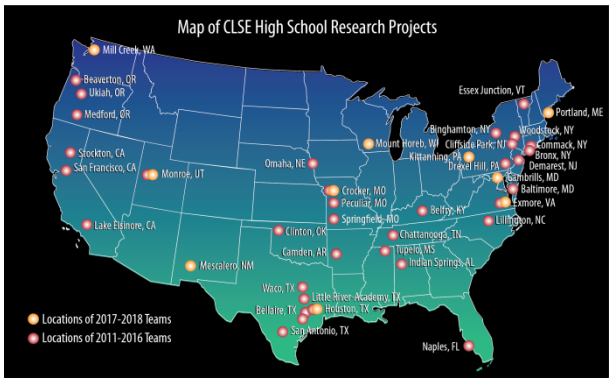
ExMASS: Four Years of Authentic Lunar and Asteroid Research by High School Students. A. J. Shaner[1,2], S. Watson[3], S. Buxner[4], M. Bakerman[4], D. A. Kring[1,2], A. Hackler[1], [1]Lunar and Planetary Institute, Houston, TX (shaner@lpi.usra.edu), [2]Center for Lunar Science and Exploration, [3]University of Houston-Clear Lake, Houston, TX, [4]Planetary Science Institute, Tucson, AZ.

Introduction: The National Research Council [1] has expressed a need for participatory science experiences for students. Opportunities are needed for students which 1) allow them to understand how scientific knowledge develops and 2) can heighten their curiosity, capture their interest, and motivate their continued study of science. Studies [2] have also recommend educators provide students with opportunities to do science through extracurricular work with scientists. In addition to being given the opportunity to fully participate in the scientific enterprise, students must also be explicitly guided in their attempts to develop a more appropriate understanding of the nature of the scientific enterprise [3][4][5].

Program Description: The Exploration of the Moon and Asteroids by Secondary Students (ExMASS) program provided an authentic research opportunity for students. The ExMASS program was managed by the LPI/NASA JSC-led Center for Lunar Science and Exploration (CLSE). This program was a follow-on to the successful High School Lunar Research Projects funded by the NASA Lunar Science Institute from 2009-2013. Over the course of one academic year, teams of high school students conducted their own scientific investigations of either Earth's Moon or asteroids, with guidance from a scientist advisor.

The program included two elements: 1) two guided inquiry, introductory research activities that built students' knowledge of current lunar/asteroid science and lunar/asteroid data and 2) an open inquiry research project in which students applied their knowledge to a self-defined project. At the end of the school year, teams submitted an abstract and research poster describing their work. These posters were scored independently by a panel of scientists. The top four scoring teams then gathered virtually via Adobe Connect to give short presentations to the judges. After presentations and time for Q&A, the judges chose one team to present in person at the Exploration Science Forum (ESF). The posters of all finalist schools from each year were displayed at the ESF.

Approximately 200 students from 23 states participated in the program. Sixteen student posters were displayed at the ESF with four posters placing or receiving honorable mention in the student poster competition.



Evaluation: Evaluation data collected during each program year included pre and post assessments of changes in students' lunar/asteroid content knowledge, student attitudes toward science and science careers, and student reporting of the processes of science in which their team participated. Exit surveys for teachers, students, and advisors were also distributed at the end of each program year to gather general feedback about the program and its impact.

Measuring Attitudes Towards Science. Assessment of students who participated in the High School Lunar Research Projects showed that these students are highly motivated and have positive attitudes towards science. Therefore, measuring positive changes in attitudes toward science in this type of program has been shown to be a difficult task. The survey used to assess student attitudes during the ExMASS program used students' reflections on how their attitudes have changed (Post-Then assessment)[6]. Analyses revealed that students made small, but statistically significant, increases in their attitudes toward science from pre to post program.

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