

Math panel counts ways to improve

By **Carla Thomas McClure**

The National Mathematics Advisory Panel, established by executive order in 2006, was charged with recommending research-based actions to advance the teaching and learning of mathematics. The panel of mathematicians, cognitive psychologists, educators, and other experts reviewed more than 16,000 research and policy reports, public testimony from 110 individuals, written commentary from 160 organizations and individuals, and survey results from 743 algebra teachers. The panel concluded that the U.S. “delivery system in mathematics education — the system that translates mathematical knowledge into value and ability for the next generation — is broken and must be fixed” (p. xiii).

The big picture

The panel’s final report (2008) takes a broad view in presenting 45 findings and recommendations, with the central message being to put first things first. In a nutshell:

- Streamline the preK-8 math curriculum and emphasize the most critical topics (whole numbers, fractions, and particular aspects of geometry) in the early grades. Follow a coherent progression, and avoid revisiting topics year after year.
- Capitalize on research on how children learn (e.g., give them a strong start in mathematics; help them develop conceptual understanding, computational and procedural fluency, and automatic recall of facts; and emphasize effort and persistence).
- Attract, prepare, evaluate, and retain effective teachers.
- Inform instructional practice through high-



quality research and the professional judgment of accomplished teachers.

- Improve the quality of the National Assessment of Educational Progress (NAEP) and state assessments; increase their emphasis on the critical knowledge and skills students need for algebra.
- Build the nation’s capacity for rigorous research in mathematics education, and use research findings to inform policy and practice.

The algebra pipeline

Based on available data, algebra is often described as a gateway to higher math courses, better math scores on standardized tests, and college attendance. For this reason, the National Math Panel recommends that more students should be prepared to succeed in algebra and have the opportunity to take it in the 8th grade. The most recent NAEP results show that only 39% of 8th graders are at or above the “proficient” level in mathematics. “Problems in mathe-

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mathematics learning in the U.S. increase in late middle school before students move into algebra,” the panel reports (p. 3). NAEP scores indicate that the problems continue throughout high school, with only 23% of students achieving proficiency or better in mathematics in the 12th grade.

Although much has been made of the call for 8th-grade algebra, the panel emphasizes that higher standards alone are not likely to yield the hoped-for results. A random national survey of Algebra I teachers indicates that preparation for success in algebra needs to begin in elementary school. They noted that student preparation seems especially weak in three areas: rational numbers, word problems, and study habits.

Regarding instructional practices, the panel concluded that quality research does not support the exclusive use of either “student centered” or “teacher directed” approaches. Struggling students and those with disabilities benefit from explicit instruction when the teacher provides clear models for solving problems, offers examples, lets students practice and think aloud, and provides extensive feedback. Other findings: Formative assessment can improve student learning in the elementary grades. Using real-world contexts to introduce mathematical ideas does not improve student performance on assessments that focus on other aspects of math, such as computation, simple word problems, and equation solving. Although students’ use of calculators was found to have little or no impact on calculation skills, problem solving, or conceptual development over periods of one year or less, the panel cautions that “to the degree that calculators impede the development of automaticity (e.g., instant recall of multiplication facts), fluency in computation will be adversely affected” (p. xxiv).

Professional development for teachers

The panel recommends that professional development for mathematics teachers should not only strengthen their knowledge and skills, but also help them understand how the content they teach is connected to what students have already learned and what they will learn next. Unfortunately, existing research offers little infor-

Recommended resources

- CENTER ON INSTRUCTION
K-12 mathematics resources
www.centeroninstruction.org
- NATIONAL RESEARCH COUNCIL
How People Learn: Brain, Mind, Experience, and School
www.nap.edu/openbook.php?record_id=6160
- U.S. DEPARTMENT OF EDUCATION
National Math Panel Report and Related Resources
www.ed.gov/about/bdscomm/list/mathpanel
- ORGANIZING INSTRUCTION and Study to Improve Student Learning (IES Practice Guide)
<http://ies.ed.gov/ncee/wwc/pdf/practicguides/20072004.pdf>

mation about “what effective teachers do to generate greater gains in student learning” (p. xxi). The panel also lamented the lack of quality research on the efficacy of placing full-time math teachers in elementary schools.

Reference

National Mathematics Advisory Panel. (2008). *Foundations for success: The final report of the National Mathematics Advisory Panel.* Washington, DC: U.S. Department of Education. ◆

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