Examining the Potential for Using Space Science as a Context for Teaching Among Minority-Serving Preservice Faculty

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Abstract

- Reports showing ethnic disparities in both math and science test scores are a concern for all educators. Instead of improving, the gap between black and white students has increased between 1994 and 2003. This study examines what barriers preclude preservice teaching programs at minority-serving colleges and universities from using space science as a context to enhance math and science teaching and learning.
- A survey was developed for use with the NASA-Norfolk State University Preservice Teacher Program (PSTP). The PSTP hosts an annual conference that draws preservice faculty from a national network of more than 100 institutions. The MARSSB team distributed surveys to one faculty representative from each postsecondary institution attending the 2004 PSTP conference held Feb. 12-14 in Alexandria, VA.
- Results of this survey research suggest how the resources, services, and expertise of the NASA Office of Space Science support network can offer professional development services to enhance science and mathematics education for preservice teacher programs.

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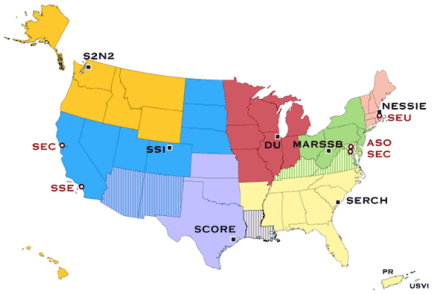
Areas Served by Mid-Atlantic Region Space Science Broker (MARSSB) Program

Scientists and educators in the mid-Atlantic region seeking information or involvement in the NASA Mission Science Directorate (MSD) Education and Public Outreach (E/PO) program can contact MARSSB through its web site, mailings, or direct telephone or personal contacts. As the map below shows, the MARSSB area includes: Delaware, Kentucky, Maryland, New Jersey, New York, Ohio, Virginia, Pennsylvania, West Virginia, and the District of Columbia.



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Conceptual Framework

Theme 1. Access to a technology and curriculum resource infrastructure

Theme 2. Support and mentoring opportunities

Theme 3. Mastery of a multidimensional set of skills, knowledge, and proficiencies that science, mathematics, and engineering teachers are expected to have to be successful

Theme 4. Right to use structures and actions that enable collective efficacy

Ecological variables that impact science, technology, and mathematics teaching and learning at the K-12 and postsecondary levels

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Methodology

- The survey instrument was developed by selecting and adapting questions from preexisting national and international educator instruments.
- The survey data included 54 completed surveys representing 54 of 71 institutions that attended the 2004 NASA/NSU Preservice Teacher Conference.
- The postsecondary faculty survey consisted of 40 questions (with multiple subitems) and required about 20 minutes to complete.
- A copy of the postsecondary preservice faculty survey is accessible online at **http://MARSSB.cet.edu.**

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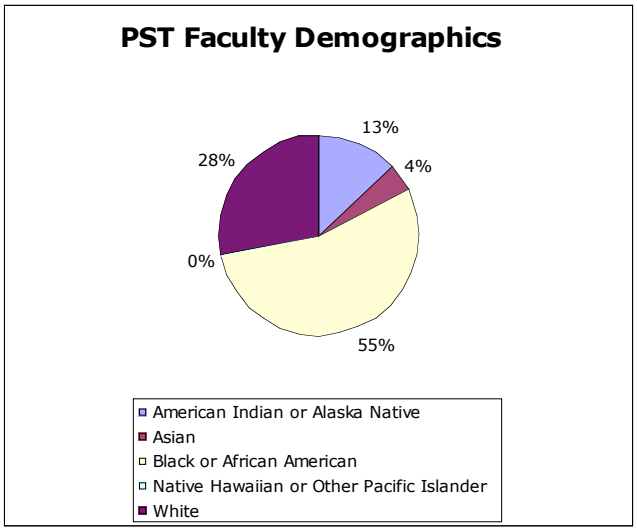
Data Analysis
Survey Participants



10% overall are Hispanic or Latino

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Theme 1. Access to a technology and curriculum resource infrastructure

Table 1. Barriers to using space science as a context for teaching and learning

(17%)	Lack of knowledge of space science (by teacher)…Funding for training and retraining of teachers…As an elementary teacher the barrier --not "specializing" in any content a rea. The content knowledge is lacking…Familiarizing classroom teachers with the resources available and how they can use them at the level they teach (especially K -3)…Material is at a high level
(13%)	Lack of support staff and materials… equipment availab ility and cost
(6%)	Accountability w/standardized testing…Existing emphasis on meeting national and state standards for accreditation purposes (NCATE, PDE, ISTE, NAEYC)… Not related Praxis or INTASC students
(4%)	Myths commonly held by individuals that math and science are extremely difficult (if not impossible) content areas as academic majors…fear of content
(4%)	My assignment is math… not included in any preservice teaching program
(1%)	Time…limited number of hours for teaching science content in t he teacher education program

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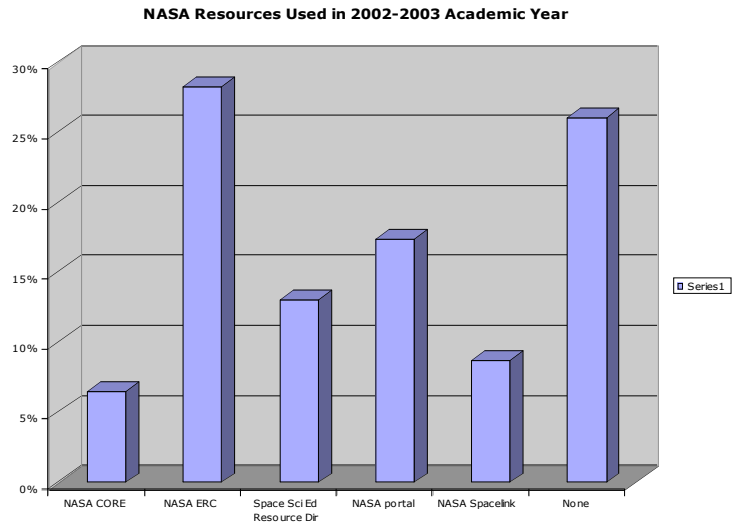
NASA Resources Used in the 2002-2003 Academic Year



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NASA OSS Products Used

- NASA web site for educators, NASA WebQuests
- Sky lab, MU-SPIN resources
- Space materials (pictures, lessons etc.)
- Web site, materials for elementary and middle levels
- Space science textbooks, resource web sites, hands-on activities for teacher education courses
- Earth system science products
- Our education students take a course in GIS, GLOBE training, and Earth science with NASA Imaging. Although I don't work directly with these resources, I expect students to show me how they will incorporate their training in the classroom.

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Theme 2. Support and Mentoring Opportunities

Table 2. Professional development workshops that faculty representatives have attended during the 2002-2003 academic year.

During the 2003 academic year have you participated in professional development in any of the following?	***Yes***
a. Space science content?	14.8%
b. Science pedagogy/instruction?	46.3%
c. Science curriculum?	42.6%
d. Integrating information technology into science?	55.6%
e. Integrating science with literature?	37%
f. Integrating science and mathematics?	48.1%
g. Improving students' critical thinking or inquiry skills?	72.2%
h. Science assessment?	37%

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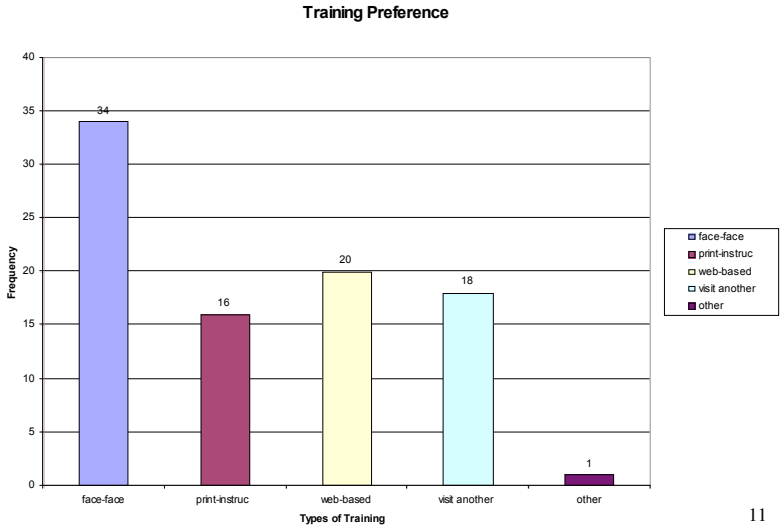
Delivery Style Preferences for Space Science Training



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Theme 3. Mastery of a Multidimensional Set of Skills, Knowledge, and Proficiencies That Science, Mathematics, and Engineering Teachers Are Expected To Have To Be Successful

Table 3 . Summary of faculty licensure and/or certification

Area of License/Certificate	*Faculty*
Elementary Level	44.4%
Secondary Level	24.1%
Science Specialization	9.3%
Math Specialization	5.6%
Reading and Language Arts	9.3%
Art and Music Specializat ion	5.6%
Technology Education Specialization	1.9%
Vocation Specialization	0
Gifted Specialization	1.9%
Special Education	5.6%
Other _____	14.8%
NA	3.7%

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Resources Used and Faculty Involvement in Research

Table 4. Resources used for classroom instruction

Resources	*Science*	*Math*	*Technology*
Textbook	44.4%	33.3%	16.7%
Supplemental material	40.7%	29.6%	20.4%
Guest speakers	22.2%	18.5%	9.3%
Field trips	20.4%	11.1%	11.1%
Web resources	33.3%	25.9%	24.1%

Table 5. Faculty engaged in research and development activities

Categories of professional work	*Percentage who selected this category*
Basic Research	20.37%
Applied/Policy oriented	5.56%
Literary/Performance/Exhibition	1.85%
Program/Curriculum developm ent	44.44%
Other	3.70%

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Instructional Use of Web Sites

Table 6. Instructional use of web sites

	Science	*Mathematics*	*Technology*	*NA*
f. Web Site Usage for Instruction				
(1) To post general class information (i.e., syllabus and office hours)	29.6%	22.2%	22.2%	22.2%
(2) To post information on homework assignm ents or readings	31.5%	24.1%	24.1%	20.4%
(3) To post practice exams/ exercises that provide immediate scoring	9.3%	9.3%	3.7%	27.8%
(4) To post exams or exam results	3.7%	5.6%	3.7%	24.1%
(5) To provide links to other information	22.2%	14.8%	18.5%	22.2%
(6) To access NASA web sites	14.8%	5.6%	5.6%	18.5%

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Theme 4. Right to Use Structures and Actions That Enable Collective Efficacy

- The fourth theme that addresses collective efficacy provides a potent reminder that a technology/resource infrastructure, professional development program, and a master set of teaching skills, knowledge, and proficiencies are strongly influenced by the school cultural climate.
- To improve teaching and learning among minority-serving and rural institutions, consideration should also be given to how teachers can be provided opportunities to influence instructionally relevant decisions.
- The process of assessing the collective efficacy of a school or university department should include consideration for cultural identify and learning differences.

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Conclusions and Implications

- Teachers need professional development that considers the subject matter relevancy, appropriate pedagogies, assessment tools, student interactions, and opportunities for scholarly advancement within the context of the program.
- While addressing all these factors cannot always be accomplished in one setting, survey results suggest that print and/or web-based follow-up to face-to-face meetings are acceptable presentation options.
- Perhaps the most important outcome from this needs assessment study is to have available current descriptive indicators that show where particular schools are now and a picture of where they want to be in the near future.
- Please share your feedback and participate in the V-NECC discussion accessible on the web at: **http://marssb.cet.edu**.
- For further information and/or to share comments, contact ossbroker@cet.edu.

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