MSP Math and Science Partnership Program Impact Report

Executive Summary

Since 2002, the National Science Foundation's (NSF) Math and Science Partnership (MSP) program has funded a variety of partnerships to strengthen and reform mathematics and science education in the United States. The 52 partnerships funded to date unite some 150 institutions of higher education with more than 550 school districts, including more than 3,300 schools, in 30 states and Puerto Rico. More than 70 businesses, numerous state departments of education, informal science organizations and community-based organizations are also partners.

Following are some examples of the MSP impacts on national mathematics and science education:

Commitment to Teacher Development

Partnerships in the MSP program are expected to impact more than 141,500 teachers of mathematics and/or science. In academic year 2004-05, more than 30,000 teachers participated in MSP professional development designed to deepen and expand their expertise through such venues as:

Summer Teacher Institutes: Deepen teacher understanding of subject matter in mathematics and the sciences, and include pre- and post-testing of participants. Results from the Appalachian Mathematics and Science Partnership, for example, show significant gains in teachers' reasoning/problem solving and pedagogical content knowledge. The teacher's ability to translate that knowledge into an effective learning experience for students is also critical. In the Alliance for Improvement of Mathematics Skills, PreK-16, 250 teachers from nine school districts in south Texas participated in more than 30 hours of professional development for two years. Results were a significant decrease in lectures and an increase in student-centered classroom learning, with student engagement increasing 80 percent.

Learning Communities: Include K-12 teachers and higher education faculty who teach science, technology, engineering and math. Teachers examine student data, strategically address their content and pedagogical needs, and devise new strategies to improve student achievement.

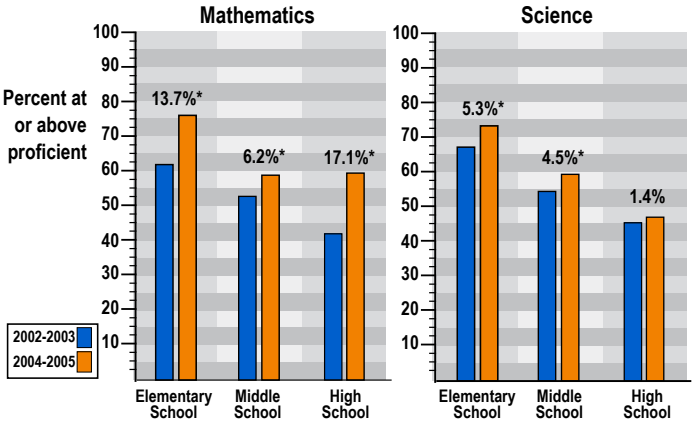
Teacher Institutes for the 21st Century: Enable experienced teachers to gain the expertise and experiences needed to become school and district-based intellectual leaders in mathematics or the sciences. They may acquire a new certification or a master's degree as a result of their completion of the Institute. Teachers take this expertise back to their schools, where they may help shape curriculum or mentor peers.

Other Venues: Include 'externships' in higher education or in businesses, mentoring/cognitive coaching and training in the use of technology to innovatively demonstrate course content.

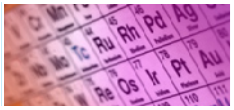
The MSP teaching force is also more diverse overall than the nation (as reported by the National Center for Education Statistics), and more diverse than bell-weather states such as Florida, Texas and California. MSP teachers in 2004-2005, the most recent data year, were 58 percent white, 11 percent black, and 28 percent Hispanic (3 percent were reported as "other").

Evidence of Improved Student Proficiency in Math and Science

The most recent analysis of 123 schools participating in the MSP program shows improvements in student proficiency in mathematics and science at the elementary, middle and high school levels over a 3-year period.



The "*" denotes a statistically significant change at the 0.05 level (i.e., 1 in 20 chance the change results from random chance).



A key feature of the MSP program is its emphasis on challenging courses and curricula for all students in mathematics and the sciences. This emphasis includes:

Novel curriculum models in K-12: In the System-Wide Change for All Learners and Educators (SCALE) partnership, interdisciplinary teams of university science, technology, engineering and math faculty, learning scientists, school district curricular coordinators, and teachers have developed, tested and implemented immersion units designed to sustain students' enthusiasm as they learn rigorous content aligned with district standards. Students learn academic content by working like scientists: making observations, asking questions and communicating their results based on evidence. The units emphasize standards and concepts where students typically need focused support or on highlighted concepts that merit deeper exploration than what is currently supported by the existing instructional materials.

Redesign of curricula for teachers: MSP supports new graduate programs and courses for teachers of K-12 mathematics and science. In a sample of 10 partnerships, more than 100 courses were identified as having been redesigned or newly developed with MSP support. Every partnership in the sample has developed new programs, certificate pathways or degrees as a result of MSP funding.

Dedicated to Providing New Tools and Strategies for Better K-12 Education

A unique component of the MSP program is the development of tools to make the partnerships' work more strategic, build evaluation capacity, and conduct focused research. MSP also emphasizes coherence in curricula and instruction and K-16 alignment as an important strategy for improving K-12 education.

Research, Evaluation, and Technical Assistance (RETA): More than 30 RETA projects develop tools to help the MSPs assess their progress. Recent RETA projects across the country include research on MSP teacher recruitment, induction and retention, development of assessments of teachers' growth in content knowledge in mathematics and science, and studies of student motivation and principal knowledge and beliefs about teaching and learning.

Coherence in curricula and instruction: Data from the Promoting Rigorous Outcomes in Mathematics and Science Education (PROM/SE) partnership reveal that elementary and middle school teachers do not feel well prepared to teach higher mathematics topics, which most likely impacts their ability to lay critical foundations for their students' later, higher mathematics success.

K-16 alignment: While MSP requires partnerships between higher education and K-12, some projects go beyond the requirement and articulate explicit goals to align the sectors. The University of Texas at El Paso, for example, seeks to prepare students for success in rigorous college courses by aligning their high school mathematics and science courses with those of partner universities. Mathematics and science curricula in grades K-8 are then aligned with the newly designed high school courses. Finally, the MSP further aligns the K-12 mathematics and science courses with the content and pedagogical approaches in the university/college teacher preparation programs so that the university partners produce new teachers prepared to be more immediately effective in classrooms.

NSF Stewardship

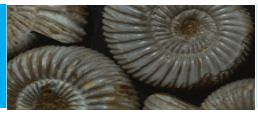
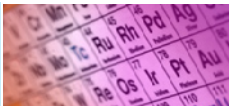
One of NSF's investment priorities is to build strong foundations and foster innovation to improve K-12 teaching, learning and evaluation in science and mathematics. The MSP program has matured into a learning organization within NSF and contributes to understanding the effectiveness of future federal investment in mathematics and science education.

MSP Management Information System: Collects common, required data from all partnerships and enables the aggregation of quantitative and qualitative data on students, teachers, schools, districts, faculty and others.

MSP Program Evaluation: Addresses impacts the MSPs have produced on student achievement and contributions they may have made to advancing knowledge in mathematics and science education.

MSPnet: Created as the primary link among active MSP projects for electronic sharing, professional examination and distribution of strategies and information, MSPnet is an important vehicle for disseminating the work of the program to the public at large and the MSP community.

Web sites:

National Science Foundation's MSP Program:
http://www.nsf.gov/ehr/MSP/

MSPnet: An Electronic Community of Practice Facilitating Communications and Collaboration:
http://hub.mspnet.org/