HERE'S YOUR INVITATION: ENGAGE WITH THE NEXT GENERATION IN AUTHENTIC RESEARCH. A. J. Shaner[1,2] and D. A. Kring[1,2], [1]USRA-Lunar and Planetary Institute (3600 Bay Area Boulevard, Houston, TX 77058, shaner@lpi.usra.edu), [2]NASA Solar System Exploration Research Virtual Institute, NASA Ames Research Center.

Introduction: The National Research Council [1] has expressed a need for participatory science experiences for students. Opportunities are needed for students which A) allow them to understand how scientific knowledge develops and B) can heighten their curiosity, capture their interest, and motivate their continued study of science. Studies have also recommend educators provide students with opportunities to do science through extracurricular work with scientists [2]. In addition to being given the opportunity to fully participate in science, 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 is a practical, effective model for engaging high school students with subject matter experts in authentic, open-inquiry research while stimulating positive attitudes toward science [6]. The ExMASS program is managed by the Center for Lunar Science and Exploration (CLSE). Led by the Lunar and Planetary Institute, CLSE is a member of NASA's Solar System Exploration Research Virtual Institute. Through ExMASS and its precursor program, approximately 500 students from 42 schools across the U.S. (Figure 1) have conducted their own scientific investigations of Earth's Moon or asteroids with guidance from a scientist advisor. Because the research is student-driven, it is not necessarily original research. However, one team's research has been published in a professional journal [7].

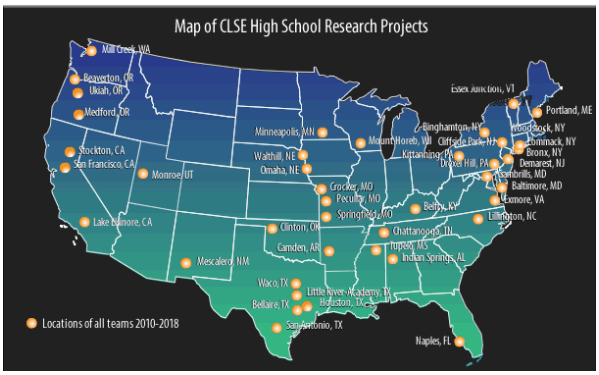

Figure 1. Locations of ExMASS participants.

At the close of each year teams submit an abstract and research poster which are scored by a panel of judges. The top four scoring teams gather virtually to give short presentations to the judges. After presentations and discussion, the judges choose one team to present in person at the annual Exploration Science Forum, where the posters of all finalist schools are displayed.

This poster will present information/data that may be useful for practicing scientists looking for an opportunity to participate in an established education program that engages them on a deeper level with precollege students.

Advising Students: The teachers and the scientist advisors participating in ExMASS are the program's strongest, and most important, assets. Both teachers and advisors have important solitary, and collaborative, roles. Figure 2 outlines those roles, in general.

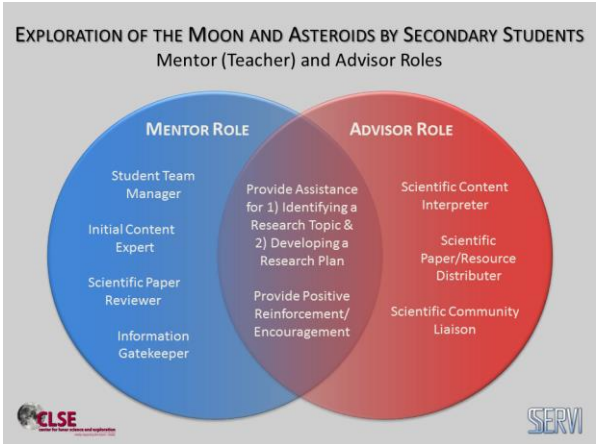

Figure 2. Teacher Role vs. Scientist Advisor Role

What does the data say? At the end of each ExMASS program year, advisors are asked to complete an exit survey that gathers their feedback regarding their experience and their perceptions of the students' experience. Survey items include asking why they chose to advise high school students, what advice they would provide for future advisors and their perspective on how much ownership students take in their research projects. This and other data will be discussed in this poster.

How do I become an advisor? ExMASS is always on the lookout for, and in need of, advisors for student teams. The next opportunity to serve as an advisor is the 2020-2021 school year. Because most of the ExMASS program is run virtually (i.e. email, telecon, videoconferencing), advisors can be located anywhere. Figure 3 shows the locations of past ExMASS

advisors (and judges). Ready to jump in? Contact Andy Shaner at the Lunar and Planetary Institute – shaner@lpi.usra.edu or 281-486-2163.

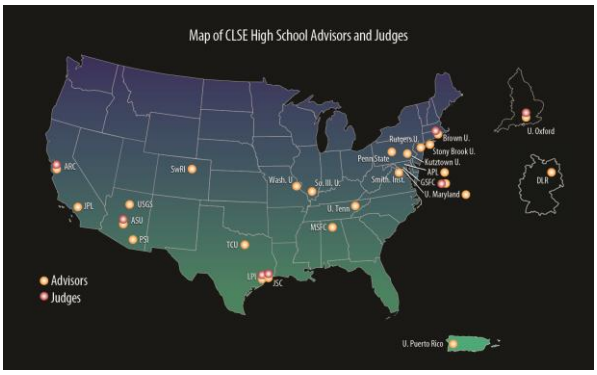

Figure 3. Locations of past ExMASS advisors and judges.

References: [1] National Research Council (2012) *A framework for K-12 science education: Practices, crosscutting concepts, and core ideas*, The National Academies Press. [2] Aydeniz M. et al. (2011) *Journal of Science Education and Technology, 20*, 403-421. [3] McDonald C.V. (2010) *Journal of Research in Science Teaching, 47*, 1137-1164. [4] Rudge D.W. and Howe E.M. (2009) *Science & Education, 18*, 561-580. [5] Yacoubian H.A. and BouJaoude S. (2010) *Journal of Research in Science Teaching, 47*, 1229-1252. [6] Shaner A. J. et al. (2018) *Acta Astronautica*, *152*, 1-9. [7] Kickapoo Lunar Research Team and Kramer G. (2014) *Icarus*, *228*, 141-148.

Additional Information: For more information on the ExMASS program, please visit bit.ly/39w5BHr. If you have questions or would like additional information regarding the possibility of advising a high school team for the ExMASS program, please contact Andy Shaner – shaner@lpi.usra.edu or 281-486-2163.