

Ideas for Including Pre-Service Science Educators in Education and Public Outreach Efforts

Pre-Service Educator Working Group of NASA's Science Mission Directorate's Support Network
and

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Overview

The Pre-Service Educator Working Group of NASA's Science Mission Directorate's Space Science Support Network includes scientists and education specialists who are working to develop an understanding of space science education needs within pre-service programs and to identify ways to meet these needs in collaboration with pre-service faculty.

In March of 2005, the Working Group hosted *Before the First Day of School: Pre-Service Teacher Preparation and the Role of the Earth and Space Science Community*. Over 50 Earth and space scientists, education specialists, and formal, informal, and pre-service educators attended. Conversations during this workshop, and during other conferences such as AAS, have begun to address primary questions:

- What challenges are associated with using space science as a context for pre-service teacher training?
- How can an *individual scientist* become involved in preparing future educators?
- How can partnerships across disciplines and institutions create opportunities to prepare exemplary science teachers?



A. The challenges in using space science as a context for pre-service teacher training are formidable.

A recent survey of *pre-service faculty* (Ruberg & Jones, 2004) reported on challenges and opportunities in educator preparation. *These results can inform partnerships between pre-service faculty, scientists, and the E/PO community.*

- Many faculty, especially those working with elementary school teachers, report *their* exposure to science concepts is limited, reflecting the need to train elementary teachers as generalists rather than as specialists in a discipline.
- Both pre-service faculty and teachers have restricted time, funding, and access to professional development. They select professional development opportunities that *integrate* science, mathematics, and pedagogy; space science content alone may not meet their needs.
- Emphasis on standards and testing often precludes investment in space science except where integrated with literacy or math standards.
- Space science materials often are too complex for use with pre-service teachers and / or are not classroom-ready.
- Some of the greatest challenges to pre-service faculty and teachers are controlled by school cultural climate. Factors include technology and resource infrastructure, professional development, and the desired master set of teaching skills, knowledge and proficiencies.
- Pre-service faculty and teachers would greatly benefit from stronger partnerships with university, government, and industry researchers who are practicing real science and are willing to share their discoveries.

B. There are multiple ways in which scientists can become involved in preparing future educators.

- Use what you know; much of what the E/PO profession has learned with in-service teachers will inform working with pre-service educators.
- Understand why careful preparation of pre-service educators is important and what is needed; collaborate with local pre-service faculty.
- Pre-service science teachers will facilitate student learning; they must have a deep understanding of content to do so. In your teaching, emphasize content that is taught (and tested) in K-12 classrooms in courses that have a significant population of pre-service educators. Examine national and state standards to determine topics pre-service teachers must master.
- Model effective teaching practices to share *how to best teach* topics to students.
- Help pre-service educators understand – and use – critical thinking skills and the process of science.
- Identify and share appropriate resources / tools for teaching that can be used in the pre-service educator's classroom.
- Coach and mentor a pre-service educator before and during the first few years they are in the classroom.
- Immerse a pre-service educator in your science through a summer field or laboratory experience.

Educators share with their students the content with which they are most familiar and comfortable - and they often share it in the manner in which they were instructed. If pre-service educators do not participate in STEM content and pedagogy in a meaningful way, they will not expose their students to STEM content.



C. Partnerships across disciplines and institutions can create a menu of opportunities to prepare exemplary science teachers.

Perhaps one of the greatest challenges facing the E/PO community is establishing strong partnerships with pre-service faculty and teacher preparation programs.

Collaborate to design or restructure a course specific to the needs of pre-service educators.

Partner to design a *course of study* for pre-service science educators that emphasizes content mastery of topics they will teach and effective pedagogy. Examine existing models (e.g., U-TEACH at the University of Texas; ____ at the University of Arizona).

Collaborate to match fundamental content with appropriate pedagogy, resources, and hands-on activities that can be ported into the pre-service educator's future classroom. Map these connections across the pre-service educator's course of study.

Establish a mentoring *program* for pre-service teachers in their first 3-5 classroom years that involves pre-service faculty, STEM researchers, in-service educators, and school administrations.

Establish intern programs, field workshops, or research experiences to expose and immerse pre-service educators in authentic science.

Offer professional development opportunities in your institution's discipline field with "certification" of mastery; work with pre-service teacher programs and local school administrations for recognition of certification.

Connect to existing state, regional, and national reform efforts through organizations such as NSTA.

At the institution level:

Encourage the "best teachers" in STEM departments to teach introductory and educator science courses. Reward partnership with education faculty and innovative teaching.

Support STEM scientists in becoming effective teachers through participation in professional development opportunities.

Involve graduate students in pre-service education initiatives as mentors, participants in workshops on effective teaching, etc.

Establish networks of pre-service education faculty and STEM researchers to enhance communication and innovation.

*Educators prepare our Nation's future scientists; help prepare our educators!
If you are interested in partnering with the Working Group, please contact us!*



http://www.lpi.usra.edu/education/score/pre_service.shtml