

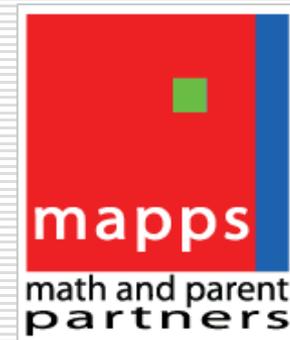
# What is Mathematical Knowledge for Parenting?

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## MATH AND PARENT PARTNERS (MAPPS)

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# THE PROBLEM

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- *“The evidence is consistent, positive and convincing: families have a major influence on their children’s achievement. When schools, families, and community groups work together to support learning, children tend to do better in school, stay in school longer and like school more.”* (Henderson and MAPP, 2002)
  - Widespread documented effects lacking; parents are often not accessed as academic resources for mathematics learning (Horne, 1998; Jackson & Remillard 2005; Perissini 1998).
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# Research Questions

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- *Does parental involvement in a standards-based mathematics program such as MAPPS carried on at Title I K-8 schools improve student understanding and achievement in mathematics? Secondarily we ask how might this improvement occur?*
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# What impacts student achievement?

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- ❑ Mathematical Knowledge for Teaching  
(Hill, Rowan, & Ball, 2005)
  - ❑ Parental Involvement & Education  
(Goldstein & Campbell, 2000; Mullis, Martin, Gonzalez, & Chrostowski, 2004)
  - ❑ Family Structure  
(GA Supreme Court Commission on Children, Marriage, and Family Law)
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# Methods

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- 115 Children, 59 Parents and 33 Teachers from four Title I elementary schools attended 8-week minicourses
    - 2008-2011. 8 Mini-Courses presented.
    - Pre/post tests of parents, teachers; attitude surveys; 95 interviews; standardized test scores; free response test
    - Instruction provided by Mathematics Education graduate students.
    - Quasi-experimental design-self selection
    - Multi-tiered Teacher Development Experiment
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# Quantitative Results

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- ❑ MAPPS students taking at least one mini-course improved significantly on the mathematics portion of the CRCT ( $n = 39$ ,  $p < 0.001$ ). Comparison students *did not* improve significantly ( $n = 36$ ,  $p = 0.331$ )
  - ❑ Mathematical Knowledge for Teaching Test-P&T group improved significantly on the Number and Operations test when 1<sup>st</sup>-last compared. ( $n = 60$ ,  $p = 0.029$ )
  - ❑ Parent/Teacher attitude survey- Parent and teacher group improved significantly when 1<sup>st</sup>-last compared ( $n = 65$ ,  $p = 0.084$ ).
  - ❑ One school's math standardized test scores rose from 63% passing in 2008 to 81% passing in 2011.
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# Qualitative Findings from 95 Interviews

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Code	Freq
<i>Primary:</i>	
Improved Parent-Child Interaction	103
Knowledge of Content and Teaching	87
Content Knowledge CCK(32) SCK(29) GLM (26)	87
Enjoyment of/Valuing MAPPS	75
Valuing MAPPS	75
Learning Community	43
Student learning/achievement	42
<i>Secondary:</i>	
Confidence/Motivation	31
Continuing Education	23
Broader Impact of MAPPS	18

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# Parental Learning of Math

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- AK: Was there something that you didn't understand before that now you do understand?
  - Parent: Yes. Like I said before...some of the things that I was taught in my school at my time...I didn't real understand them for some reason I got them right. And she [the graduate instructor] just breaks it down, and then I understand it better...For example, one night we had this conversation: a half...what is the half of a quarter? ...And would you believe that for years I didn't know that half of a quarter...It is one eighth...And that you keep cutting it...ummm... $\frac{1}{2}$  of  $\frac{1}{8}$ ...And even on this test that I got...they asked me that question... $\frac{1}{2}$  of a quarter and I could answer...
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# Knowledge of Content and Teaching-Manipulative use

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- Int: So what specifically did she [child] learn better with you just using the base ten blocks with her?
  - Parent C: The order...let's say in the tens place where she had something like 10 plus 10. Um, a lot of times, she would struggle because I would try to use pennies or little dots on a paper, and she didn't understand it. She would get confused, and I would get upset. And it wasn't going anywhere, but when we got the blocks or the little units or whatever, she was able to understand...
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# Improved Homework Interactions

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- ❑ Parents are empowered to help their children with math homework
  - ❑ AK: OK. So, do you help him with his math homework sometimes?
  - ❑ Parent: Yes. But lately he doesn't want me to help him. Remember a couple of weeks ago I was telling you about the tenths and ten?
  - ❑ AK: Yes
  - ❑ Parent: And I did it for him but I was doing the tenths instead of ten and we got all of them wrong.
  - ❑ AK: Oh, no!
  - ❑ Parent: What ever time I try to help him, he says to me, "Mommy I don't think you know what you're saying." So I have a problem, right there. But now that I'm coming here, I can show him my notes and say this is what they taught me.
  - ❑ AK: So did you sit down and talk about that?
  - ❑ Parent: Yes, we did. ... the last time I came here I did um addition and then he took it to school and it was right. So. He's kind of trusting me a little now. (Both laugh) So that's good. I'm trying not to mess up again. (more laughter)
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# Improved Family Interactions

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- ❑ Parents report looking forward to “Math Night” with the family.
  - ❑ Homework time is becoming “Family Time”.
  - ❑ Families are playing MAPPS math games and activities at home (and teachers are implementing them in their classrooms).
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# Broader impact

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- ❑ Parent confidence with mathematics and with helping their children improved.
  - ❑ Several participants continued their education after MAPPS
  - ❑ Parents enjoyed MAPPS, especially in that they were part of a learning community
  - ❑ Parent-teacher interactions improved.
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# Mathematical Knowledge for Parenting

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- ❑ Content knowledge
  - ❑ Valuing students' own strategies
  - ❑ Listening to students' explanations
  - ❑ Knowing there is more than one way to solve
  - ❑ Knowing to use manipulatives versus solely pencil and paper to solve problems
  - ❑ Knowing *how* to use manipulatives to model
  - ❑ Knowing appropriate games & skill reinforcers
  - ❑ Knowing how to support the learning process (i.e. Do not immediately give answers.)
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# Implications

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- ❑ **Mathematical Knowledge for Parenting:** Professional development in mathematics can and should occur for parents and teachers simultaneously.
  - ❑ **Parental Involvement:** Schools' parental involvement efforts should be academic in nature and at the same time should facilitate strong family relationships.
  - ❑ **Parent-Child Interaction:** Schools must have a vested interest in the health of the families they serve
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“We all as a family are graduating tonight.”  
[www.math.arizona.edu/~mapps](http://www.math.arizona.edu/~mapps)

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