Mathematics and Science Partnerships

Scientifically Based Research in Mathematics

Student Achievement and School Accountability Conference

Denver, CO
October 25, 2002

The Math and Science Partnership (MSP) program addresses a portion of the President's challenge—enunciated in No Child Left Behind—to strengthen K-12 science and mathematics education. The MSP program promotes a vision of education as a continuum that begins with our youngest learners and progresses through adulthood. The program supports partnerships that unite K-12 schools, institutions of higher education and other stakeholders in activities that ensure that no child is left behind.

www.nsf.gov

Math and Science Partnership Program

September 2002

- Five-year national effort to unite the activities of higher education institutions, K-12 school systems and other partners in support of K-12 students and teachers.

- In fiscal year 2003, the president's MSP budget request amounts to $200 million for the National Science Foundation and $12.5 million for the Department of Education.

NSF-ED Solicitations

MATH-SCIENCE PARTNERSHIPS (MSP) COMPETITION

http://www.nsf.gov/pubs/2002/nsf02190/nsf02190.htm

Letter of Intent: December 2, 2002
Proposal due: January 7, 2003 (5:00 p.m. EST)

WORKSHOPS

http://www.nsf.gov/ehr

SUMMER INSTITUTES COMPETITION

To be announced

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Key Features – 2003 Competitions

MSP projects will raise achievement of K-12 students in mathematics and science by:

- **Stimulating partnerships** among K-12 teachers and administrators, and higher education mathematics, science and engineering faculty; Ensuring that K-12 students are prepared for, have access to, and participate and succeed in challenging mathematics and science courses;
- **Increasing the number, quality and diversity of K-12 teachers** of mathematics and science;
- **Making evidence-based contributions to the MSP Learning Network** and the learning and teaching knowledge base so research findings and successful strategies can be broadly disseminated to improve educational practice; and
- **Stimulating well-documented, inclusive and coordinated institutional change** in both colleges and universities, and in local school districts to support improved student outcomes in mathematics and science.

PARTNERSHIPS

Core Partners Must Include:

- **At least one K-12 local or regional school district (for ED-funded programs, must be high-need district);**
- **At least one higher education institution (arts and sciences faculty emphasized); and**
- **A State educational agency (required for ED-funded programs only).**

Core Partners May Include:

- **State educational agencies, business and industry organizations, community organizations, science centers and museums, professional societies, research laboratories, private foundations**

Mathematics and Science Partnerships (Title II, Part B)

Authorizes grantees to use funds to:

(1) develop or redesign more rigorous math and science curricula;

(2) provide professional development for teachers designed to improve their subject knowledge;

(3) promote strong teaching skills that include those based on scientific research and technology-based teaching methods;

(4) operate summer workshops or institutes;

(5) recruit math, science, and engineering majors into teaching;

(6) establish distance learning programs;

(7) design programs to prepare teachers to mentor other teachers;

(8) operate programs to bring math and science teachers into contact with working scientists, mathematicians, and engineers;

(9) design programs to identify and develop exemplary math and science teachers in grades K-8; and

(10) develop programs to encourage young women and other underrepresented groups to pursue careers in math, science, engineering, and technology.

TYPES OF PROJECTS

Comprehensive Projects (up to $7 million annually):

- Improved student achievement in math and science across K-12 continuum; or
- Improved student achievement in math across K-12 continuum; or
- Improved student achievement in science across K-12 continuum.

Targeted Projects (up to $2.5 million per year)**:**

- Improved student achievement within a targeted grade range or disciplinary emphasis

MSP Learning Network

2003 MSP Workshops

- For teams planning **comprehensive** or **targeted** proposals.
- A partnership may send 2-4 individuals to workshop.
- Partnerships that will participate must meet prior to the workshop, be familiar with the solicitation, and have formal commitments to the MSP project from both the K-12 and higher education partners.
- Workshops are scheduled for:
  - **Washington DC** (October 14-15)
  - **New Orleans LA** (October 29-30)
  - **Portland OR** (November 5-6)
  - **Kansas City MO** (November 11-12)
  - **Minneapolis MN** (November 19-20)

Comprehensive Awards -- 2002

PI Name	Award Title
Verna Holoman	North Carolina Partnership for Improving Mathematics and Science (NC-PIMS) (UNC)
William Firestone	New Jersey Math Science Partnership (Rutgers Univ)
Terrence Millar	System-Wide Change for All Learners and Educators (UW-Madison)
Paul Eakin	Appalachian Mathematics and Science Partnership (U of Kentucky)
Susana Navarro	El Paso Math and Science Partnership (UTEP)
Ronald Stern	Mathematics and Science Partnership: FOCUS (Faculty Outreach Collaborations Uniting Scientists, Students and Schools, UC-Irvine)
John Lee	SUPER STEM Education (Baltimore County Public Schools)

Targeted Awards

PI Name	Award Title
Richard Cardullo	Mathematical ACTS (UC-Riverside)
Osman Yasar	Math and Science Partnership: Integrative Technology Tools for Preservice and Inservice Teacher Education (SUNY Brockport and Rochester Public Schools)
Diane Resek	A Partnership Through Lesson Study (San Francisco State University)
Robert Bayer	Stark County Math and Science Partnership (Stark County ESC)
Gary Ybarra	Teachers And Scientists Collaborating (Duke University)
Kenneth Gross	Vermont Mathematics Partnership (UVM-Inst for Science & Math)
Wiliam Badders	Cleveland Math and Science Partnership (Cleveland Municipal Schools)
Lee Sloan	Alliance for Improvement of Mathematics Skills PreK-16 (Texas Engineering Exp Station)
Edward Macias	St. Louis Inner Ring Cooperative: Intervention Case Studies in K-12 Math & Science (Washington University)

Targeted Awards

PI Name	Award Title
Jasper Adams	Texas Middle and Secondary Mathematics Project (Stephen F Austin St University)
Gerald Wheeler	Virtual Mentoring for Student Success (NSTA)
Dennis Chaconas	Learning to Teach, Teaching to Learning (Oakland USD)
William Frascella	Indiana University - Indiana Mathematics Initiative Partnership (Indiana University)
David Pagni	Teachers Assisting Students to Excel in Learning Mathematics (TASEL-M) (CSU-Fullerton)
Nancy Shapiro	Vertically Integrated Partnerships K-16 (VIP K-16) (U-MD College Park)
James Parry	PRIME: Promoting Reflective Inquiry in Mathematics Education (Black Hills Special Services Cooperative)
Judith Fonzi	Deepening Everyone's Mathematics Content Knowledge: Mathematicians, Teachers, Parents, Students, & Community (University of Rochester)

MSP Learning Network

PI Name	Award Title
Gordon Kingsley	Alternative Approaches to Evaluating STEM Education Partnerships: A Review of Evaluation Methods and Application of an Interorganizational Model (GA Tech)
Jeanne Rose	Century Bridging Research and Practice in the MSPs: Technical Assistance for Use of Research and Data-Based Decision Making (EDC)
Blaine Worthen	Building Evaluation Capacity of STEM Projects (Utah State University)
Paul Hickman	STEM-HELP (Higher Education Liaison Project) (Northeastern University)
Brian Lord	Creating Better Frameworks for Implementation Evaluations in MSPs: A Research and Evaluation Design Study (EDC)
Norman Webb	Adding Value to the Mathematics and Science Partnerships Evaluations (UW-Madison)
Heather Hill	Design, Validation and Dissemination of Measures of Content Knowledge for Teaching Mathematics (University of Michigan)

MSP Learning Network

PI Name	Award Title
Iris Weiss	Incorporating High Quality Interventions into a Broader Strategy for Sustained Mathematics/Science Education Reform (Horizon Research)
Joni Falk	MSP-Network: A Technical Assistance Design Project (TERC)
Madeleine Long	Assistance for Building Capacity (AAAS)
Arthur Gosling	Developing the Dissemination Strategy and Framework for the Math and Science Partnerships Program (GWU)
Rolf Blank	Longitudinal Design to Measure Effects of MSP Professional Development in Improving Quality of Instruction in Mathematics and Science Education (CCSSO)
Edys Quellmalz	MSP Assessments (SRI)
Katherine Stiles	Academy for Professional Development Design in Science and Mathematics (WestEd)
Jay Labov	Facilitating Math/Science Partnerships (NAS)
Shirley McBay	Technical Assistance to Increase the Participation and Competitiveness of Teams Involving Minority-Serving Institutions in the MSP Program (Quality Education for Minorities Network)

What do we know about effective mathematics teaching and learning?

Adding It Up: Helping Children Learn Mathematics. National Academy Press, 2101 Constitution Ave. NW, Washington, DC 20055, or online at www.nap.edu

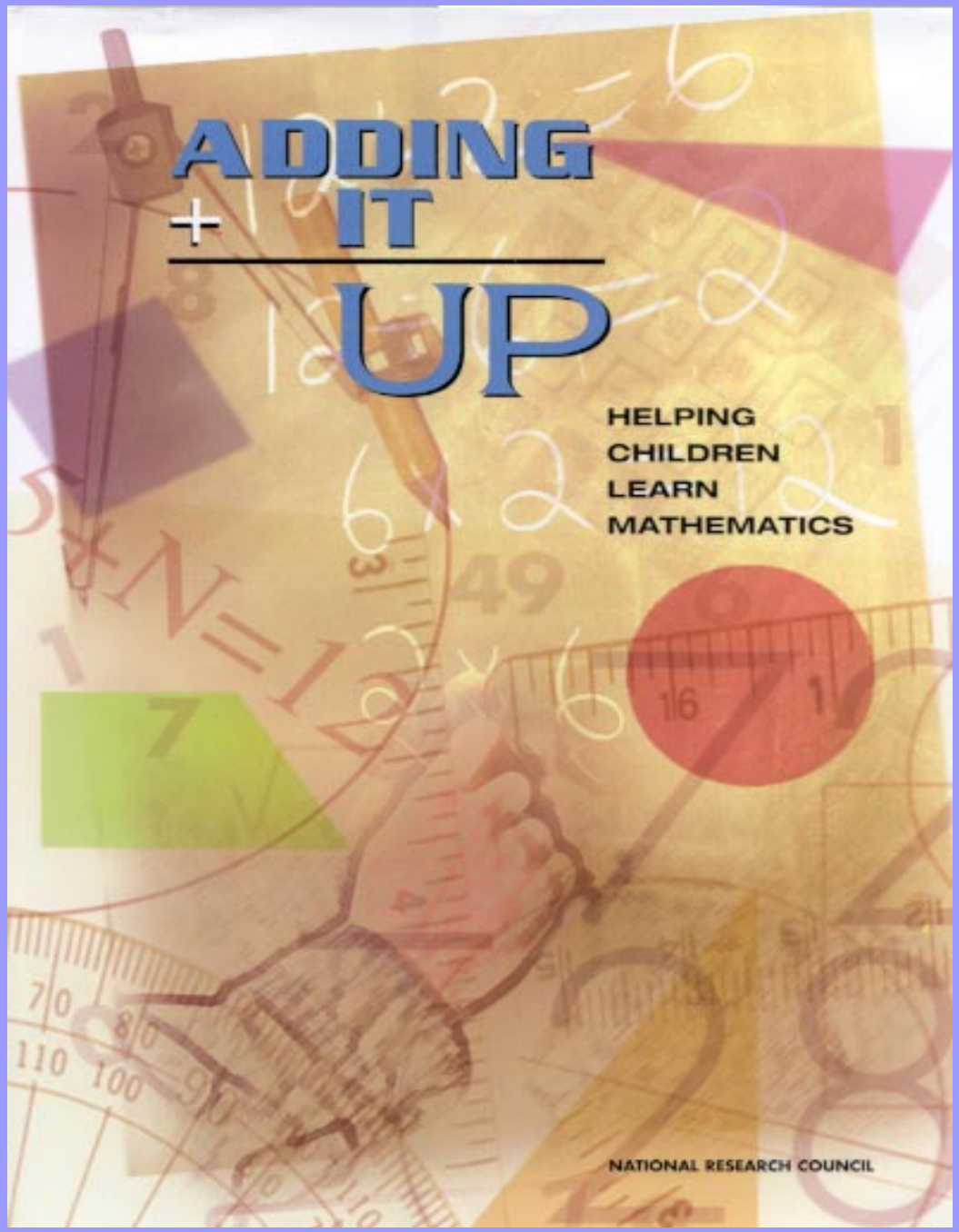
Educating Teachers of Science, Mathematics and Technology: New Practices for the New Millennium. National Academy Press

Every Child Mathematically Proficient: An Action Plan of the Learning First Alliance. Learning First Alliance, 1001 Connecticut Ave., NW, Washington, DC 20036, or online at www.learningfirst.org/mathaction.html

High Stakes: Testing for Tracking, Promotion and Gradation. National Academy Press

How People Learn: Brain, Mind, Experience, and School. National Academy Press

The Mathematical Education of Teachers. Conference Board of Mathematical Sciences, 1529 18th St. NW, Washington, DC 20036, or online at www.maa.org/cbms/MET_Documents/index.htm


ADDING
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UP
HELPING
CHILDREN
LEARN
MATHEMATICS
NATIONAL RESEARCH COUNCIL

Scientifically Based Research and Effective Mathematics Instruction

- **All students can and should be proficient in mathematics.**
- **Mathematical proficiency has five intertwined strands:**
  - ***Understanding*** **mathematics**
  - ***Computing*** **fluently**
  - ***Applying*** **concepts to solve problems**
  - ***Reasoning*** **logically**
  - ***Engaging*** **with mathematics - seeing it as sensible, useful and doable.**
- **For all students to become mathematically proficient, major changes must be made in instruction, instructional materials, assessments, teacher education, and the broader educational system.**

Scientifically Based Research and Effective Mathematics Instruction

- **In particular –**
  - **Instruction should support the development of mathematical proficiency for all**
  - **Instructional materials should incorporate the five strands**
  - **Assessments should contribute to the goal of mathematical proficiency**
  - **Teachers should have the support that will enable them to teach all students to be mathematically proficient**
  - **Efforts to achieve mathematical proficiency for all students must be coordinated, comprehensive, and informed by scientific evidence.**
- **Proficiency cannot be achieved through piecemeal or isolated efforts. Parents, teachers, administrators and policy makers must work to together to improve school mathematics.**

Frequently Asked Questions about Teaching and Learning Mathematics

Q. What are the "math wars"?

A. Reform efforts during the 1980's and 1990's downplayed computational skills, emphasizing instead that students should understand and use math. In extreme cases, students were expected to invent math with little guidance. Reactions to those efforts led to increased attention to memorization and computational skills. The clash of these positions is referred to as the "math wars."

Q. **Which side of the "math wars" is correct?**

A. Neither – both are too narrow. Students become more proficient when they understand the underlying concepts of math, and they understand the concepts more easily if they are skilled at computational procedures. U.S. students need both more skills and more understanding.

Frequently Asked Questions about Teaching and Learning Mathematics

Q. Do students still need to learn to compute with paper and pencil now that calculators are so widespread?

A. Yes. The availability of calculators has reduced the need for performing complex arithmetical calculations, but students still need to understand what is happening in those calculations. Computational fluency is often essential in solving higher-order problems.

Q. How can teachers develop all the strands of math proficiency when they already have so much to teach?

A. By teaching in an integrated fashion, teachers will actually save time in the long run. They will eliminate the need to go over the same content time and again. The five strands will support one another, making learning more effective and enduring.

Frequently Asked Questions about Teaching and Learning Mathematics

Q. Does working in small groups help students develop math proficiency?

A. It depends. Cooperative learning groups of 3-5 students can work together to increase their proficiency, but all students must be allowed to contribute. Small groups can increase achievement and promote positive social interactions among students, but tasks must be well chosen and students must be taught how to work in this mode.

- **Do students have to be grouped by ability?**

A. No – "ability grouping" results in achievement gaps that grow rather than diminish. Effective teaching methods can help all students in mixed-ability classes to develop proficiency, and teachers can be supported to acquire and use these methods.

Frequently Asked Questions about Teaching and Learning Mathematics

Q. Should all students study algebra?

A. Yes – algebra is the gateway to higher math. The study of algebra, however, need not begin with a formal course. The basic ideas of algebra can be learned by the end of middle school if they are taught in ways that draw on all strands of math proficiency.

- **Does improving students' math proficiency require new types of tests?**

A. Yes. New tests are needed and old tests need to be changed. Most current tests address a fraction of math proficiency – computing and parts of understanding and applying. Tests must help teachers gauge how far students have come in all five proficiency strands, and must allow students to simultaneously build and exhibit their proficiency.

Contact us!

Websites:

www.ed.gov/offices/OESE/esea/progsum/title2a.html#math

or

www.ehr.nsf.gov/msp/

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