SPACE SCIENCE FIELD WORKSHOPS FOR K-12 TEACHER-SCIENTIST TEAMS.

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Introduction: As part of our NASA Code-S Broker / Facilitator Education and Public Outreach efforts, we have collaborated with NASA Space Grant Consortia and other partners in several states to develop space science workshops for K-12 science, math, and technology teachers.

We have focused on involving scientists by supporting up to five scientist-teacher teams from across the country, so that scientist team members participate as mentors and instructors throughout the entire workshop rather than giving isolated presentations. This also enables us to take an interdisciplinary approach to the space science theme. Our Space Grant partners recruit additional teachers from the region.

Field and laboratory experiences have proved to be an invaluable component. Field excursions to the Scablands of central Washington provided vivid comparisons with the geology of Mars, and Hawaiian volcanoes offered insights into volcanism on other planets. Hands-on labs on image processing and spectroscopy illustrated how data from space exploration missions is gathered and interpreted. The field trips, especially if taken in advance of classroom activities, also allow scientists and teachers to interact informally and spontaneously, encouraging active participation from everyone as the workshop progresses. The classroom component of each workshop emphasizes tested, inquiry-based activities and materials that can be readily used in a school setting. Facilities and Continuing Education credits are made available by arrangement with a university partner in the area.

The space science topic and content changes from year to year, but a constant underlying theme is allowing teachers to experience the process of doing actual science with professional researchers. Many past participants have told us that working directly with scientists was a unique experience in their careers and that seeing first-hand how science is actually done is at least as valuable as the specific content learned. Further, having all the scientist team members involved often reveals how the same data and observations can be interpreted differently and even argued about! This has been something of a revelation to many teachers and provides another window into the way science is really done. From the teachers, the scientists have gained new insight into real classroom practices and limitations and the ways in which new state and national standards have changed how and what they teach in space sciences today.

2000-2001 Workshops: LPI collaborated with the Washington Space Grant Consortium conducted field geology training workshops for K-12 science teachers, including school librarians and cross-disciplinary teachers. Our objective was to provide a “down to Earth” framework for understanding geologic processes on other planets, both by analogy and contrast. Each workshop included 4-5 days of field work followed by 3 days of classroom instruction.

Field Portion. As described above, we present the field experience first. The theme in 2000 was “Mars Geology.” We focused on the Channeled Scablands of eastern Washington. The Scablands formed in giant flood events at the end of the last ice Age and serve as an analog for catastrophic flood features observed on Mars. Stops in the Columbia River Flood Basalts and the Yakima Fold Belt provided an introduction to volcanic and tectonic processes. A night session at the Manastash Ridge Observatory extended the program to astronomical topics. The theme in 2001 was “Planetary Volcanism.” Field stops were made at Mount Rainier, Mount St. Helens, Newberry Volcano, Crater Lake, and the Josephine Ophiolite. This allowed presentation of many of the major styles of volcanism: shield volcanoes, composite volcanoes, cinder cones, lava flows, pyroclastic eruptions, and intrusive dike complexes.

Classroom Portion. Illustrated lectures in classrooms at the University provide additional information about the geologic processes studied in the field and show how these processes are relevant (or modified, or absent) and why for other solar system objects. This segment also includes demonstrations and
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hands-on activities and experiments for the classroom. In 200, activities included impact cratering, mapping of channel systems and landslides on Mars, computer image processing of planetary imagery, and reflection spectroscopy in remote sensing. In 2001, activities included lava layering, mapping the Apollo 15 landing site through photogeology, gelatin volcanoes, wax volcanoes, cake batter lavas, and planetary cooling as related to volcanic activity in the solar system. Many activities have been tested in LPI’s Exploring the Solar System enrichment program for gifted 5th graders [1], while others were adapted from Hawai’i Space Grant’s Exploring Planets in the

Curriculum Development.

An important component of the workshop was encouraging teachers to think together about incorporating their experiences into the classroom. Teams of 4 or 5 teachers of differing backgrounds were assigned the task of developing an activity or framework for incorporating planetary volcanism in their teaching. Library and Web access for research were provided and each group reported to everyone on the final day. Incorporating state standards was explicitly required, which gave teachers an opportunity to observe similarities and differences between those of Texas and Washington. This activity was and experiment in 2001; it worked sufficiently well that we will likely include it in future workshops. The Texas teachers have continued to meet with science and education staff at the LPI to refine and capture their ideas in written format for dissemination to a broader audience of educators in Texas and elsewhere.

Future Development: We will continue these workshops, alternating geographic sites from year to year, supporting five scientist-teacher teams as well as some supplies and take-home materials under the Broker/Facilitator effort. We will continue to leverage the program with state Space Grant Consortia and/or university support for regional educators and classroom facilities. We will also develop a new field trip with our Arizona and New Mexico partners focusing on Meteor Crater and the role of impact processes in the solar system. Our partners in Hawai’i will work to incorporate astronomy using the Keck telescopes and the Mauna Kea Educational Center into their workshop, broadening the scope of space science topics that can be covered.

References:

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