PHOENIX STUDENT INTERNS PROGRAM: ACTIVE RESEARCH ON MARS. C. D. D. Bowman[1], J. Camacho[2], W. Dorsch[2], D. Hurd[3], J. Meyer[4], J. Overton[4], K. Stocco[5], N. Young[4]. [1]Raytheon ITSS, NASA Ames Research Center, M/S T28-B, Moffett Field, CA 94035, cbowman@mail.arc.nasa.gov, [2]Northwest PA Collegiate Academy, Erie, PA, [3]Edinboro University of PA, Edinboro, PA [4]Cleveland High School, Cleveland, TX, [5]Tegeler Career Center, Pasadena, TX.

Introduction: The Phoenix Student Interns Program is based on the highly successful Athena Student Interns Program (ASIP) that involved high school students and teachers from around the country in the Mars Exploration Rover mission in 2003-2004 [1]. PSIP follows this model, incorporating changes informed by the evaluation of ASIP in 2004. In June 2007, thirteen distributed groups (each composed of two high school students and a teacher) became part of the Phoenix Mars Mission science team, interacting with each other and the mission scientists and engineers to do the work associated with exploration and discovery on Mars in the summer of 2008. To this end, they communicate with each other and the science team by email, the web, teleconferences and face-to-face meetings. The teachers help coordinate the team and support the students' interactions with the scientist mentors. To further broaden the impact of the program, the PSIP teams develop and maintain their own web site, give presentations, participate in webcasts and submit publications, allowing them to communicate their activities and lessons-learned to other students and to the public.

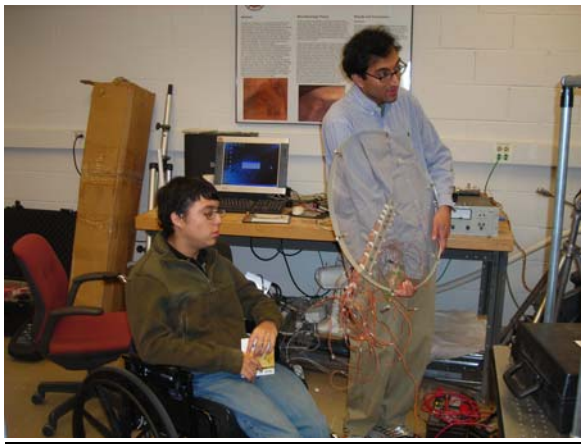

Figure 1. Student learns about pressure sensors related to Phoenix mission landing.

Program Goals: The overarching goal of PSIP is to get students excited about science and related fields and to give them exposure to the real work of science and engineering. The program aims to help students explore future study and career goals in science, mathematics, engineering, and technology by providing them with the opportunity to apply knowledge learned in school, such as geometry and geology, to a "real world" situation. Limiting the number of students in each group insures that the participants have continuous one-on-one interactions with teachers, mentors, and mission scientists and engineers. Additionally, through PSIP it is hoped that students will experience improved communication skills and appreciation of teamwork, enhanced problem-solving skills, and increased self-confidence.

Preparation: PSIP participants were selected through a national application process. Applicants applied to work with a specific mentor and had to meet certain requirements for technology access and time commitment, as well as describe their plans and ability to engage other students and the public in their activities through presentations and other forms of outreach. The program staff and scientist mentors selected participants based on the fit with each mentor's work (as described in the application) and ability to meet the requirements.

Members of the Phoenix Mission science team that chose to be PSIP mentors have been working closely with the groups to prepare them for Mars research. In addition to meetings between the mentors, teachers, and students, groups take part in numerous teleconferences with mission scientists, engineers, software developers and other students in the program. For example, the team from PA is working with Dr. Nilton Renno and his staff at the University of Michigan to learn about their research and help them with analysis of atmospheric data. The team from Cleveland, TX is working with Dr. Doug Ming of JSC to help build a database for the TEGA instrument.

Mission Involvement: Beginning in July 2008, the PSIP teams will travel to the Science Operations Center at the University of Arizona in Tucson to work "on Mars" with their scientist mentors for a week of landed operations. Each scientist mentor is an expert in the science associated with one or more of the instruments on the Phoenix Lander and each mentor's associated PSIP group will work as part of their mentor's own team to help manage and interpret data coming from Mars and to perform research that aids the work of the mission science team.

Figure 2. Balloon-powered lander activity developed by PSIP teacher Steve Widmark [2].

Teacher Participation: The teachers in the program provide a crucial bridge between the scientists and the students, helping the students draw connections between their prior knowledge and new learning. The teachers and scientist mentors work together to support student learning and develop ways that they can actively contribute to the scientist's research. Teachers are also invaluable in bringing the mission science to other teachers, students, and the public through the development of classroom activities, as well as sharing their experience in their own classrooms.

Facilitator Participation: One lesson from ASIP, the PSIP pre-cursor program, is that the learning curve for the participants is steep and can often be overwhelming and stressful [3]. The teachers and students must learn large amounts of information about the mission and its associated science while simultaneously learning to work with professional scientists and within the complex organizational structure of NASA and its various partner institutions. The participating scientists must learn (or remember) how to interact with high school students and teachers, how to guide their participation, and how to support their work with the mission. To address this issue, PSIP included "facilitators" as part of the team. These former ASIP teachers represent the best and brightest (and most dedicated) of past participants and are able to share their experience and knowledge with new participants. They provide an additional level of support to the scientists, students, and teachers as they get started in PSIP and maintain contact with their assigned teams throughout the program, culminating with mission operations in Tucson. Facilitators also provide outreach to their local communities about the Phoenix mission goals and science.

Outreach: Outreach is an integral part of PSIP. Through presentations and materials created for educators, students, and the public, the teams share their knowledge and gain experience in teaching and public speaking. Teams have engaged in such varied outreach endeavors as creating new classroom activities (e.g. Figure 2), giving planetarium presentations, working with elementary school students, and presenting to local school boards and clubs. Through outreach, teams have the opportunity to impact hundreds to thousands of people who might not otherwise have access to a NASA mission.

Evaluation: Formalized evaluation of PSIP employs empowerment evaluation, which has been used with Mars student intern programs since 2001 [4]. The technique allows program participants to be fully involved in the ongoing evaluation of ASIP by determining the mission or vision of the program, identifying the most important aspects of the program and taking stock of how well they are going, and planning for the future, including making mid-course corrections and improvements. Products and activities created by the participants are another important aspect of the assessment, as well as being part of their contribution to the mission. Groups create presentation materials and activities to share with other PSIP teams and the public. Additionally, each group works with their mentor to create their own research project based on the mentor's expertise. The project is carried out during the landed mission and is another method of gauging student learning and program success.

Conclusion: PSIP is designed to provide a variety of benefits to a number of different stakeholders: the high school teacher and student participants gain deep experience doing science "at the elbows" of scientists [5], the facilitators continue their connection to the program and have a chance to give back, the scientists have the opportunity to inspire the next generation and receive valuable research assistance, and the general public in areas around the U.S. have a chance to learn about the Phoenix mission from their own "local experts." Evaluation of PSIP will also provide lessons learned for implementations of student intern programs associated with space missions in the future.

References: [1] Bowman, C.D. et al. (2003) *J. Geosci Edu, 51, 1*; Bowman, C.D. el a. (2005), LPSC XXXVI, Abstract #2113 [2] Activity available at: http://phoenix.lpl.arizona.edu/psip.php [3] Bowman, C.D. (2006), Harvard Graduate School of Education. [4] Fetterman, D. and C.D. Bowman. (2002) *J. Experiential Edu, 25, 2.* [5] Baram & Hay (2001) *J. Res. in Sci. Teaching 38, 1.*

Acknowledgements: Thanks to all PSIP mentors, teachers, and students, the Phoenix Mars Mission team, and Carla Bitter, Andy Shaner, and Sanlyn Buxner of U of A for their enthusiasm and commitment to the project and continued support of PSIP.