NASA DATA IN EDUCATION: OPPORTUNITIES AND CHALLENGES FOR SCIENTISTS AND NASA's EDUCATION AND PUBLIC OUTREACH COMMUNITY. S. Klug Boonstra[1], D. W. Boonstra[2], J. Ristvey[3], S. Shipp[4], [1]Arizona State University, School of Earth and Space Exploration, Mars Space Flight Facility, Moeur Bldg. Rm. 131, P. O. Box 876305, 201 E. Orange, Tempe, AZ 85287-6305, sklug@asu.edu; [2]sySTEMec LLC, 4540 E. Karsten Dr., Chandler, AZ 85249; [3]McRel International, 4601 DTC Boulevard, Suite 500, Denver, CO 80237-2596; [4]Lunar and Planetary Institute, 3600 Bay Area Blvd., Houston, TX 77058.

Introduction: In April 2013, the Next Generation Science Standards (NGSS) were rolled out to the U.S. educational community. These new science standards represent a major paradigm shift in the methodologies and approaches used in teaching K-12 science. NGSS calls for authentic experiences in science which requires the availability of authentic data and engaging contexts.

Scientist Opportunities: NASA scientists have a great opportunity to help enable the learning of the scientific process as envisioned by NGSS. Purposefully planning to open and sharing their current and/or archived data to K-12 teacher and student use could be a powerful step into helping students understand and master scientific processes at a much younger age. This data sharing could also lead to partnerships that not only benefit the students' learning, but could provide actual gains for the science teams in focused data analysis that might not get accomplished otherwise.

Educational Opportunities: The adoption of NGSS presents the best opportunity in years for authentic science data and the accompanying scientific research methodologies to be adopted and fully utilized in the K-12 classroom. NGSS emphasizes students being involved in critical thinking and actually empowers teachers to engage students in the process of real science practices by replacing worksheets with the collection and analysis of real data. Having the students work with actual data sets is more connected to the way science works in the real world and lays the foundation for follow-on learning, as students understand how science really works by actually *being* a scientist [1,2,3,4].

Through the use authentic data in the classroom, students will gain important insights and skills that can be applied to the fundamental understanding of scientific processes . Data analysis and researching scientific questions incorporate 21st Century Skills (workforce development skills) such as critical thinking and problem solving, communication and collaboration, information literacy, media literacy, information and communications technology, and flexibility and adaptability when applying their scientific knowledge and reasoning skills to new areas of study. Students will have the opportunity to practice and reinforce these skills through activities that incorporate the use of scientific data and research methodologies.

Challenges: Sharing of data sets is not a new concept within NASA circles. The old methods for this included the idea that if teachers had access to the Planetary Data System (PDS), teachers could access all the data they wanted. This easy idea, unfortunately, has proven less effective than hoped. Many teachers are unfamiliar with PDS data formats and simply do not have the time to create lessons to use raw data if they did understand the formats. Through projects that have used data in the classroom and conducted the educational research as to the adoption and impact of such projects [5], there are lessons-learned and best practices that are emerging for integrating data use in the classroom successfully. Scientist's data, research and analysis methods and the K-12 classroom have very different needs. For wider classroom adoption and ways for the classroom teacher to be defensible in providing the learning that is articulated in NGSS using scientific data, there has to be a good team consisting of the scientist and educational experts well versed in NGSS to be successful.

Conclusion: The Planetary Science Education and Public Outreach Forums (SEPOF**)** is in the process of bringing together interested scientists and E/PO educational experts to examine and articulate the best practices for creating opportunities for data use in the classroom, outline lessons-learned and provide suitable evaluation methodologies to help measure impact for such projects.

Examples of current, successful models (e.g., Mars Student Imaging Project) [5] will be shared and key ingredients for successful partnerships with scientists and the K-12 classroom community will be examined. If you are interested in joining this discussion or would like further information, please contact Sheri Klug Boonstra (sklug@asu.edu) or Stephanie Shipp (shipp@lpi.usra.edu).

References:

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