Aligning Inquiries in a Mathematics Coaching Research Project

Colloquium on Mathematics Coaching Research
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Today’s Topics

• Background on the MCP research context.
• Development of the evaluation study methodology, including instrumentation.
• Role of collaborators.
• Development of the growing research project.
Background on the MCP research context

• Implemented in Grades 3-6, in mathematically low-performing schools in Ohio.

• Trains coaches to provide on-site professional development in a content-focused coaching model.

• The model includes one-on-one intensive interactions between coach and teacher for planning, teaching and assessing students.

• Quality of coaching interactions is dependent upon teacher knowledge of content and pedagogy.

• Desired student outcome is improved student achievement.
MCP Structural Model

Technical Assistance Team: Project PI's and Facilitators

- School-Based Mathematics Coaches District Hires
  - Teachers in Coach's Building
    - Students

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Facilitators: A Distinctive Feature of the MCP

• Facilitator role in the program
  – Provide monthly small group support sessions at program sites and additional PD between MCP sessions.
  – Serve as liaisons between MCP and schools: Develop and maintain relationships with coaches and school administrators.

• Facilitator role in the research
  – Serve as Key Personnel in research, connecting to schools, assisting coaches in the data collection.
MCP Conceptual Framework

**Content knowledge:** Limited to rigorous

**Societal norms:** Cultural ignorance to cultural awareness

**Classroom norms:** Externalized authority to shared authority

**Equity, Diversity & Social Justice:** Umbrella focus to individual focus

**Assessment:** Judgmental focus to informative focus

**Processes:** Static application to dynamic integration

**Classroom interactions:** Teacher-centered to student-centered

**Task selection:** Rigid procedural focus to richly connected and integrated conceptual/procedural focus

The Ohio State University
Mathematics Coaching Program
Research Question and Sites

• Project Research Question: What is the relationship between the MCP and student achievement?

• The schools: Low-performing elementary and intermediate schools.
  – Rural and urban locations in Ohio.
  – 200-600 students per school.
  – Communities are economically fragile and racially and ethnically diverse.
  – Control schools are aligned with MCP schools based on student achievement level, socio-economic status, racial and ethnic percentages and other pertinent criteria and do not have an MCP coach in the school.
Research Populations

• Teachers
  – All teachers who teach mathematics in MCP schools are eligible to participate in the research.
  – Involvement in the MCP is not mandatory.
  – Teachers not involved in the MCP serve as an additional control sample.

• Students
  – Full populations for achievement data at grades 3-6.
  – Student population sampled for descriptive data.
Key Outcomes Investigated

• Teacher Content Knowledge (LMT)
• Teacher Pedagogical Content Knowledge (LAMP)
• Student Mathematics Achievement (OAT)
Methodological Learnings from 05-06 pilot

• LMT for teacher content presented problems.
• Continue using the LAMP for pedagogy.
• Develop the LAMP instrument for content.
• Develop instrument for data on student mathematical processes.
• Change use of previous year’s exams for the grade level to use of comparable exams for the pre and post.
• Change protocol to eliminate the IRB issues.
Protocol for 2006-2007

• Same research question, types of schools in project, populations, outcomes investigated.

• Addressed instrument issues (removed LMT, developed LAMP, created Problem Sets, used pre-post OAT).

• Changed protocol to address IRB compliance (utilized district contacts, school support, and coaches’ MCP data work in getting the de-identified student data).
Instruments and Protocol in 2006-2007 Evaluation Study

- LAMP for teacher content knowledge.
- LAMP for teacher pedagogical content knowledge.
- Released, full-length OAT as student pretest.
- May OAT as post test.
- Problem Sets for descriptive data on student processes.
Instrumentation: LAMP

- Instrument collaboratively developed.
- Problem sources: texts, NAEP exams, general resources.
- Ten items, each for both content and pedagogy.
- Each item centered on a problem and student responses.
- Each of the 10 items scored 2 times holistically, once for content and once for pedagogy.
- Using MCP integrated procedural/conceptual scoring guide.
Instrumentation: OAT Pre and Post Tests

- Pre test is the released full version of each grade level test for grades 3-6
  - ODE trains coaches to score short answer and extended response.
  - Facilitators work with their coaches on scoring.
  - Coaches work with their teachers on scoring.
  - Coaches enter data in MCP data base.

- Post test is the state’s May administration of the exam
  - Coaches retrieve individual student data for end of year OATs, and enter in MCP data base.
Instrumentation: Student Problem Sets

• Demographically-sampled student set of 12 per school.

• De-identified by coaches so researchers can align with test scores.

• Focused on process, not content.

• Administered across the school year.

• Scored holistically with scoring guide.
Collaborations in the MCP Research

- Districts
- Schools
- Coaches
- University
- State Dept
- Funders
- IRB

- Support for data collection
- Maintaining voice
- Support for research and project
- Infrastructure
- Support and accountability
- Influence methodology
- Complex compliance vs. informed problem-solving
MCP Conceptual Framework

 Processes:
 - Static application to dynamic integration

 Classroom interactions:
 - Teacher-centered to student-centered

 Task selection:
 - Rigid procedural focus to richly connected and integrated conceptual/procedural focus

 Content knowledge:
 - Limited to rigorous

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 Elements of Mathematical content

 Pedagogical elements

 Socio-cultural elements
Revisiting the MCP Conceptual Framework Lens

- Frames the overall research project.
- Provides direction for overall evaluation plan.
- Provides a lens for analysis of evaluation plan.
- Reveals absences in evaluation research.
- Suggests areas for additional study in the overall evaluation plan.
- Suggests parallel frameworks for complimentary studies.
Addressing Absences

Context-Framework-Opportunity

• The context of this coaching program.
• The relationships within this coaching program.
• The conceptual framework’s thoroughness, utility, and flexibility.

Provide a wealth of opportunities for multiple studies and the cohesiveness for a successful research project comprised of those studies.
Thank You!

Diana & Patti
You ask your students to compare Figures A and B below.

Frank says, “Figure B is twice as big as Figure A” and Sheryl says, “Figure B is 4 times as big as Figure A”.

a. Are these answers correct or incorrect? Describe what these students may have been thinking.

b. How might you compare the Figures A and B?

c. How might you teach students to learn about comparing figures as in this problem?
LAMP Data

• Quantitative scores for teacher pedagogy and content.
• Qualitative data for detail and description of subtle changes/growth.
• Example: …what concepts are addressed? (in a geometry context)
  – Pre-test: “Basic geometry math concepts are being addressed here. Understanding shapes and their identity”
  – Post-test: “Recognize or identifying shapes via their attributes: vertices, angles, closed/open shapes, comparing”.

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Sample use of OAT Data

Percentage of Students At or Above Proficient Level Across the Years

- COHORT I (05-06)
- State Avg (05-06)
- COHORT I (06-07)
- State Avg (06-07)