Findings From the First Year of a K-6 Mathematics Coaching Project

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Welcome!

- About the title of our session
- Introductions
- Studies being presented
  - Program Evaluation Components
  - Additional Pilot Studies
- Structure for the session

Mathematics Coaching Program: The Journey

What do we need to do to improve student mathematics achievement?

- Use Research-Based, Reform-Based Methodologies
  - Inquiry, Discovery, Guided Discovery
  - Problem-Based, Student Centered, Cooperative Learning
  - Cognitively Guided Instruction
  - Focus on Process Standards and Student Thinking

Who have we been most committed to working with?

- Students in urban and rural settings
- Teachers in urban and rural settings, especially those in districts with limited PD budgets and support.

Mathematics Coaching Program: The Journey

Why are the research-based methods not being used?

- Lack of knowledge, lack of confidence, lack of support?
- Time, my room, my kids, my materials, no support.

What do we need to do to get teachers to use these methodologies?

- Improve Teacher Content Knowledge
- Improve Teacher Pedagogical Content Knowledge
- Erase the barriers: Time, my room, my kids, my materials, no support.

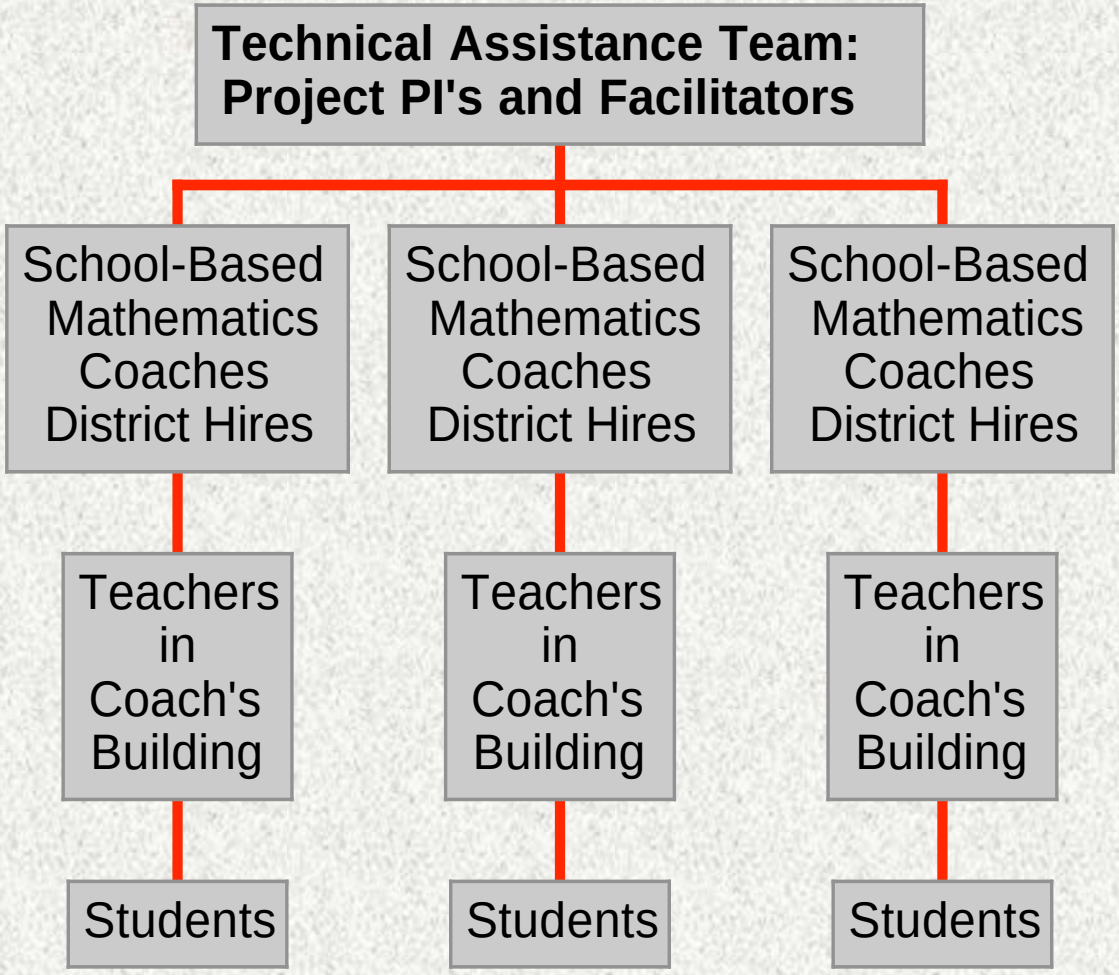
How do we get this to happen?

- Long-Term, High-Quality, Job-Embedded Professional Development and Technical Support

Mathematics Coaching Program

- **Mathematics Coaches**
  - Mathematics Specialists assigned to an elementary school
  - Provide job-embedded professional development to teachers
  - Team teach with classroom teachers using best practices
- **MCP - The Goal**
  - How do we get these ideas in this classroom, with this teacher, with these students, with this curriculum, and with these materials.
- **Research Contributions**
  - How is high-quality job-embedded professional development related to student mathematics achievement?
  - How does work centered on mathematics coaches as professional development providers result in teacher and coach learning?
  - In what ways do teachers transfer their professional learning into classroom practice?

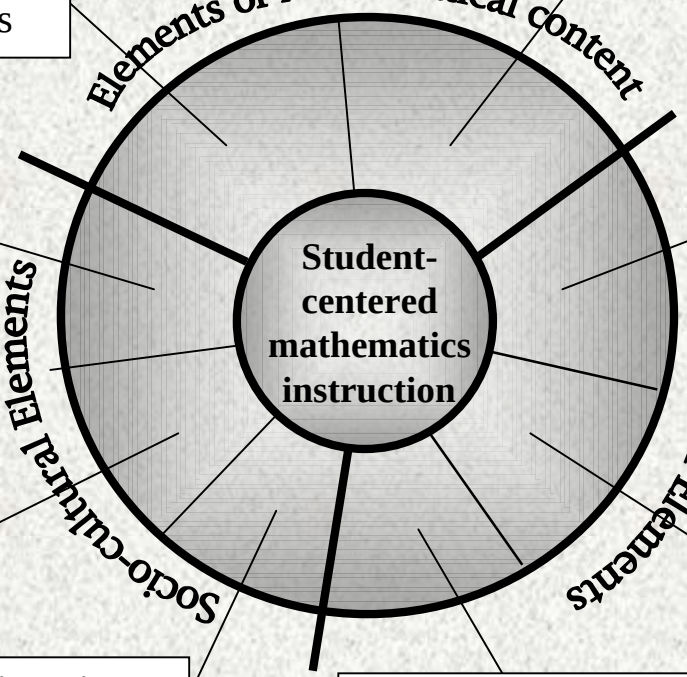
MCP Structural Model



MCP Conceptual Framework

Processes:
Static application to dynamic integration

Content knowledge:
Limited to rigorous



Classroom interactions:
teacher-centered to student-centered

Societal norms:
Cultural ignorance to cultural awareness

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

Classroom norms:
Externalized authority to shared authority

Equity & Diversity:
Umbrella focus to individual focus

Assessment:
Judgmental focus to informative focus

Context for Research

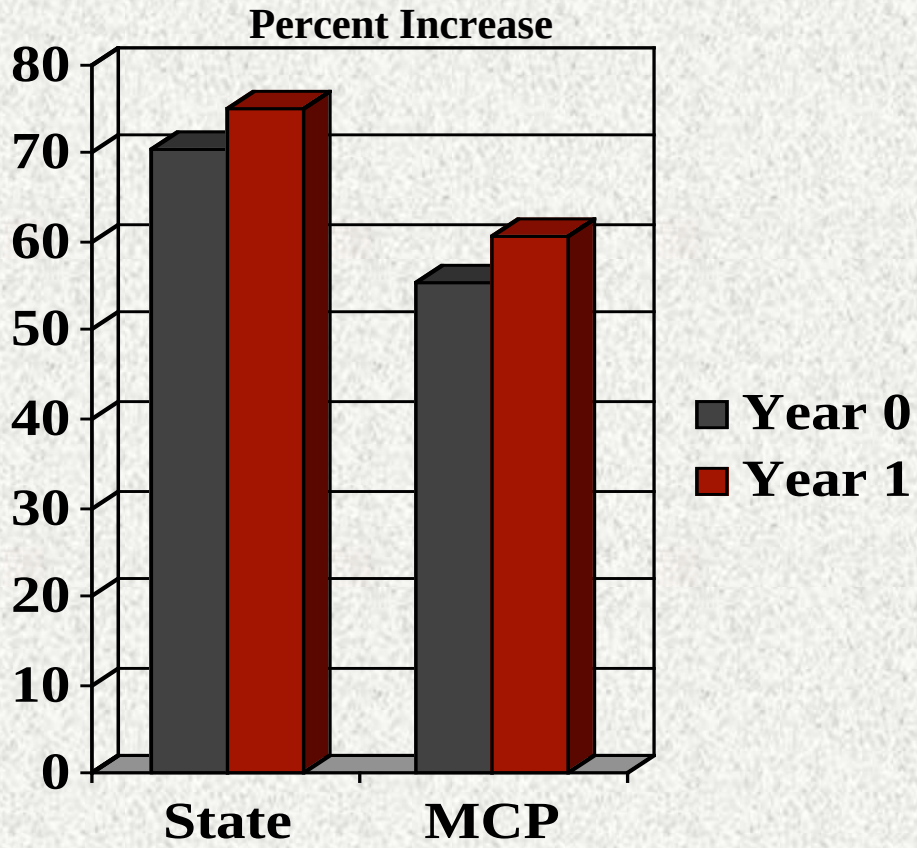
- **Mathematics Coaching Program (MCP)**
  - State Funded Pilot Program
  - 34 Low-Performing Schools (urban, urban-fringe, rural)
  - Coaching Project Started in January
- **Presented Studies**
  - Student Content Knowledge
  - Coach and Teacher Mathematics and Pedagogical Content Knowledge
  - Teacher and Student Work as Reported by Coaches
  - Coach Development as Leaders

Student Mathematics Content Knowledge (Brosnan)

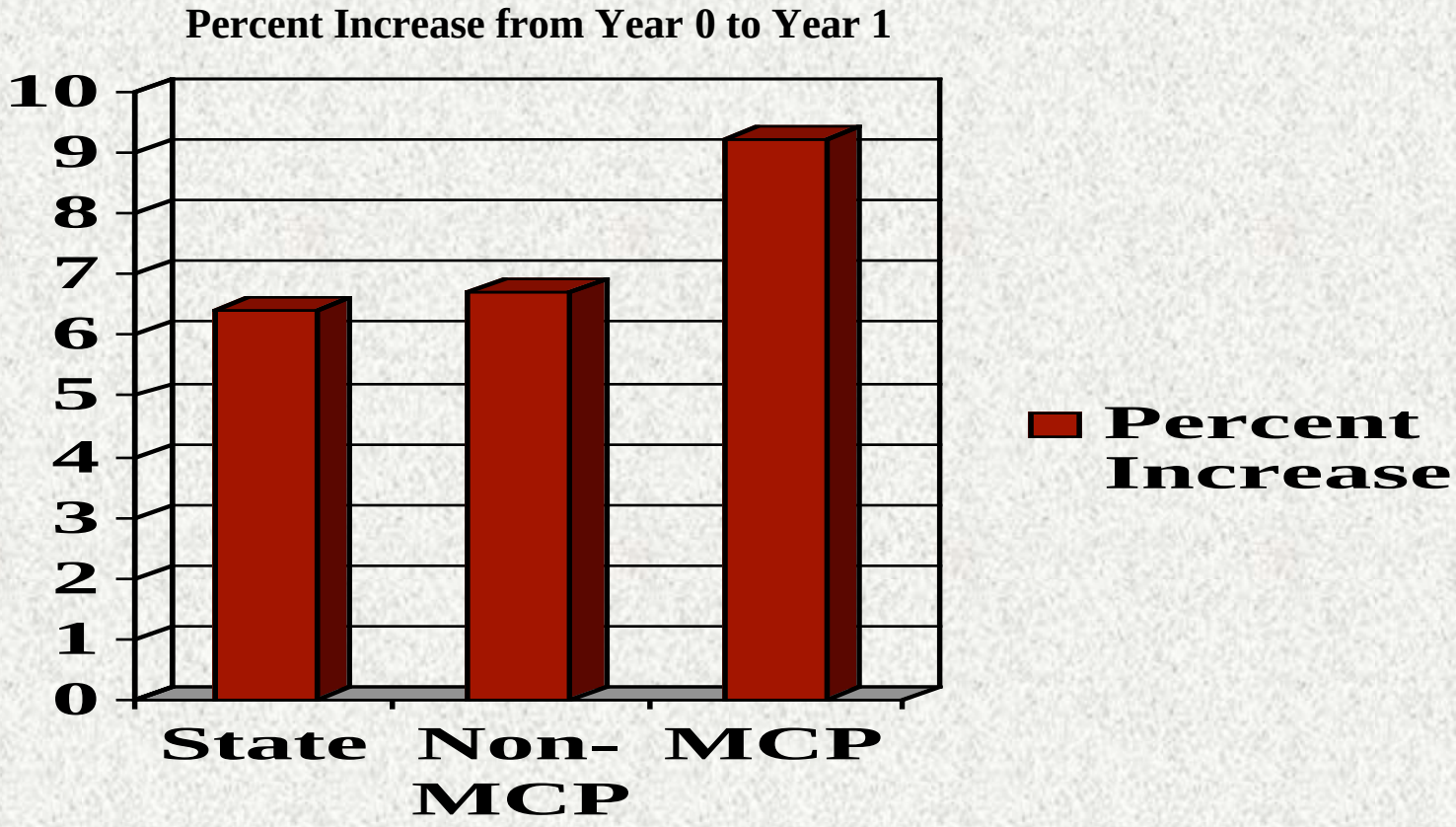
- **Instrumentation**
  - Pre/Post Test: Half Length Released Ohio Achievement Tests at each grade level 3 and 4. Pre/Post Tests given in January and May
  - Full Ohio Achievement Tests Grades 3-4 Given in March
- **Quantitative Data**
  - Third graders improved by 8.2% on Pre/Post
  - Fourth graders improved by 14.2% on Pre/Post
  - OAT shows 9.6% gain from previous third grade results.
- **Qualitative Data**
  - Extended Response Items: answered, more articulate, conceptual and procedural development, and greater understanding

Student Mathematics Achievement

- **State Average**
  - March 2005 70.4
  - March 2006 74.9
  - Percent increase for schools statewide: 6.4%
- **MCP Average**
  - March 2005 55.4
  - March 2006 60.5
  - Percent increase for MCP schools: **9.2%**



Student Mathematics Achievement



Extended-Response Problem

- Twelve students wrote their names and the number of letters in their names on cards as shown.

Tommy 5	Elli 4

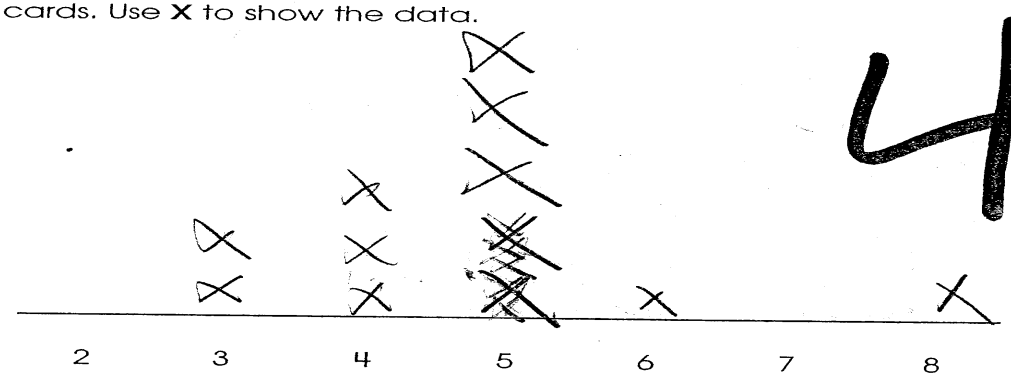
- Use the line to construct a line plot of the information on the students' cards. Use X to show the data.

2 3 4 5 6 7 8

10. Twelve students wrote their names and the number of letters in their names on cards as shown.

Grant 5	Ali 3	Courtney 8	Kim 3	Owen 4	Heidi 5
Katie 5	Mark 4	Linda 5	June 4	Abdul 5	Connie 6

Use the line to construct a line plot of the information on the students' cards. Use **X** to show the data.



Number of Letters in Names

Find the median, mode and range of the data on the cards.

Median: 5

Mode: 5

Range: 5

I found the median by crossing off the numbers until I got my answer.
I found the mode by counting which one had the most.
I found the range by taking the bigger number and smaller number and subtracted them. 4-0-4

Learnings From Student Mathematics Content Knowledge

- Use within-grade full-length achievement tests as pre-tests at each grade level 3-6.
- Develop extended response item sets across the five content standards for each grade level 3-6.
- Turn the 'blip' into a positive trend.

Coach and Teacher Content and Pedagogical Knowledge (Erchick)

- Learning about Mathematics Pedagogy (LAMP)
- Sample LAMP Item:

Miss Jones put the following picture on the overhead and asked her students to identify all of the rectangles.

- Jose picked A, B, and D. Is he correct or not? Explain your reasoning.
- Name or describe each of the non-rectangles from among the figures A-G.
- What mathematical concepts are being addressed in this problem?

Comparing Coach and Teacher Pre-Program Responses to the Rectangle Item

Teacher (random sample) pre-program responses

Item a. Was Jose correct?

- 67% of the teacher responses were correct with one "it depends on the definition of a rectangle"

Item b. Which are not rectangles?

- 56% of the teacher responses were correct

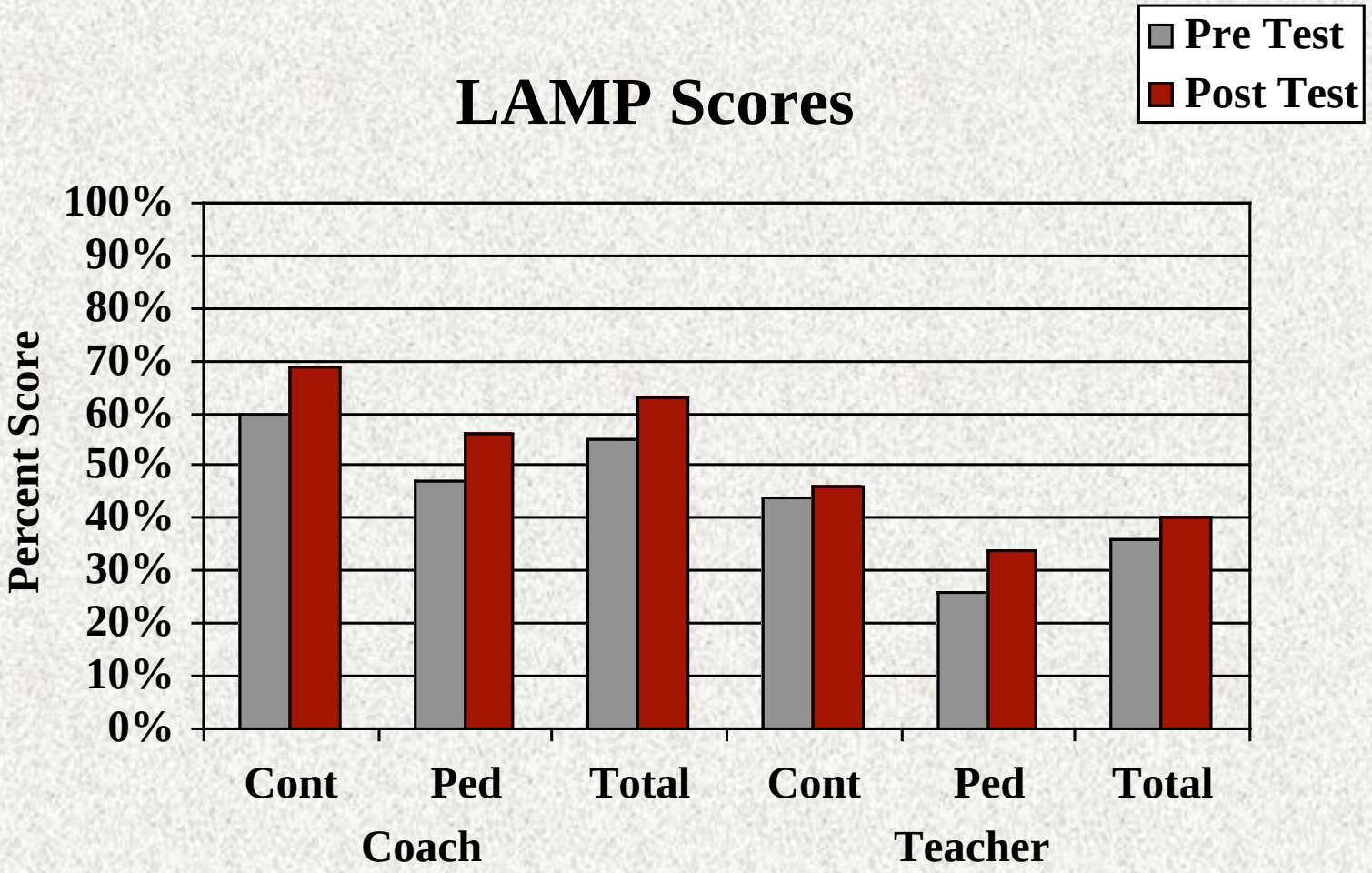
Coach pre-program responses

Item a. Was Jose correct?

- 68 % of the coach responses were correct

Item b. Which are not rectangles?

- 64 % of the coach responses were correct


LAMP Scores
Pre Test
Post Test
Percent Score
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Cont
Ped
Total
Cont
Ped
Total
Coach
Teacher

Sample of Coach and Teacher Qualitative Growth: Content

Geometry example, part C, what concepts…?

- 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"

Insights from Coach and Teacher Content and Pedagogy Instruments

- The need for MCP to attend to coach mathematics and pedagogical content knowledge, as opposed to methods of coaching, is understandable.
- Continue development and use of the LAMP instrument.
- Find more ways to determine exactly what the coaches are doing in their daily coaching work.
- Find more ways to determine exactly what the teachers and students are doing in the coached classrooms.

Coaches Written Descriptions of Teachers' Changes (Grant & Hughes)

Participants:

- 9 MCP coaches (urban & rural districts; two 5-6 Intermediate buildings; seven elementary buildings)

Data Sources:

- Audio-taped focus group discussions
- Transcriptions of individual coach interviews
- Classroom observations
- Qualitative survey instrument

Research Study Details

Research question:

- How do coaches describe teachers' changes?

Additional Goals:

- Create an instrument and/or protocol to get rich descriptions of teacher change, consistently.
- To gather data about what is happening in the classroom and what the coaches are doing in their daily work.

Preliminary Findings

- Coaches' definition of change differed from investigators'
- Describing teacher's change is challenging
- Emergent themes used by coaches to describe teachers' changes
  - Instructional strategies
  - Professional discourse
  - Teacher's reflection

Emerging Questions

- Are we really getting the "best" stories?
- How can coaches' descriptions of change be used to inform their work with teachers?
- What types of changes tend to be self-sustaining and/or generative?

Transitioning from Teacher to Mathematics Leader, From the Coaches Point of View (Forrest and Douglass)

- Participants:
  - 9 MCP coaches from 2 facilitator groups (8 elementary and 1 intermediate).
- Data sources:
  - **Autobiographical statement describing coach as learner of mathematics, teacher of mathematics, and coach of mathematics.**
  - **Periodic coach reports**
  - **Large and small group observation records**
  - *Interview*
  - *MCP Assessments: pedagogical content knowledge, mathematical content knowledge, and mathematical dispositions*

Phrases coaches use to describe their role as mathematical leader

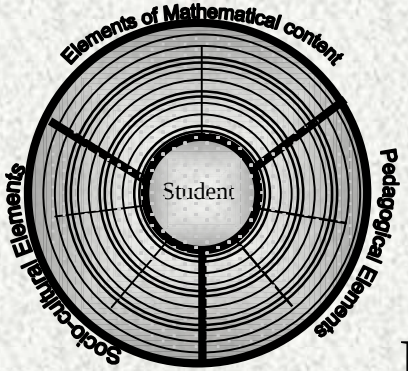
#1 Helping teachers by pulling materials, manipulatives, and other resources

#2 Modeling how mathematics can be taught a different way

#3 Working with kids on mathematics: math clubs, math night, tutoring, and test preparation

#4 Providing information to teachers about teaching mathematics differently

Where coach language places them on the pedagogical continuum

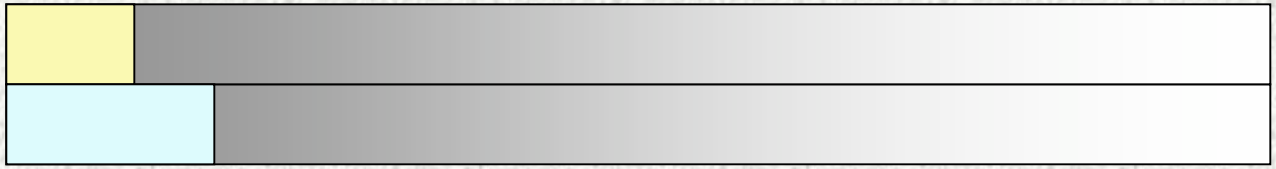


Classroom interactions

Before starting the MCP.

Coach as learner

Coach as teacher



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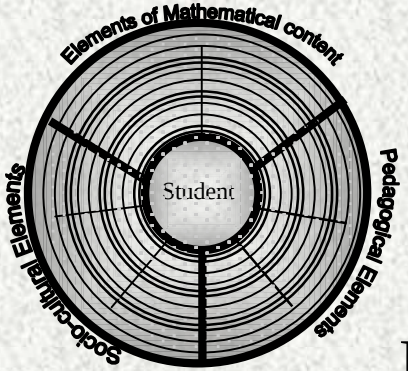

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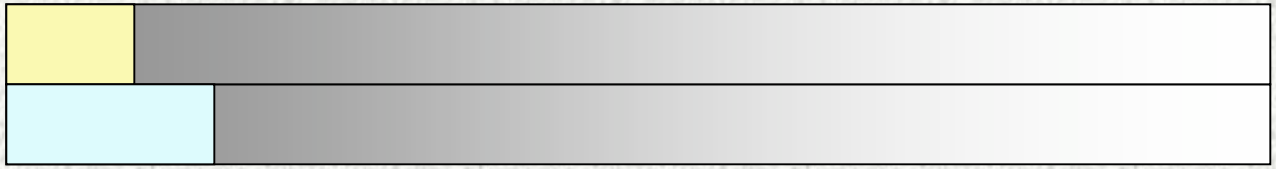

After MCP.

Coach as teacher

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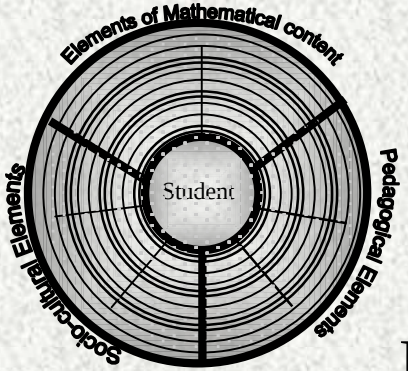

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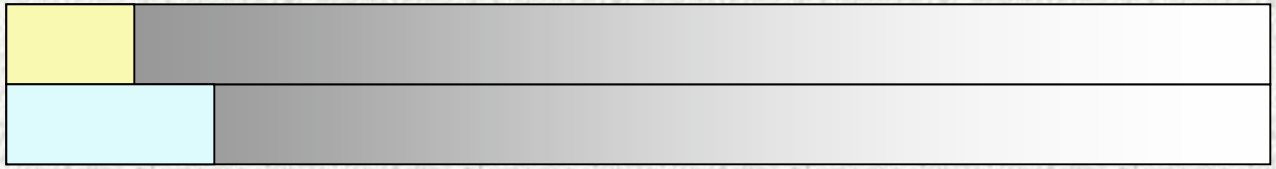

After MCP.

Coach as teacher

Coach as coach

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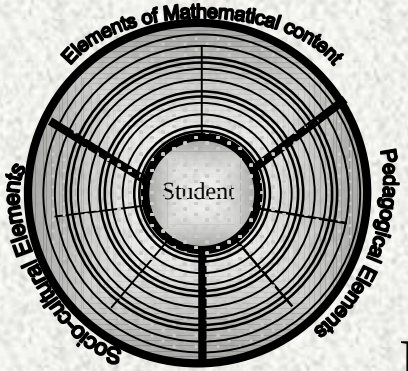


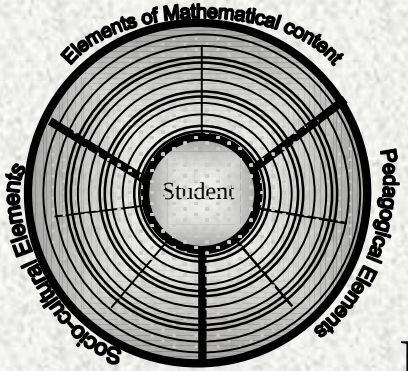
Task selection

Rigid, procedural focus		Richly connected and integrated conceptual/ procedural focus

Before starting the MCP.

Coach as learner		
Coach as teacher		

Where coach language places them on the pedagogical continuum



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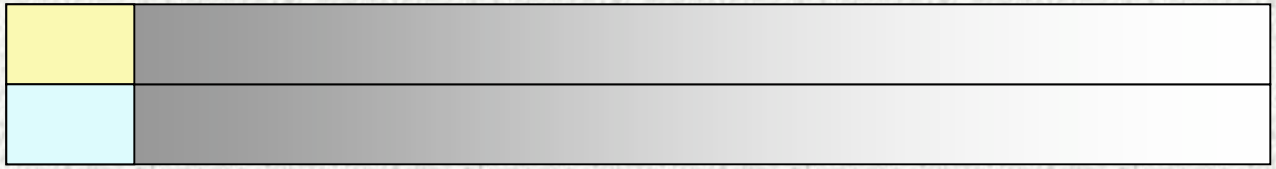
Rigid, procedural focus — **Richly connected and integrated conceptual/ procedural focus**

Before starting the MCP.

Coach as learner

Coach as teacher



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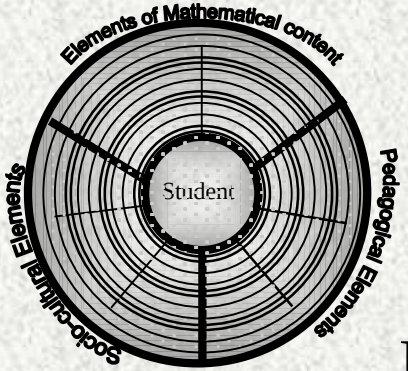
Coach as teacher

Where coach language places them on the pedagogical continuum



Task selection

Rigid, procedural focus — **Richly connected and integrated conceptual/ procedural focus**

Before starting the MCP.

Coach as learner

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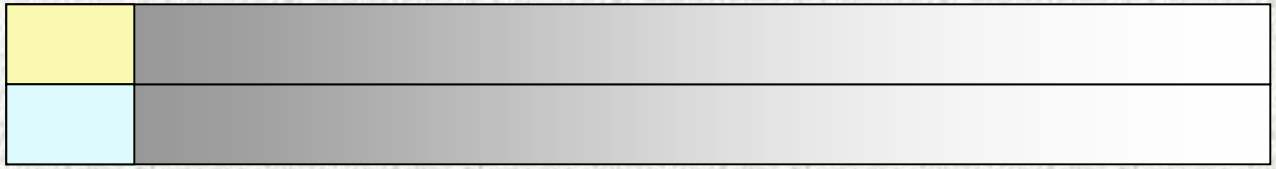

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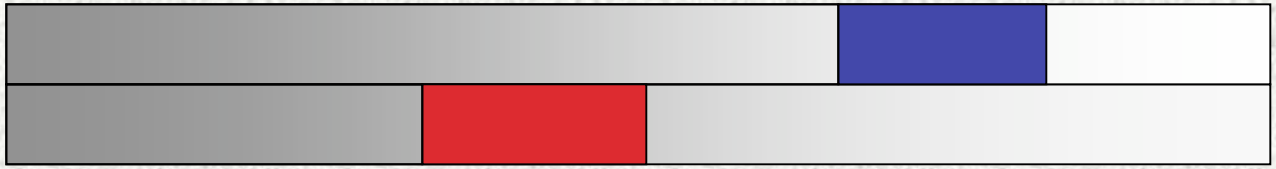
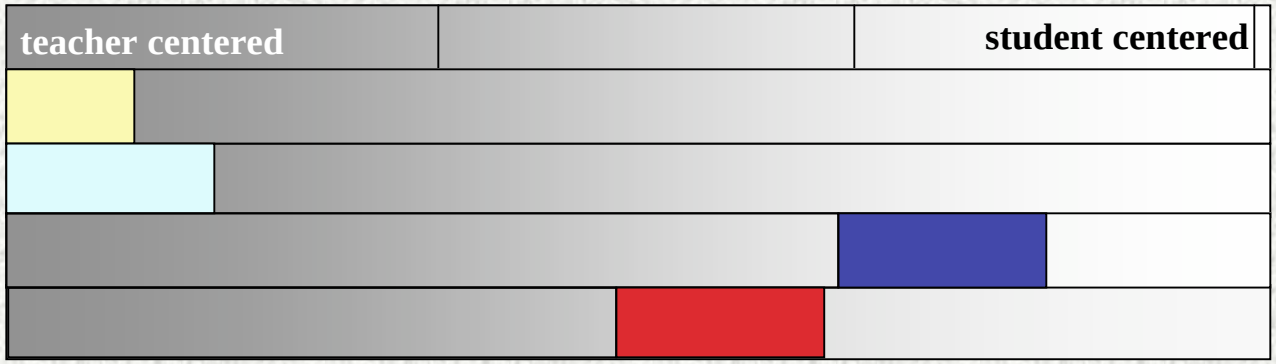
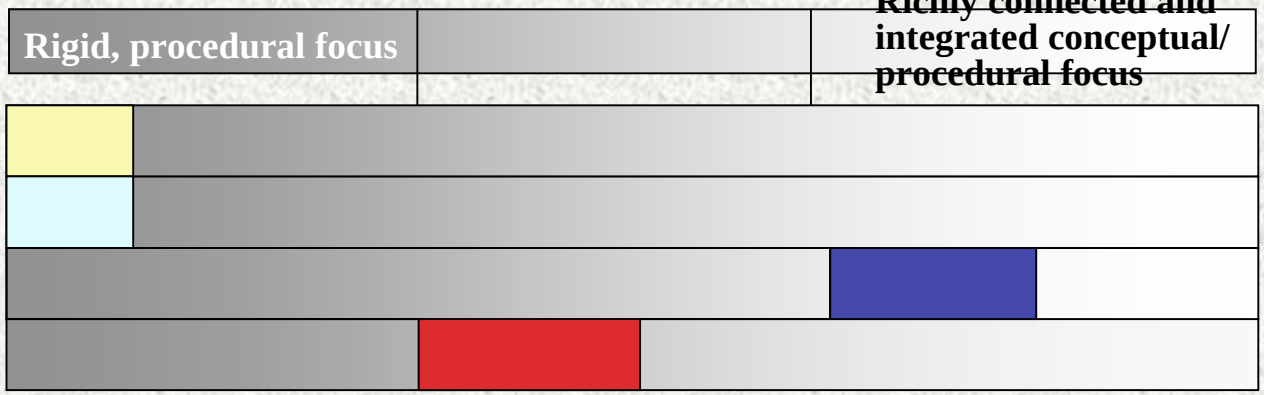


Where coach language places them on the pedagogical continuum

Interactions



Task selection



To be continued…

- These data represent the coach point of view, and other perspectives need to be considered.
- How can the facilitator role support the coaches' movement on the continuum?

Your Turn

- What questions emerge for you from these studies?
- Based on your experience in teaching and research, what ideas do you have about:
  - What can make our current research more robust?
  - Additional research studies you believe we need?
  - What would help the MCP from a program perspective?

Mathematics Coaching Program
The Ohio State University