ExMASS at X: A decade of authentic, inquiry-based research by secondary students. A. J. Shaner\textsuperscript{1,2}, S. Buxner\textsuperscript{3,4}, and D. A. Kring\textsuperscript{1,2}, \textsuperscript{1}Lunar and Planetary Institute – USRA, \textsuperscript{2}Center for Lunar Science and Exploration, \textsuperscript{3}Planetary Science Institute, \textsuperscript{4}Toolbox for Research and Exploration.

Introduction: For more than a decade, the LPI-JSC-led Center for Lunar Science and Exploration has managed a research program for secondary students across the United States. The Exploration of the Moon and Asteroids by Secondary Students, or ExMASS is designed to provide secondary students with an opportunity to conduct authentic, inquiry-based research with the guidance of their teacher and a planetary scientist.

In this context, “authentic” student research occurs when they utilize multiple processes of science, just as professional scientists would, during an investigation. “Inquiry-based” student research occurs when students pursue a research question/topic that is of interest to them. While student investigations in the classroom may be authentic, they may not necessarily be inquiry-based, and vice versa.

Why ExMASS?: For decades, national science education reports and science education researchers have called for more student opportunities to participate in authentic, inquiry-based research experiences. Despite those recommendations, there has been a dearth of such experiences available. The ExMASS program aims, in its own capacity, to improve the situation.

This paper will reflect on the past ten years of this research program describing its successes and lessons learned obtained from evaluation data and communications with students, teachers, scientists.

Evidence of Success: Annual evaluation data from surveys show that the program consistently meets its goals:

- Students utilize multiple processes of science during their investigations
- There are statistically significant increases in students’ attitudes towards science
- Student knowledge specific to lunar and asteroid science also increases

The program’s success is also evident in some of its products and student activities following their participation. For example, 38 student posters have been presented at annual NLSI/SSERVI forums, 20% of which have received student poster awards. One student project resulted in a peer-reviewed journal article and one team presented their research to their state legislature.

Credit where credit is due: The success of the ExMASS program is due to the outstanding efforts of students and the dedication of the scientist advisors. Advisors participate on a volunteer basis, contributing generously of their time. When asked why they participate, most respond by stating they simply want to give back and help the next generation.

More information: For more information about the ExMASS program please visit the website at www.lpi.usra.edu/exploration/education/hsResearch or contact Andy Shaner, shaner@lpi.usra.edu.