

The Future is Now:
Issues and Innovations in Mathematics

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What's the problem?

- http://www.nsf.gov/news/special_reports/math/classroom.jsp

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The urgency

1. Enormous gaps in learning opportunities and disparities in achievement (within U.S. and in international comparisons)
2. Rapidly changing school population
3. Higher, more complex academic goals
4. High expectations for <u>all</u> students



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What are these "higher expectations"?

- Mathematical skill and understanding, intertwined
- Skills with reasoning, judging the validity of claims, representation
- The ability to communicate about mathematical ideas
- Strategic use of numerical, algebraic, geometric ideas and tools
- Ability to think with and use data

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- We've been here many times before.
- We keep gravitating to the same strategies.

Have we learned anything that can help us not go through this again?

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What are some of the most widely-touted strategies for educational improvement?

1. Teacher-proof instruction.
2. Install a more challenging curriculum.
3. Increase accountability.
4. Reorganize schools.
5. Pay teachers more.
6. Recruit teachers: lower the barriers for entry to teaching.

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What persistently impedes progress?

1. Persisting with extinct arguments about skills versus conceptual understanding (Adding it Up [2001]; National Math Panel Report [2008])
2. Lack of a central or common mathematics curriculum
3. Persisting with outdated and refuted ideas about "teacher quality," especially with respect to content knowledge (National Math Panel Report [2008])
4. Persisting with pendulum shifts from teacher-proofing to teachers, but rarely focusing on teachING
5. Persisting with approaches to teacher education that emphasize things other than practice (e.g., reflection, beliefs, propositional knowledge, experience) (Hiebert & Stigler, 2007)

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What are the most promising areas to target, and why?

1. Focus teacher education on a common K-12 mathematics curriculum
   - A national or state common curriculum
   - Use of a common curriculum material in TE
   - ◆Evidence that teachers' learning is enhanced when grounded in the pupils' curriculum (Cohen & Hill, 2001; Japanese lesson study)

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What are the most promising areas to target, and why?

2. Focus mathematics teacher education on practice
   - Mathematical knowledge for teaching (Ball, Hill, & Bass, 2005)
   - Decomposition and close modeling, training, and coaching on highest leverage practices (Ball, Sleep, Boerst, & Bass, 2009; Grossman & McDonald, 2008; Grossman, Compton, Igra, Ronfeldt, & Shahan, 2009; Lampert & Graziani, 2009)
   - ◆ Evidence that there is professional knowledge of content and that it can be taught (Hill & Ball, 2004); teaching practice can be taught and scaffolded; addresses the unpredictability of learning from experience and the scale problem

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What are the most promising areas to target, and why?

3. Build common assessment systems to support and evaluate teachers' learning and performance of mathematics teaching that produces student learning
   - Build assessments that are keyed to gains for students
   - Develop ways to appraise whether teachers can do the work rather than the pathway through which they come
   - ◆Evidence that assessments can be built that are linked to student achievement gains (Hill, Rowan, and Ball, 2005; Rockoff, Jacob, Kane, Staiger, 2008)

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4. Support early years of teaching (years 0 -5)
   - Mentoring programs
   - Differentiated staffing for beginning teachers, more collective responsibility (like nursing)
   - Continued installments of more advanced practice
   - ◆ Early career support is assumed in other occupations and professions (hairdressing, retail sales, service, architecture, nursing, medicine, social work)

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