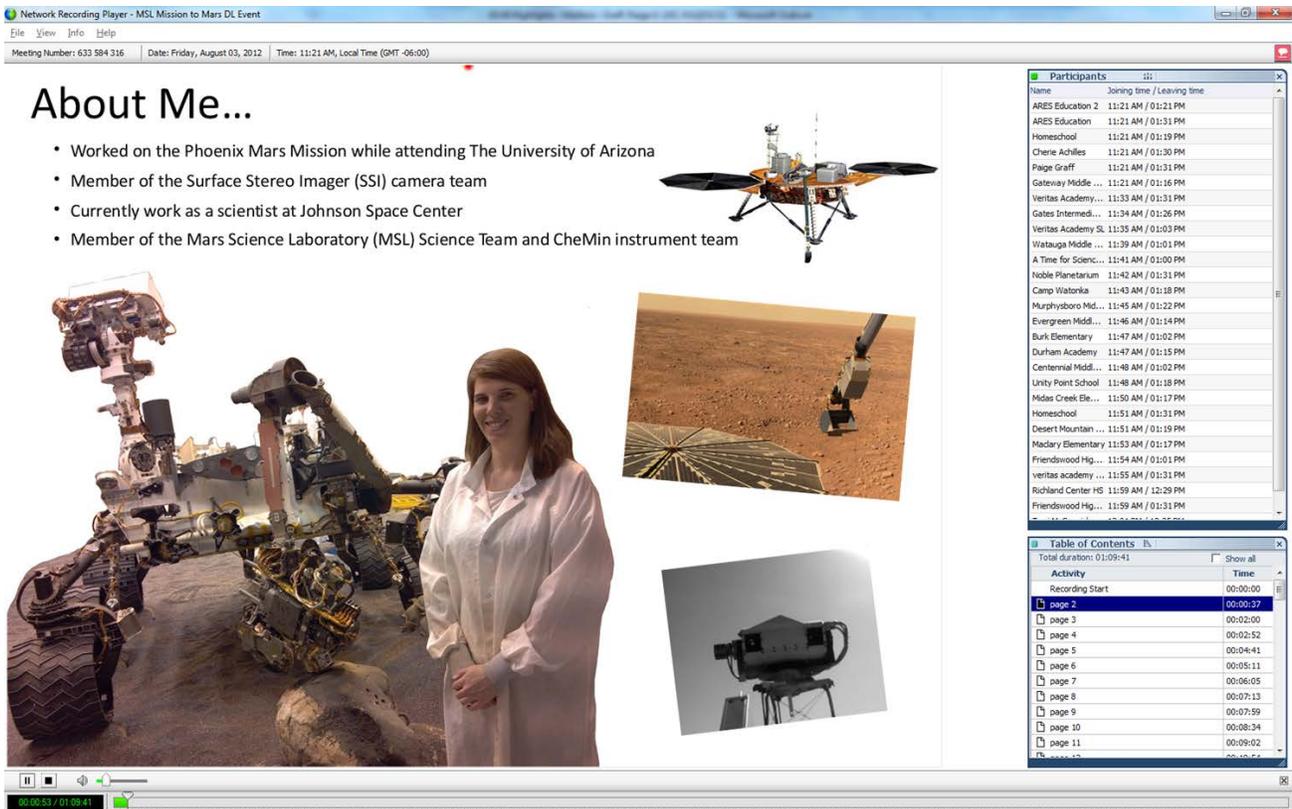


Figure 5.– Connecting scientists with classrooms.

NASA Discovery Program Education

Through educator workshops and student events, ARES staff shares the excitement and challenge of NASA’s robotic exploration with teachers, students, and the public. The workshops and events endeavor to showcase ARES scientists and engineers working on exploration missions.

NASA Space Science Days

NASA Space Science Days (NSSD) are undergraduate-mentor-led educational outreach programs that expose middle school students to STEM-related SMD educational products based on an upcoming science mission such as a current Discovery mission. ARES’ partners in this endeavor are

- The University of Texas at Brownsville and Texas Southmost College (UTB/TSC) – South Texas Engineering Math and Science Program
- Society of Hispanic Professional Engineers (SHPE) – Foundation
- International Ultraviolet Association (IUVA)

To accomplish this, the following five rotating components occur each year:

- **Mini-information training sessions at SHPE’s National Institute for Leadership Advancement (NILA) conference held in August.** These sessions are held to recruit new SHPE student and professional chapters. SHPE requires all chapter officers to attend its annual 3-day

intensive leadership training, and NSSD has taken advantage of the event to expose all SHPE chapters to NSSD goals. NSSD also solicits proposals from chapters interested in having NSSD host an event in their communities.



Figure 6.– SHPE student leaders at NILA describing lunar and Martian soil simulants.

- **Science content mentor training.** Mentor training is held at JSC every year in December; two students from each past and future NSSD site attend a 2-day workshop conducted by ARES. Mentors attend lectures and tour laboratories to learn about ARES and prepare them to give presentations using a thematic approach to the content and related hands-on activities.



Figure 7.– Mentor science content training at JSC.

- **The original NSSD event at UTB/TSC.** The original NSSD event is held at the UTB/TSC campus in Brownsville, Texas, each January. The event, now in its 10th year, allows new mentors to see how the program works and actively participate in the mentoring process. About 700 fifth and eighth graders from the Texas Rio Grande Valley school districts attend the event.



Figure 8.— Local fifth graders use remote imaging data to show NSSD mentors where they would land on Mars.

- **Teacher-mentor training workshops at all NSSD sites are selected from proposals submitted by candidate host sites.** Upon selection of the NSSD host site, which is typically a local university, a teacher-mentor training workshop is held approximately 2 months prior to the NSSD event. SMD products are distributed to local middle school teachers, and the teachers are trained to participate in the event. Mentors from a local university and some upper-level high school students are also trained to lead hands-on activities.



Figure 9.— Teachers compare planet sizes using various fruits and spices as models.

- **National NSSD events.** NSSD host sites are awarded through a proposal-review process after NILA. Currently, there are six NSSD sites nationwide, with two sites celebrating their third annual NSSD event at their university.



Figure 10.— Students from Cache County, Utah, eagerly wait to view lunar and meteorite educational disks through a microscope.

Publications

The following activities and education packages have been developed and published by the ARES Directorate in collaboration with classroom educators. The presentation of accurate science through hands-on learning experiences is a hallmark of the ARES education team.

- Blue Marble Matches
<http://ares.jsc.nasa.gov/ares/eeab/BMM.cfm>
- Destination: Mars!
<http://ares.jsc.nasa.gov/education/activities/destmars/destmars.htm>
- Expedition Earth and Beyond Student Scientist Guidebook
<http://ares.jsc.nasa.gov/ares/eeab/SSG.cfm>
- Exploring Meteorite Mysteries
<http://ares.jsc.nasa.gov/education/activities/expmetmys/expmetmys.htm>
- Mars Soil Sleuths
<http://ares.jsc.nasa.gov/education/index.cfm>
- Modeling the Solar System
http://ares.jsc.nasa.gov/Education/pdf_files/ModelingSolarSystem.pdf
- Oh, What A Pane!
<http://ares.jsc.nasa.gov/ares/eeab/WAP.cfm>
- Spheres of Earth
<http://ares.jsc.nasa.gov/ares/eeab/SOE.cfm>