

THE MARS EXPLORATION STUDENT DATA TEAMS: CONNECTING STUDENTS TO AUTHENTIC RESEARCH OPPORTUNITIES UTILIZING DISTANCE LEARNING STRATEGIES

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Introduction: The Mars Exploration Student Data Teams (MESDT) program, created by Arizona State University's Mars Education Program, focuses on immersing teams of high school students in an authentic research STEM-based experience. MESDT is designed to allow the students to be direct participants in the scientific process. MESDT was created to work within the infrastructure of any planetary science mission and to provide a valuable resource for mission scientists as they analyze an increasing volume of data. Our beta-test worked with the scientists and engineers of the CRISM instrument onboard the Mars Reconnaissance Orbiter currently in orbit around Mars. Students follow the same process of the Mars mission participating scientists: 1) teams received CRISM tiles to import into REACT (the software used to analyze CRISM data); 2) teams then select mineral spectra to focus on for data collection; 3) make either point target suggestions or polygon target selections based on established criteria; 4) upload 2-3 target suggestions to the master list for CRISM targeting; 5) once an image is taken, the teams receive the image and confer with a science mentor to analyze the data; and 6) write up and potentially post their findings and results on the MESDT website. The Mars Exploration Student Data Teams allows the student teams to take ownership during each step of this process by the students making the research choices, choosing the image target, working through the data analysis, and determining their results with the help of mentor scientists associated with the instrument.

The Mars Exploration Student Data Teams program has been in existence since the October 2002 when students analyzed data sets prior to the landings of the Mars Exploration Rovers. The program was revamped in Spring of 2006, and in February 2007 students began to work with data from CRISM. Four teams from around the country were selected to participate in the development and implementation phase to work out any issues that may arise during the process of participation. By design, MESDT utilizes a heavy distance learning component to communicate with teams, implement strategies, train students on the use of software, and discuss specifics regarding Mars exploration. As a

result, MESDT has evolved into a much broader and deeper cutting-edge educational experience.

Because of the flexibility of the being able to conduct trainings and meetings through distance learning methods, teams can implement the program within their school schedules as necessary. The Distance Learning component has provided an opportunity to MESDT teams to enhance and supplement the connectivity of their classroom to Mars research scientists and the STEM content that the MESDT teams are researching.

Format: The ASU MESDT team evaluated several software types that would enable distance learning to be easily facilitated, again by the MESDT customer or schools. One of the customer feedbacks that had high importance to the usability was that most schools reported firewall issues of downloading new software of any type on school-based computers. One of the software packages explored and subsequently chosen for use was web-based and easily exported to schools. This software – *Adobe Breeze Live Meeting*, converts PowerPoint slides into flash and allows presentations to be easily archived so they can be viewed asynchronously at later dates. A *PowerPoint* format was also available and sent ahead of the event to MESDT teams to use as a redundancy in case there were any network issues. Additionally, some teams felt it would be easier to utilize the downloaded files to review at a later time. This format design also fits the ASU Mars Education Program's "high-tech and low-tech" approach to inclusively provide access to programs to schools that do not have all the latest "bells and whistles" technology and provide opportunities for all schools to participate.

In addition to periodic Distance Learning events, the MESDT program utilizes a bulletin board system forum for further communication. This bulletin board is closely moderated, and is protected by a password system that only allows persons involved with the MESDT program access to the forums. Teams can utilize the forums several ways: (1) asking questions of science mentors or MESDT staff, (2) comment on other team's postings following established guidelines of conduct, (3) make observations about data collection, (4) review

previous trainings via web link, (5) download resources and reading materials about Mars Exploration.

Introduction

- **Region:** Terra Tyrrhena
- **Tile #:** 895
- **Lon,Lat:** {103,-5}
- **Importance:**
 - Mineral Composition (Phyllosilicates)
 - Possible Landing Site
- **Hypothesis:** The amount of phyllosilicates present in this area indicate past signs of water.

(Note: The image shows a spectral plot with a red box highlighting a specific region. A legend below the plot identifies 'A - Phyllosilicates', 'B - Pyroxene', and 'C - Pyroxene/Al'.)

One student team's PowerPoint presentation using ASU's Breeze Distance Learning program.

Procedure: While the MESDT program is currently in the testing and implementation phase, we will open up the program to teams of high school students in the fall of 2008. The AO to participate in MESDT will begin in the spring of 2007 via the Mars Education website, the NASA portal, and NSTA announcements. To handle the increased numbers of students participating in MESDT, current MESDT team mentors will become bulletin board moderators to answer questions and monitor postings. Additionally, we will continue to have MESDT training events throughout the year to train new members of the team. Using *Breeze* software or *PowerPoint* format, the MESDT Distance Learning component can accommodate fairly large audiences of students and teachers at each event.



Students practice using spectrometers during the preparation phase of MESDT

During the event, teachers can connect via the Web either with students at individual computers

(i.e., in a computer lab) or through a single classroom computer and a speakerphone. The classes that are connecting and using the *PowerPoint* format use an established meet-me number and follow along with the *PowerPoint*. An ASU MESDT coordinator brings the audience together and introduces the guest scientist and topic. The scientist explains the MESDT-related content and the participants are given a time for questions.

Current Outcomes: The primary benefit that has been observed (anecdotally) using the early data acquired by the ASU MESDT Team during the MESDT Distance Learning events is that the MESDT teams that participate in these opportunities are gaining a deeper understanding of the research content. This observation is based upon the teams that have participated in these MESDT Distance Learning events are able to present scientific findings with a high level of accuracy and detail. The teams that have participated have also been (for the most part) more robust in carrying through various procedures and steps within MESDT.

Future Outcomes: Data on the MESDT Distance Learning events will continue to be collected and evaluated within the ASU MESDT Team. The MESDT participant feedback will continue to be collected and evaluated (there is an on-line evaluation that is completed by each of the teams after each distance learning event).

Because of the flexibility of the MESDT program to incorporate any planetary data set, other instruments onboard MRO, the THEIMS instrument and other planetary missions will be incorporating MESDT into their EPO plan. The initial success of the MESDT program is evidence that future implementation will be equally successful.