THE ARIZONA MARS K-12 EDUCATION PROGRAM: OUTREACH FOR MARS GLOBAL SURVEYOR, MARS PATHFINDER, AND OTHER MISSIONS.
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Summary: The Arizona Mars K-12 Education Program provides opportunities for direct interaction between K-12 teachers, students, and the scientists and engineers who are involved with the Mars Global Surveyor and Mars Pathfinder missions. Student visits to the Mars Global Surveyor facility at Arizona State University (ASU), K-12 teacher workshops, and supplementary education and mission update materials were the primary activities in 1994. Interested educators have witnessed the transition from Mars Observer to the new Mars missions through an on-going workshop series, Internet communications, and a newsletter, TES News. In 1995, the program is continuing the previous themes and expanding to incorporate development of classroom materials and continued exposure to the latest news in planetary science and Mars exploration through the on-going teacher workshop series. The program has a growing list of educators who live/teach outside Arizona.

Introduction: Partnerships and direct interaction between research scientists and K-12 educators and their students are strongly encouraged by most science education reform efforts [e.g., 1, 2]. The Arizona Mars K-12 Education Program began in mid-1992 as an effort to bring the real-time experience of Mars Observer's Thermal Emission Spectrometer (TES) project to the students and teachers of Arizona [see 3]. In 1994, the education program provided information and interaction between students, teachers, scientists, and engineers involved with the Mars Global Surveyor and Mars Pathfinder missions. Both programs have the direct involvement of science teams based in Arizona (Mars Global Surveyor TES and Mars Pathfinder wind socket experiment at ASU; Imager for Mars Pathfinder (IMP) at University of Arizona [4, 5]).

Mars in K-12 Education: Mars and planetary exploration provides an exciting and coherent interdisciplinary theme for enhancing K-12 education. The 1994 National Science Teachers Association convention in Anaheim, California, featured no less than 10 teacher workshops devoted specifically to the theme of integrating Mars into the K-12 classroom [6]. The interest is also manifested in the demand for education products with a Mars theme, such as the Challenger Center for Space Science Education "Marsville" and "Mars City Alpha" kits [7] and the "MarsLink" kits from the Planetary Society. Using Mars to integrate math, science, social studies, literature, art, and other subjects is even better when there is a real mission to Mars underway. In late 1996, two U.S. spacecraft (Mars Pathfinder and Mars Global Surveyor) will launch toward Mars. Each will represent the culmination of significant engineering, financial, and political challenges to build spacecraft "better, faster, and cheaper." The educational opportunity for the next two years is to present the process of developing these new Mars missions in the context of our present understanding of the planet.

Activities in 1994: The Arizona Mars K-12 Education Program in 1994 focused on several means of direct interaction between K-12 students, teachers, and the people involved in Arizona with the new missions to Mars. The main activities were: (1) student visits to the TES facility on the ASU campus, (2) K-12 educator workshops, (3) a newsletter, TES News, (4) development of the 1994-1995 Education Supplement and Guide, and (5) placement of Mars information and educational material on the Internet World Wide Web. During the year, 100 to 800 students per month visited the TES facility. A typical visit consisted of 30 minutes of discussion, hands-on activity, and instruction with a member of the TES group. Two teacher workshops were held, continuing a twice-yearly series begun in February 1993. The February 5, 1994, workshop included discussion of the process which unfolded after Mars
Observer was lost (both the investigation of causes and the scramble to recover the lost science) and an introduction to the Internet and World Wide Web. The February workshop also featured D.G. Blumberg speaking on the SIR-C radar mapping mission and J.W. Rice, Jr., who shared his experience in the joint Russia-U.S. Antarctic expedition to the Bunger Hills Oasis in 1991-1992. The August 20, 1994, workshop featured the latest news about the Mars Global Surveyor, Mars Pathfinder, and international Mars 96 and Mars 98 missions. A hands-on activity derived from the GEMS Oobleck kit [8] was used to consider the difficulties in landing a spacecraft on another planet, and thus served as a lead-in to Mars Pathfinder. L.D. Friedman of the Planetary Society was a guest speaker at the August workshop, and spoke on the topic of international Mars missions in 1996-2005. The 1994-1995 Education Supplement and Guide was available for the workshop, and included information about the new Mars missions, a Mars reading list, plus resources available from NASA and others. Both workshops included hands-on sessions led by K-12 teachers who had developed Mars-related instructional material for their classroom.

Activities Planned for 1995: The fifth K-12 teacher workshop, part of the continuing series that allows teachers to keep abreast of developments in Mars, Earth, and planetary sciences, was planned for February 4, 1995. The sixth workshop will occur in August 1995. K-12 student visits to the TES facility will continue in 1995. The program will expand to include monthly visits to rural school systems to present Mars Pathfinder and Mars Global Surveyor information. Development of new "MarsLink" education kits, a project initiated by the Planetary Society in 1993, is planned to become an activity of the Arizona Mars K-12 Education Program. Other events for 1995 are in early planning stages as of this writing.

For More Information: Contact the address above or at edgett@esther.la.asu.edu. K-12 educators can be placed on the mailing list to receive the newsletter, TES News, and workshop announcements. The 1994-1995 Education Supplement and Guide can be obtained for a fee that covers photocopy costs. Anyone can access the newsletter, education guide, and other material including Mars Global Surveyor and Mars Pathfinder news updates, via the Internet World Wide Web URL http://esther.la.asu.edu/asu_tes/. Research science teams interested in holding teacher workshops should read advice in our companion abstract [9].

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