

TELLING THE TALE OF TWO DESERTS: TEACHER TRAINING AND UTILIZATION OF A NEW STANDARDS-BASED, BILINGUAL E/PO PRODUCT.
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Overview: "A Tale of Two Deserts" is a set of educational exercises that introduces educators, students and the public to water-formed features in desert environments on Earth and potentially similar landforms on Mars [1]. These computer-based exercises familiarize educators and students with landforms important to NASA's "follow the water" strategy for Mars exploration to help them share more actively in the discoveries from ongoing and future Mars missions. The exercises are student-centered, inquiry-based, include a hands-on modeling component, and have been designed in direct alignment with state and national science teaching standards (e.g., the National Research Council's National Science Education Standards).

The exercises synergistically combine satellite images of desert landforms on Earth with those from ongoing Mars missions (e.g., Mars Global Surveyor (MGS) and Mars Odyssey), with imminent updates using newly acquired Mars Express and Mars Exploration Rovers (MER) data). Climate data from Earth and Mars are also included to allow users to explore the stability of water and landforms on both planets.

Previous distribution of these exercises has been via CD-ROM, but the exercises are currently available for downloading in English and Spanish language versions at <http://europa.la.asu.edu:8585/PGG/education/activities>. Teacher training and dissemination efforts are currently in high gear and will continue at an increasing pace.

Background: Access to spacecraft images of planetary landforms, particularly those of the surface of Mars, has become increasingly easy through the Internet. Beginning with the Mars Pathfinder mission in July 1997, NASA

has been posting images to the Worldwide Web within hours to days of acquisition. This has continued with the MGS, Odyssey, and MER missions, and with the ESA-sponsored Mars Express mission. These missions have produced a wealth of images for educator use, but often with little or no information to tie these images to comparable-format images of similar landforms on Earth. Indeed, a web search for "sand dunes" is likely to turn up more "hits" for Mars mission data than for earth-based information. In addition, most images of Earth available on the Web are in color; they often have little or no annotation providing scale information, and are commonly surface-based rather than aerial or satellite images. This has historically made it very difficult for educators to fully utilize the wealth of the Mars images in their earth and space science courses. Our project has striven to fill this void.

Training and Dissemination: A major goal of this project was to create a unique, innovative and user-friendly set of standards-based educational exercises that will encourage teachers to incorporate new NASA Mars image data into their science lesson plans. Now that the exercises exist in both English and Spanish language versions, and can be used online or downloaded to classroom computers, we have entered the dissemination phase of this project in earnest. Over the past 16 months, we have conducted four teacher-training seminars (two of which included real-time videoconferences) in both Phoenix and Albuquerque (Figs. 1 and 2). Over 80 educators (both pre- and in-service) have participated directly in these seminars to date. A majority of the in-service teachers have used or are currently

using the exercises and are sharing them with colleagues at their home institutions. Many of these schools include significant underserved and/or underrepresented school populations, including Hispanic and Native American populations.

Future Work: The focus for continuation of this project over the next 16 months and beyond will be to maximize the exposure, availability and usage of these exercises via seminars, word-of-mouth and the Internet. To this end, we will conduct a bilingual videoconferenced training seminar in early 2004, as well as a seminar at the 2005 National Science Teacher's Association (NSTA) Annual Meeting. Efforts are also being made to establish links through ongoing Mars mission homepages and other educational product sites. Finally, in order to take full advantage of the current high visibility of Mars science and the new orbital and surface images being released by several ongoing missions (MGS, Odyssey, Mars Express and the twin MERs), we will be adding new Mars landform images, along with Earth analog localities. This will allow us to maintain the currency and relevance of these exercises for use in school classrooms.

Summary: Training and dissemination of these exercises continues, in an expanded fashion, and now includes Spanish language resources. Many dozens of educators, and over 1000 students are using these exercises, and downloads of the exercises via the Internet continue at an increasing rate. Efforts are in the works to increase the availability and educational community awareness of these exercises by establishing links on current Mars mission and other educational outreach product homepages. The exercises will be presented at upcoming national conferences, and new images are being incorporated into the downloadable versions of the exercises to maintain their currency and relevance (and, hence,

encourage their use) at this time of very high interest in multiple ongoing Mars exploration missions.

Comments, inquiries and requests for copies of the exercises should be sent to the authors at: kadel@asu.edu.

Reference: [1] Kadel, S.D. *et al.* (2003) *LPSC XXXIV*, 1020.



Figure 1. Educators at the Tale of Two Deserts training seminar at Arizona State University in November 2003.



Figure 2. Educators creating layered terrain models for later erosion during the Great Desert seminar at the University of New Mexico in July 2003.