

Title IIB: Massachusetts Mathematics and Science Partnerships Competitive Grants

Summaries of Funded Projects – Grants Awarded September 2008; anticipated ending August 2011

Aligning Mathematics in the Middle Grades (AMMG): Building on What Students Bring, Preparing Them for What's Ahead

Partners: Boston Public Schools, Northeastern University, Education Development Center, Inc. and the University of Washington

The AMMG project is a collaborative effort involving the Boston Public Schools, Northeastern University, Education Development Center, Inc., and the University of Washington designed to strengthen mathematics teaching and learning at grades 5 through 8 in Boston over a three-year period. The project provides a cohesive program of professional development that strengthens mathematical knowledge for teaching with a particular focus on number and operations and algebra. The intent is two-way vertical understanding. The mathematics that students are learning in these strands at the elementary grades can be more explicitly built upon by math teachers in the middle grades. Elementary teachers of math become more aware of and better able to anticipate middle school math expectations in their teaching.

The project provides support for professional learning communities in schools. In this way, teachers can continue to deepen their mathematical knowledge for teaching as they plan and debrief lessons, examine student work, and participate in structured visits to each other's classrooms. These learning communities support teachers as they enact what they are learning from the project in their own classrooms.

Finally, the project supports the creation of district alignment documents addressing the content of our curriculum materials and our state frameworks so there are clear expectations for each grade level. This will create important tools for communication with teachers, teacher leaders, math coaches, administrators, and parents about the trajectory of math learning across the 5 through 8 grade span and beyond.

There is a strong evaluation component designed to measure gains in mathematical knowledge for teaching and changes in mathematics teaching practice. In addition the evaluation will identify features of the project that contribute to these gains.

For more project information, contact the program coordinator: Linda Davenport, Senior Program Director, Boston Public Schools.

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Math Initiative Partnership (MIP)

Partners: Brockton Public Schools, Bridgewater State College, Fall River Public Schools, Bristol Community College, Cape Cod Community College, Cape Cod Collaborative, and North River Collaborative

The goal of this partnership is to improve math instruction by deepening teachers' knowledge and understanding of math concepts and standards-based pedagogy techniques. We will also build a network of support linking teachers from Brockton and Fall River (High Needs districts) and Cape Cod Collaborative and North River Collaborative with higher education faculty at Bridgewater State College, Bristol Community College, and Cape Cod Community College.

The partnership will offer a series of math courses to math teachers in grade 4 - 8 in partnership with INTEL education, and will include content from number sense through algebra and functions. A third course in geometry will be locally developed based on a needs-analysis using MCAS data. Up to six teams of instructors, with each team consisting of a content teacher from higher education and an experienced middle school teacher will be trained by senior trainers from INTEL education to co-teach the courses. The courses will be offered on a rotating schedule at Bridgewater State College, Bristol Community College and Cape Cod Community College.

Each district will arrange for a lead teacher/coach to work with teachers during and after the courses to build their capacity to use standards-based instructional strategies with their students. This lead teacher/coach will also monitor an electronic discussion forum for ongoing communication with all participants. Teacher participants will be required to deliver a professional development session for their peers in their district using standards-based strategies and course content.

Teachers will participate in surveys and focus groups related to standards-based math instruction. A pre and post assessment for the math courses will also be administered to the teacher participants, and the MCAS data on the students of participants before and after taking the courses will be tracked.

For more project information, contact the program coordinator: Linda Santry, Coordinator of Math and Science K-8, Brockton Public Schools. lindasantry@bpsma.org

Core Partners in Science (CPIS)

Partners: Gateway Regional School District, Westfield State College, Eastham Public Schools, and Holyoke Public Schools

The **Core Partners in Science (CPIS)** project will fund an effective and sustained inquiry-based science professional development partnership between the Gateway Regional School District, Holyoke Public Schools, Easthampton Public Schools, and Westfield State College's Center for Teacher Education and Research (CENTER). The Massachusetts DESE has designated all three school districts as high need in science, based upon student MCAS performance.

This innovative professional development program will serve eighty grade 5-8 teachers who teach science, special education and ESL and will require 45 hours of

graduate-level instruction and 20 hours of in-district supplemental activities. Participating teachers will receive a stipend for completing the entire sequence of six full-day seminars and 20 hours of approved supplemental activities. Full-day seminars will be led by three highly regarded science professors at Westfield State College, and will include keynote speakers who are experts in the fields of life science, earth science and physical science. Seminars will include rotating breakout sessions where teachers will work with instructional leaders in small groups. Each district's curriculum director will supervise 20 hours of site-based supplementary activities tied to STEM improvement plans. In the final seminar in July, teachers will showcase the outcomes of their class work and supplementary activities, demonstrating changes in instruction and student performance. This professional development program replicates a very successful model developed by the CENTER under two Federal Teaching American History Grants. Curriculum Research and Evaluation, Inc. (CRE) will serve as the independent external evaluator.

For more project information, contact the program coordinator: Priscilla Miller, Director for Teacher Education and Research, Westfield State College. pmiller@wsc.ma.edu

Math Content and Curriculum Synergy

Partners: Lesley University and Springfield Public Schools

The Springfield Public School system is collaborating with Lesley University to implement a systemic change program for all grade 5 - 8 middle school teachers of mathematics. The project, Mathematics Content and Curriculum Synergy, builds upon two successful years of standards-based mathematics professional development in Springfield in mathematics.

Its goals are as follows: (1) to develop meaningful instructional and conceptual synergy between mathematics content and the district curriculum; (2) to establish a consistent inquiry-based, problem-solving approach in mathematics built on strong pedagogical content knowledge; (3) to develop a critical mass of teacher-leaders and teacher implementers to sustain an inquiry-based mode of instruction in the district; and (4) to develop a district-based community of learners who collaborate on lesson study on a monthly basis.

Classrooms based on mechanical and routine instructional practices will move toward classrooms based on a deeper pedagogical content knowledge in mathematics. Springfield is poised to take dramatic steps to engage all teachers in reflective discourse about teaching, student thinking, conceptual development, and assessment. Key to this strategy is the opportunity for teachers to develop a deeper understanding of mathematics through school year and summer professional development.

Multi-year structured mathematics content courses are designed to include the modeling of pedagogical content knowledge. Equally important, the professional development involves monthly lesson study workshops designed to engage teachers in

planning lessons, teaching those lessons, reflecting on the lessons, and revising the lessons.

For more project information, contact: Anne Collins, acollin8@lesley.edu, Program Director, or the Program Coordinator Katherine Richard, krichar6@lesley.edu Associate Director of Math Programs at Lesley University

Greater North Shore Science Partnership

Partners: Northeastern University, Lynn Public Schools, Malden Public Schools and UMass Boston

The Greater North Shore Science Partnership (GNSSP), a collaboration among the Lynn and Malden Public Schools, Northeastern University, (NEU), University of Massachusetts, Boston, (UMB) and EDC, will offer an intensive course of study leading to the completion of 90% of the courses required in NEU's Masters of Education in Middle School Science. The courses are 60 hours long, carry 4 quarter hours of graduate credit and will be offered at NEU or UMB. All, but one, have been co-developed by STEM professors either from UMB or NEU and by Boston Public School Lead teachers, as part of the Boston Science Partnership, an NSF-funded MSP program.

Participating teachers will be encouraged to take at least three courses per year in order to complete the Degree requirements in three years. Each course is co-taught by a team consisting of two experienced teacher leaders and a university STEM professor. While the primary goal of these courses is to strengthen teachers' content knowledge, they also model current pedagogical practices that are based in research about how students learn. In the first year, three of these courses will be offered during the academic year and four during the summer. Follow-up activities will focus on documenting, via portfolios, the impact of the courses in the classroom. In addition to the courses, selected participants from each participating school district will be trained as mentors by EDC. Starting the second year, the trained mentors will organize and conduct the follow-up activities in their districts.

For more project information, contact: [Christos Zahopoulos](#), Program Director, Research Professor at Northeastern; or [Eric Johnson](#), Project Coordinator, Northeastern

Professional Learning Communities Promoting Learning and Using Science (PLC PLUS)

Partners: Randolph Public Schools, Braintree Public Schools; Bridgewater State College; and Teachers 21

Randolph Public Schools, a high needs district, in partnership with its neighbor, Braintree Public Schools, Bridgewater State College's Science Department and Center for Applied Science Education (CASE), Teachers²¹ and Assessment and Evaluation Concepts, Inc. will employ a systemic approach to improving science and technology/engineering instruction in grades five through eight. The two public school systems will serve as a learning lab featuring a network of sustained professional development experiences that increase the content knowledge and improve the standards-based instructional practices of science, technology/engineering teachers.

A variety of courses that focus on student engagement, instructional design and delivery, student expectations, an environment for learning and documentation and communication of student learning, will equip teachers of science and technology/engineering with the tools to create classrooms that yield maximum effectiveness. Various venues of offerings, such as graduate level courses, professional learning communities, workshops, mentoring and peer observations will allow teachers at any stage of their career and/or licensure to access meaningful professional development that meets licensure and career advancement goals.

The Center for Applied Science Education (CASE) will serve as the vehicle for dissemination and communication of the project, and its broad representation offers the commitment and resources for sustaining and growing the project beyond its funding period. Information shared can inform the development of pre-service courses that will better prepare teachers entering the field and the board's business membership affords opportunities for industry tours and teacher externships, allowing teachers to observe the science, technology and engineering demands.

The local evaluator, from Assessment and Evaluation Concepts, Inc. will evaluate the project, using qualitative and quantitative methods to measure the level of success in meeting the immediate and long-term goals of the project.

For more project information, contact the program coordinator: Jonathan Landman, Assistant Superintendent, Randolph Public Schools. landmanj@randolph.k12.ma.us

The World is Flat: An In-service/Pre-service Professional Development Model to Identify and Change Misconceptions Middle School Students Have about Science

Partners: Springfield College, Springfield Public Schools, New Leadership Horace Mann Charter, Springfield Museum of Science, Maine Math & Science

The Springfield Public Schools and the New Leadership HMCS, the two high-need public school districts in Springfield, have partnered with Springfield College to develop this program. Its goal is to train middle school science teachers on how to identify misconceptions their students have about science, and create strategies to eliminate student misconceptions. Students' progress in science will be evaluated to test the effectiveness of the teachers' in-service.

Approximately 60-65 teachers of science, grades 6-8, will participate during the three year project. All high-need district science teachers for these grades will be eligible to participate in the school year call backs and plenary sessions. Based upon their science subject needs, either the entire group or a subset of teachers will participate in the summer workshops each year.

The partnership will create this middle school in-service as a follow up to the success of an in-service program for Springfield elementary school teachers of science. From the previous program, we learned that students have significant misconceptions about science. Through the proposed program, teachers will learn to identify problematic areas at the start of a lesson, and monitor students for conceptual change. This formative assessment informs instruction, provides feedback to students, and improves student learning in science, particularly with low performing groups. At the completion of training, pre-service and in-service teachers will (1) be able to identify misconceptions their students have about science and understand their source; (2) be able to design instructional strategies and develop curriculum, instruction, and assessment strategies to change misconceptions students have about science; and (3) change the curriculum to positively influence student understanding of science and raise academic success. Pre and post tests will measure the change in student performance. Retests several months later will determine student retention of conceptual science.

For more project information, contact the program coordinator, Linda Marston, Director of Grants Office, Springfield College. lmarston@spfldcol.edu

Mathematical Experiences

Partners: Trustees of Boston University, Lawrence Public Schools, UMass Lowell, Arlington Public Schools, Chelsea Public Schools, Waltham Public Schools, Watertown Public Schools, and Education Development Center

Mathematical Experiences is a collaboration of Boston University's Department of Mathematics and Statistics with Lawrence Public Schools, University of Massachusetts at Lowell, and Education Development Center in Newton. Other partners include the school systems of Arlington, Chelsea, Waltham, and Watertown. The project builds on prior collaboration through the *Focus on Mathematics* (FoM) partnership, an NSF-funded (through August, 2008) Math and Science Partnership targeted at grade 5-12 teachers. *Mathematical Experiences* will extend the work of *FoM* by offering professional development programs focused primarily on elementary and middle school mathematics teachers.

Mathematical Experiences will increase student achievement by substantially improving classroom instruction through rigorous inquiry-based professional development that will support school-based learning communities comprising teachers, mathematicians and administrators. Core elements of the project are: (1) An intensive two-week summer institute for teachers devoted to an in-depth investigation of "Number

and Shape,” designed to deepen content knowledge by providing teachers with opportunities to practice the habits of mind that support student learning in the classroom. (2) Study groups, jointly facilitated by mathematicians and educators. By combining strategies of the *FoM* study groups with lesson study research, study groups develop deep content knowledge while attending carefully to student learning and classroom practice; and (3) Leadership development through Boston University’s nationally acclaimed PROMYS for Teachers---an intensive six-week graduate program in mathematics for teachers at all levels. *Mathematical Experiences* aims to engage teachers in a mathematically focused institute and follow-up activities designed to meet the identified needs of the teachers involved.

For more project information, contact the program coordinator: Glenn Stevens, Professor of Mathematics, Boston University ghs@math.bu.edu or Katie O’Malley, Project Coordinator komalley@focusonmath.org .