Mathematics Coaching: Findings from a Program Showing Students’ and Teachers’ Mathematics Content Improvement

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The Ohio State University
Mathematics Coaching Program
The Journey

• Continued poor performance in mathematics.

• Tons of federal and state funding on curriculum and professional development.

• Mathematics Education Research and what captured our attention.
Traditional Professional Development

• Teach large groups of teachers good stuff.
• Use a train the trainers model.
• Go to conferences, read journal articles.
• Talk to experts.
• Lesson study, curriculum development.
• Hands-on, minds-on, calculators.
• High-quality professional development.
Results of Traditional PD

- Low scores still low.
- High scores still high.
- Not much teacher change.
- Not much use of research-based and standards-based ideas.
- Tons of funding with no major difference;(
Kindergarten

• See what 5-year-olds can do.
• What does the teacher do?
• What do you observe children doing?
• What does not happen as you might expect?
Student Thinking Fever

- Students are not learning mathematics the way we are teaching.
- We must learn how students can learn mathematics and how we need to teach so that learning can happen.
- Lowest performing schools.
- Lowest performing students.
- Lowest strand of mathematics.
The Mathematics Coaching Program (MCP)

• The Guiding Question:
  – How do we get research-based strategies into this classroom, with this teacher, with these students, with this curriculum, and with these materials?

• The MCP Approach:
  – Coaches are assigned to one elementary school to provide classroom-embedded professional development to teachers on research-based strategies.
MCP Coaches’ work

• Focusing on student thinking and learning.
• Provides an informed and rigorous focus on the Ohio standards for mathematical processes.
• Data-based decision making.
• Professional development in content, pedagogy, and coaching (~300 hours of PD during academic year).
• Curriculum independent.
MCP: Framework

- Mathematical Content
- Pedagogical Elements
- Socio-Cultural Elements
MCP Conceptual Framework

Content knowledge: limited to rigorous

Processes: Static application to dynamic integration

Larger societal norms: Cultural ignorance to cultural awareness

Classroom interactions: from teacher-focus to student-focus

Classroom norms: Externalized authority to shared authority

Task selection: Procedural focus to conceptual focus

Equity & Diversity: Umbrella focus to individual focus

Assessment: Judgmental focus to informative focus
Research Base

- Student Thinking
- Inquiry
MCP: Research Base

- Teacher content knowledge (Leinhardt & Smith, 1985; Lampert, 1990; Ma, 1999; Simon, 1993); Mathematics knowledge for teaching (Ball, Hill & Bass, 2005); PCK (Shulman, 1986, 1987; Pinar, Reynolds, Slattery & Tubman (1995); Wilson, Shulman & Richert, 1987)

- Critical features of instruction (Hiebert, J., Carpenter, T., Fennema, E., Fuson, K., Wearne, D., Murray, H., Oliver, A., & Human, P., 1997); Teaching practice (Lampert, 1990; Ball & Cohen, 1999; Smith, 2001),

- Student thinking (Fennema & Carpenter, 1990; Franke; Bright; Cobb, Wood, Yackel; Battista)

- Non-instructional factors (Crane, 1996; Erickam, Lapointe & McCreith, 2005; Ladson-Billings, 1995a; 1995b; Tate, 1997).


- Mathematics Coaching (Davenport, Grant, Carter, Gorman & Mark, 2006; Staub, Resnick, West).
We have one GOAL

Work together to get researched-based ideas working in YOUR classroom with YOUR kids using YOUR materials and YOUR curriculum to improve student learning and understanding of mathematics.
3rd Grade Mathematics
Ohio Achievement Test Results

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<tr>
<th>Year</th>
<th>Non-Coached</th>
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<td>2005-06</td>
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<td>2006-07</td>
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<td>2007-08</td>
<td>50</td>
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4th Grade Mathematics
Ohio Achievement Test Results

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<td>2007-08</td>
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5th Grade Mathematics Ohio Achievement Test Results

Percentage at or above Proficient

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6th Grade Mathematics
Ohio Achievement Test Results

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<tr>
<td>2007-08</td>
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<td>66</td>
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</tbody>
</table>
3rd Grade Results by Ethnicity

Percentage at or above Proficient


Hispanic Black White

52 51 73 73
68 68 86 77
77 72 72 77
50 58 58 69
## 3rd Grade Results by Economic Status

<table>
<thead>
<tr>
<th>Year</th>
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<th>Non-Coached NonDis</th>
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<td>2007-08</td>
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The Ohio State University Mathematics Coaching Program
Scaling UP

- Bring in University or Educational Service Center folks for one year to learn program.
- Satellite MCP sites Year Two and Three.
- Facilitators’ Role.
- Maintain program integrity.
- Non-Negotiables / Assurances.
Conference

• Awareness of State Projects.
• Learning about Mathematics Coaching Program.
• Building Leadership Capacity.
• Identifying universities and facilitators.
• CLI certificate - help Ohio P-6 Mathematics Specialist Endorsement.
• Understand CLI delivery.
• Outreach to those without access to PD.
• Teacher solution strategies, student solution strategies.
Challenges

• Of 34 Cohort I schools, 12 remain
  – Lost 20 Cohort I schools because they emerged from School Improvement.
  – Lost 2 coaches (and hence schools) because of school restructuring RIFs.
• Funding is dependent on School Improvement status
  – Considering variations of the model
• Identifying schools early.
• School buy-in up front: 80% of staff buy-in before joining MCP.
• Hiring coaches.
• Understanding program assurances.
• Administrative support.
• Union contracts.
Future Directions

• Expanding to grades K-12 in Ohio.
• Changing role of coach.
• Variations of the model.
• P-6 Mathematics Specialist Endorsement.
• EdS Degree for Teacher Leaders.
• Cisco Learning Institute’s National Mathematics Specialist Certificate.
• AMTE working group.
Questions?

Comments?
Jasmine and the Role of the Teacher

- View Jasmine over three time periods.
- Teacher Responsibility
  - Content
  - Pedagogy
  - Socio-Cultural Elements
- Takes Time and Persistence