
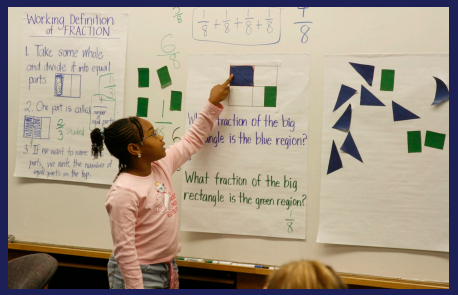


Research on Mathematics for Teaching
Taking Stock and Working Collectively
(Breakout Session, C.7)

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Teaching Teachers in the Era of the Common Core

Washington, DC • October 2-4, 2011

Overview of session

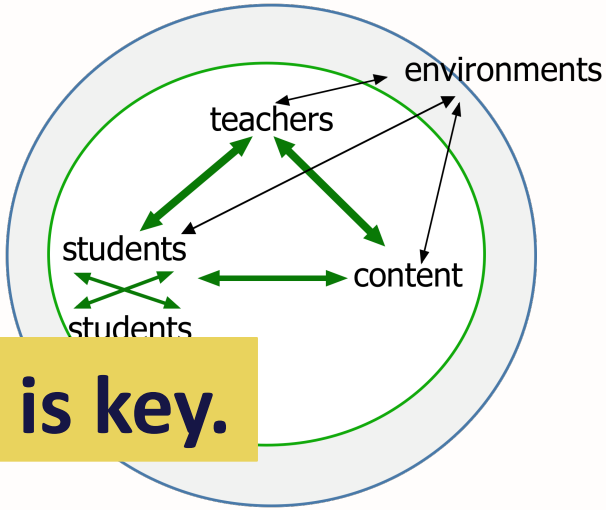
- Introductions
- Background on what we know about mathematical knowledge for teaching
- Discussion of:
  - Proposed research priorities
  - Implications of CCSS-M for research
  - How we might collaborate

MET II and the Role of Research

- What we cannot say
  - All (or even most) of the recommendations in MET II have an evidentiary base in empirical research
- MET II, like many reports of its type, is based in the expert judgment of the writing team
- The evidentiary base to rest recommendations upon is thin and uneven

Improving student outcomes

- Teachers/teaching matters a lot
  - accounts for 10-15% of variability in student achievement
  - cumulative effects can significantly reduce the achievement gap
- Improvement requires changing the interactions of instruction



Instruction is key.

Teaching involves specialized mathematical work

Solving special kinds of mathematical problems	Engaging in specialized mathematical reasoning	Using mathematical language precisely but accessibly
• Selecting or constructing a strategic example, representation, or task • Analyzing representations and definitions • Analyzing non-standard correct responses and incorrect responses	• Comparing mathematical alternatives • Justifying choices of representations, language, and tasks • Reasoning about starting points and sequences	• Coordinating between mathematical details and precision and terms children know or can learn to use • Coordinating between simple, invented, or everyday language and mathematical details • Judging what can be left more casual and what not

What makes this specialized mathematical work?

1. It is a doing of math conditioned by its ultimate uses.
2. It is not pedagogy—there is much more to teaching than this.
3. It is math, but performed in the service of helping others learn mathematics.
4. Its warrants are tied both to pedagogical purpose and mathematical integrity.

An observation

As we consider mathematical resources needed for teaching, it is easy for attention to the specialized mathematical work of teaching to slip off the table.

What we know about mathematical knowledge for teaching

- Teaching requires content knowledge beyond knowing math as a student
  - Early studies of effects show little to no effect for mathematical knowledge
  - Steady lesson of the need for it to be linked/relevant to practice
- Measures of mathematical knowledge more directly related to teaching show effects
  - Development of psychometrically responsible measures:
    LMT, KAT, DTAMS, COACTIV, TEDS-M, MET, …
  - Studies of effects:
    Ball & Hill; Baumert & Krauss; Rockoff, Jacob, Kane, & Steiger

Unresolved problems in research on mathematical knowledge for teaching

- Deep knowledge vs applied knowledge
- Lack of common definitions
- Need to get beyond illustrative examples and haphazard assessments
- How to represent content knowledge in ways that maintain its usefulness to teaching

Some proposed research priorities

1. What is, or would best be, taught and learned when across the professional education of teachers?
2. What is a mapping (content specification) of the full body of mathematical knowledge for teaching?
3. What definitions and theoretical foundations can be developed and agreed upon?

More proposed MKT research priorities

- What is MKT for secondary mathematics teachers?
- What are learning trajectories for teachers to learn MKT? How will these learning trajectories be affected by students entering with different mathematical knowledge and experience?
- What is the relationship between mathematical knowledge and pedagogical content knowledge?

Questions for discussion

- Reactions to the proposed research priorities.
- What are implications of the CCSS-M for research on mathematical knowledge for teaching?
  - With a focus on what students should know, what attention is needed on what teachers should know that is different?
- How might the mathematics and mathematics education communities work together?