

NASA SMD PLANETARY SCIENCE E/PO FORUM EFFORTS TO SUPPORT SCIENTISTS IN REACHING K-12 FORMAL EDUCATION AUDIENCES. D. W. Boonstra¹, J. Ristvey², S. Weeks², S. Klug Boonstra³, S. Buxner⁴, H. Davis⁵. ¹ sySTEMec LLC, 4540 E. Karsten Dr., Chandler, AZ 85249, donboonstra@cox.net; ²McRel, 4601 DTC Blvd, Suite 500; Denver, CO 80237; ³Arizona State University, Mars Space Flight Facility, Moer Bldg. Rm. 131, P. O. Box 876305, 201 E. Orange, Tempe, AZ 85287-6305; ⁴ University of Arizona, Planetary Science Institute, 1700 Ft Lowell Suite 106 Tucson, AZ 85719; ⁵ Technology for Learning Consortium Inc, 75 Sauga Avenue, North Kingstown, Rhode Island 02852.

Introduction: NASA SMD Forums Supporting Scientist Engagement in Education and Public Outreach: The NASA Science Education and Public Outreach Forums support the NASA Science Mission Directorate (SMD) and its education and public outreach (E/PO) community through a coordinated effort to enhance the coherence, efficiency, and effectiveness of SMD-funded E/PO programs. The Forums foster collaboration between scientists and educators and provide resources to engage a variety of audiences including K-12 teachers and students, higher education teacher and students, and informal educators and audiences.

NASA articulates three major education goals: -- Strengthening NASA and the Nation's future workforce -- Attracting and retaining students in science, technology, engineering and mathematics, or STEM, disciplines -- Engaging Americans in NASA's mission[1]. In addition, the President's Council of Advisors on Science and Technology report highlights the necessity to improve Science, Technology, Engineering and Math (STEM) education [2]. To achieve these goals NASA SMD includes K-12 education as a critical element in its education portfolio.

What the NASA SMD Planetary Science Education E/PO Forum has accomplished.

To effectively reach the K-12 audience – teacher and student – is critical to understand the needs of these audiences. Planetary Science has provided many opportunities for scientists and E/PO professionals to increase their understanding of best practices in K-12 education. All of these face-to-face discussions and online web seminars have been recorded and are available on the SMD E/PO workspace (<http://smdepo.org>). The following presentations and discussions of best practices in K-12 education have occurred in 2012 and 2013.

- **Understanding Naïve Reasoning and Misconceptions.** In a series of recorded face-to-face presentations, education research scientists specializing in science misconceptions and naïve reasoning research presented findings and engaged the community in deep discussions about naïve reasoning in students. Discussions included methods for identifying and effectively challenging misconceptions.

- **Designing and Aligning K – 12 Experiences to the Next Generation Science Standards (NGSS)**

To ensure that products and presentations to teachers and students are appropriate and impactful, it is essential that what we provide directly aids students and teachers in achieving mastery of science education standards. Because new national science education standards were released in 2013 (NGSS), it was important to provide support in understanding the challenges and opportunities of NGSS. A series of 3 web seminars was provided by Boonstra on the basic format and structure of NGSS. A series of 6 web seminars by Weeks and Boonstra were provided on the challenges and opportunities in each grade band of NGSS and in the requirement in NGSS for more engineering in science classrooms.

- **Creating More Effective Workshops.** A series of web seminars were provided in 2013 exploring best practices in providing effective workshops for K-12 teachers and Informal Education professionals. These discussions led by Buxner, Klug Boonstra and Boonstra explored Goals and Objectives, Understanding Audience Needs, and Essential Questions and reflection time. More will be offered in 2014.

- **Goal Setting and Evaluation** Davis and Buxner provided a series of face-to-face and virtual training sessions to help scientists and E/PO professionals to create more impactful programs and products by understanding logic models and evaluation strategies to guide development of efforts with high impact.

- **Wavelength as a Repository of K-12 Products.** The NASA SMD web site, Wavelength, has been developed to offer teachers easy access to K-12 products most appropriate to their classroom needs.

NASA SMD Planetary Science E/PO Forum Plans for 2014 and Beyond.

Professional development opportunities will continue to address best practices in K-12 education. Plans have been made to continue discussions about designing products for NGSS, creating more effective workshops, and evaluation of products and programs. The

PS E/PO Forum will continue to survey the E/PO community to determine needs.

References: Use the brief numbered style common in many abstracts, e.g., [1], [2], etc. References should then appear in numerical order in the reference list, and should use the following abbreviated style:

[1] Author A. B. and Author C. D. (1997) *JGR*, 90, 1151–1154. [2] Author E. F. et al. (1997) *Meteoritics & Planet. Sci.*, 32, A74. [3] Author G. H. (1996) *LPS XXVII*, 1344–1345. [4] Author I. J. (2002) *LPS XXXIII*, Abstract #1402.