



## A new equation for mathematics education

by: Kathy Quirk

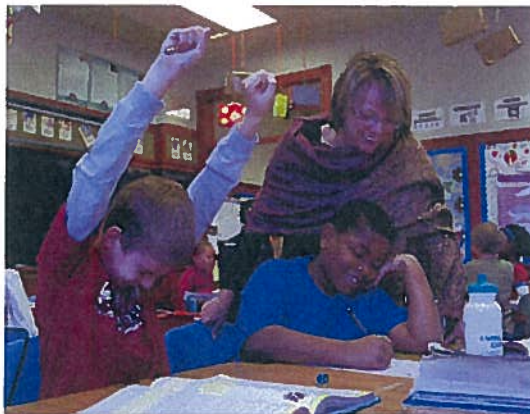
A \$20 million National Science Foundation (NSF) grant, the largest in UWM history, is changing mathematics education in Milwaukee Public Schools. UWM administers the grant for the Milwaukee Mathematics Partnership (MMP), a collaboration involving the university, Milwaukee Public Schools (MPS) and Milwaukee Area Technical College (MATC).

### Mathematics education is vital to economy

Improving mathematics education in Milwaukee is vital to the area's economy, says DeAnn Huinker, professor of mathematics education, director of UWM's Center for Mathematics and Science Education Research, and principal investigator for the NSF grant. Jobs in the growing areas of science, technology and engineering require good mathematical skills.

"We need to give teachers a deep knowledge of mathematics and a tool kit of teaching approaches to help assure that every student can not only do mathematical computation, but also can understand and apply mathematical reasoning and principles when solving problems," Huinker says.

The NSF grant encompasses numerous goals, from easing student transitions between high school and college mathematics to aligning key learning targets. However, improving mathematics teaching and learning is key.



Melissa Hedges, here working with 5th graders at Golda Meir School, provided a classroom teacher perspective on mathematics education through her work as a teacher-in-residence at UWM.

That's why, for the first time, the project has brought together mathematicians, education faculty and classroom teachers to design mathematics education courses for future teachers.

"The thinking is that if teachers and mathematicians work together, we'll end up with better mathematics overall," explains Kevin McLeod, associate professor in the department of mathematical sciences at UWM and a co-principal investigator for the project.

One key MMP initiative, developing a network of mathematics teacher-leaders within the schools, is already fostering major changes among current teachers. Teacher-leaders are classroom teachers who are trained to coach fellow teachers, work with school learning teams to improve mathematics education and integrate it with other subject areas, and take on leadership roles within their schools. They also serve as links between the district and the MMP.

The approach is working. Ask students at Emerson Elementary school what their favorite subject is, and most of them choose



Kevin McLeod, Henry Kranendonk, a co-principal investigator for the project and mathematics curriculum specialist for MPS, and DeAnn Huinker, ponder a mathematical problem. Funded by a \$20 million National Science Foundation Grant, they're leading a partnership to improve mathematics education in Milwaukee. Other co-principal investigators are Kim Farley of MATC and Aquine Jackson of MPS.

Photos by Alan Magayne-Roshak

(2008)

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math, says Elnore McKinley-Seward, third-grade teacher and mathematics teacher-leader at the school. That's a significant change from a few years ago.

**Mathematics "boot camp"**

Through the NSF grant, McKinley-Seward, a 17-year MPS veteran who'd never focused particularly on mathematics, completed a rigorous series of workshops and courses at UWM - "mathematics boot camp." Working with her colleagues, she introduced a "problem of the week" that every student in the school works on. Other efforts to bring math to life at Emerson include bright charts and graphs illustrating the results of a school fund-raising drive - prominently displayed outside the main office.

Through the MMP, experienced teachers can take workshops on everything from algebraic reasoning to geometric thinking and measurement. "Our responsibility as partners is to strengthen the mathematical knowledge needed by educators for teaching," says Huinker.

The MMP represents a two-way flow of information about how to improve mathematics education. Teachers like Melissa Hedges, a fifth grade instructor and mathematics teacher-leader at Golda Meir School, don't just take classes on how to implement curriculum. Hedges actually stepped into UWM as a teacher-in-residence to help redesign college mathematics classes for future teachers.

This classroom teacher perspective is invaluable, says McLeod. He recalls one design session where education faculty and mathematicians could not figure out how to convey a geometric concept involving planes and spheres. A classroom teacher suggested using oranges, and soon the mathematics faculty were walking through the corridors of the university with bags of oranges.

**Adding up the results**

As the National Science Foundation grant enters its fifth and final year, investigators and outside evaluators are sorting through the data to assess the partnership's overall impact.

Because of the lag time between when teaching changes take effect in the classroom and when they begin to show up in district-wide test results, the grant's impact on student progress is hard to measure district-wide.

But McKinley-Seward says Emerson's students are already changing. Mathematics scores on the school's yearly progress test have improved significantly. "That's huge for us," she says.

And there is more good news. Huinker says MPS, MATC and UWM, who forged a strong relationship through the MMP, will continue working together even after the grant ends. MPS, for example, incorporated suggestions from MMP on how to improve learning targets and assessments. Team members were consulted as schools chose new textbooks, and academic faculty are working with teachers to design assessments of progress.

The project's leadership team is also looking at ways to sustain the MMP's core work beyond the lifespan of the NSF grant. "One of our key projects in year five is to assess what stays and what goes away," says Huinker. "There are things we'll have to bring closure to because the funding isn't there."

Huinker says she's further encouraged by MPS' continued commitment to the mathematics teacher-leader program. A \$10 million state initiative to support mathematics education in MPS will also help continue the positive changes started through the NSF grant.

The network of teacher-leaders, supported by mathematics specialists, will remain in place, as will some of the continuing education courses.

Most importantly, say the MMP members, the educational leadership focused on improving mathematics education and learning in individual schools all over the system will continue.

As McKinley-Seward puts it: "Mathematics is part of the culture of the school now."



Elnore McKinley-Seward, mathematics teacher-leader at Emerson School, discusses geometric shapes with her third-graders. Mathematics is now part of the culture at Emerson, where students school-wide solve a "problem of the week" and incorporate mathematics into extracurricular activities.



An Emerson student shows classmates how he reached his answer to a word problem.

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