



Focus on Mathematics MSP Learning Network Conference January 25–26, 2010

Project Description

Focus on Mathematics (FoM) was established as a Targeted MSP in the fall of 2003. It is a partnership of mathematicians and mathematics educators from three universities: Boston University, University of Massachusetts Lowell, and Lesley University; a nonprofit organization, Education Development Center; and seven local school districts in the Greater Boston area: Arlington, Cambridge, Chelsea, Framingham, Lawrence, Waltham, and Watertown. The Focus on Mathematics Partnership has four broad goals:

- offer teachers solid content-based professional development;
- provide students with rigorous courses and curricula;
- develop and support a cadre of mathematically expert teachers who will share their knowledge with teachers in their districts and students in their schools; and
- establish a community in which mathematicians, educators, teachers, and administrators work together with students to put rigorous mathematics at the core of 5–12 mathematics education.

Teachers in the Partnership are invited to participate in a range of activities including school-based study groups with core involvement of mathematicians, partnership-wide academic year seminars, week-long summer institutes for teachers, online problem-solving courses, a public colloquium series devoted to mathematics and education, and a new Masters program in Mathematics for Teaching offered jointly by the Department of Mathematics & Statistics and the School of the Education at Boston University. The graduate program, which also offers a Certificate of Advanced Graduate Study, is based on a six-week immersion experience in mathematics (PROMYS for Teachers), a research project, and preparation for serving as mathematical resources and professional development leaders. FoM also supports student research projects in mathematics through Math Fairs in local schools and an annual Partnership-wide Math Expo. Mathematics research projects allow students to experience mathematics as an exploratory, creative endeavor that will help them acquire a deeper understanding and appreciation of the discipline.

The FoM Partnership has evolved to include a Mathematics Teaching Scholars component and a Phase II Partnership.

Mathematics Teaching Scholars Program

The Mathematics Teaching Scholars (MTS) Program is designed to increase student achievement by supporting discipline-based teacher leadership across the FoM Partnership. The program offers salary supplements to exceptional secondary mathematics teachers who serve as mentors and professional development leaders in their districts. Many teacher scholars will participate in the Master of Mathematics for Teaching (MMT) degree program at Boston University, including three summers of mathematical immersion in PROMYS for Teachers and academic courses in mathematics and mathematics education. Teacher scholars will be expert mathematical resources for their colleagues and for the FoM Partnership. They will facilitate content-based professional development both in their schools and across Focus on Mathematics Partnership.

Focus on Mathematics, Phase II: Learning Cultures for High Student Achievement

FoM Phase II builds on past success while developing and disseminating new knowledge through a focused research study on the mathematical habits of mind teachers use in their professional lives. In Phase II, FoM is broadening its impact by increasing participation in the current districts, engaging additional high-need districts, and accepting new IHE partners. The project is developing a research program with the ultimate goal of understanding the connections between secondary (grades 7–12) teachers' mathematical knowledge for teaching and secondary students' mathematical understanding and achievement. As a tool for this research, the project is developing, testing, and refining a pen and paper assessment tool and a classroom video observation protocol to measure mathematical habits of mind for teaching at the secondary level. In addition, the project staff will convene national leaders in the field to create a long-term research program that will investigate links between secondary teachers' mathematical knowledge for teaching (MKT) and student achievement.

Project Successes

Indications of the Partnership's success include the following:

- Core involvement of mathematicians. Mathematicians are integral to the Partnership activities, including teacher professional development and student research projects for math fairs. Eighteen mathematicians have been involved in Focus on Mathematics (FoM) since 2003, with 13 remaining active through 2009 [1]. This core group of mathematicians has consistently work together with teachers in the schools in afterschool study groups and academic seminars.
- Creation of a mathematical community. Genuine communities of practice have formed among teachers, administrators, mathematicians, and educators within and among our partner organizations. In such communities, developing deeper mathematical understanding is everyone's work and lunchtime discussions about a problem in algebra are commonplace. Teachers reported a sense of community developed within the districts as a result of participation in FoM activities. The mathematical community appears strongly in the attendance of study groups throughout the years. Between 2003 and 2008, 392 high school and middle school teachers participated in study groups held in local schools [1]. Articles, arising from work in the study group by FoM teachers and IHE faculty, have appeared in the NCTM journal *Mathematic Teacher* [2, 3, 4, 5]. This unique collaboration has extended beyond the Partnership to regional, national, and international meetings of the AMS, MAA, NCTM, and PME, where teachers and mathematicians have given presentations [e.g., 6].
- Development of mathematics teacher leaders. Teachers in the FoM school districts have increasingly assumed leadership roles within their districts and the Partnership. Since 2004, 11 teachers have completed the Master of Mathematics for Teaching degree program and 3 teachers are currently enrolled. At the district level these teachers provide professional development, develop and review curriculum, mentor new teachers, and organize Math Fairs. At the partnership level in the past two years, FoM seminars and summer institutes have been designed and delivered by teachers. One example of evidence of success is a teacher leader who rewrote a lower-level course to engage students in a problem-based approach to learning algebra.
- Student open-ended mathematics research projects. Over the last six years, FoM mathematicians and teachers have provided project ideas and mentored students on the development of their mathematics research projects. There has been tremendous growth in school Math Fairs over the years: In 2003, 584 students created 301 projects. In 2009, 2663 students created 1480 projects [1]. The culmination of the local Math Fair events is a partnership-wide Mathematics Expo that exhibits outstanding student projects. Teachers, administrators, mathematicians, STEM industry mentors, local politicians, and families gather to celebrate the hard work and achievement of the students.

- Collaboration of district administrators. The Focus on Mathematics Partnership has enabled mathematics and school administrators from districts with divergent priorities and needs to develop collegial relationships and share best practices. A group of mathematicians, mathematics educators, and mathematics school administrators part of the Curriculum Research Committee have met regularly since 2003 to study areas of student difficulty in linearity and measurement. This group designed and tested a mini-assessment in order to gain a better understanding of student results on standardized tests. Their work was published in the NCSM's *Journal of Mathematics Education Leadership* [7] and presented at the annual conference of the International Group for the Psychology of Mathematics Education [8].

References:

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