



PROM/SE

WHAT WE HAVE LEARNED SO FAR

>> Susan Pettit Riley, PROM/SE Director of Communications

PRELIMINARY RESEARCH FINDINGS from Promoting Rigorous Outcomes in Mathematics and Science Education (PROM/SE) are already having an impact in Michigan and Ohio school districts. As the five-year, \$35 million project funded by the National Science Foundation enters its fourth year, data emerging from the project are shedding new light on what it takes to improve student achievement in math and science.

After reviewing PROM/SE data from their districts, a group of superintendents from Calhoun Intermediate School District, Michigan, decided to visit classrooms in each others' districts in order to increase their knowledge and understanding of curriculum and instruction, and to become better instructional leaders for mathematics and science.

What makes the PROM/SE project somewhat unique is its focus on data

collected and analyzed from each of the nearly 60 participating school districts, and their teachers and students. “Our data is not about passing or failing,” said William H. Schmidt, the lead principal investigator and MSU Distinguished Faculty. “School and district assessment data collected by the project create powerful tools that help teachers and administrators understand structurally what is going on in their district and the classroom.”

With this enormous data pool, PROM/SE is arming districts with the information they need to make dramatic changes to the way mathematics and science are offered and taught in their schools. And, at the same time, this data can help districts work more efficiently by shifting the conversation from “how” to “why.” To understand the full picture of how to increase student achievement, districts need to understand why their students are not succeeding to their highest potential. This includes an in-depth look at the curriculum coherence and rigor, teacher preparation and knowledge, professional development and state standards.

While data collection and analysis are ongoing, here are some early research highlights and recommendations from the PROM/SE project.

Curriculum Coherence

In a sampling of seven school districts, the number of high school math courses offered ranged from 14 to a high of 46. These results illustrate how the lack of coherence manifests itself at the high school level due to multiple versions of various courses. High schools would be better served by having a small number of well-defined high school mathematics courses. So much variation in courses and content can water down the important connections between key concepts and how those unfold for the student between the grades and courses.

Rigorous Curriculum

PROM/SE student achievement data measuring fractions learning of nearly 200,000 students in grades 3–12 reveal that:

- Large numbers of students are not learning foundational fractions such as equivalent fractions and common denominators, making later success in more advanced mathematics difficult.
- Third grade is the crucial time for teaching and learning foundational concepts. About 60 percent of the third graders in the top-achieving countries passed the TIMSS fractions test, a test comparable to the PROM/SE assessment, while only about 25 percent of the PROM/SE third graders passed their test.
- By eighth grade, about 75 percent of PROM/SE students can pass the fractions test but the passing rate improves little throughout high school showing that about a quarter of the students do not possess fundamental skills for higher math success. (See The PROM/SE Research Report “Making the Grade: Fractions in Our Schools.”)

Teacher Knowledge

PROM/SE surveyed nearly 4,100 K–12 mathematics teachers about their knowledge of mathematics for teaching and how they acquired it. Key findings reveal:

- Elementary and middle school teachers do not feel well prepared to teach higher math topics, which most likely impacts their ability to lay critical foundations for their students’ later, higher math success.
- Only about 50 percent of the PROM/SE middle grades teachers feel very well prepared to teach such key topics as expressions and

simple equations or linear equations and inequalities. Confidence in teaching other important algebraic concepts such as proportionality, slope and functions fared less well.

- Findings vary greatly among PROM/SE districts, from about only about 25 percent of elementary teachers in one district feeling very well prepared to teach geometry basics to about 90 percent in another district.
- The consequences of data are profound both in terms of what a typical student in the PROM/SE districts will encounter and the inequities resulting from large variations across districts. (See The PROM/SE Research Report “Knowing Mathematics: What We Can Learn from Teachers”)

Beyond the numbers, PROM/SE regularly convenes meetings with superintendents and district leaders to discuss trends in the field and tie the project data to state standards and national guidelines such as the National Council of Teachers of Mathematics curriculum focal points. These meetings also provide a forum for district leaders to share implementation ideas with each other. Schmidt notes that while there may be many paths to get there, the bottom line of all these efforts is to improve student achievement in mathematics and science.

For more information on PROM/SE and to download issues of *The PROM/SE Research Report* series, visit www.promse.msu.edu.

PROM/SE RESEARCH ALSO FOCUSES ON:

- Student course-taking patterns
- Intended versus implemented curriculum
- Teacher preparation
- District- and building-level leadership
- Parent awareness
- Student achievement