New Research in Mathematics Classroom Coaching

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AMTE
Irvine, CA
February 8, 2014

EMC
EXAMINING MATHEMATICS COACHING

Research contributors

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Funded under NSF Award No. 0918326. Any opinions expressed herein are those of the authors and do not necessarily represent the views of the National Science Foundation.

Organizing question

Mathematics classroom coaching is at the intersection of research and practice. It engages our coaching colleagues as *mathematics teacher educators*.

What are next steps in coaching research, professional development or other collaborations between researchers and coaches?

Agenda

- **Overview of the EMC Project**
- Instruments to measure coaching knowledge
- Results: Descriptive statistics
- Results: Statistical analysis
- Generating research directions and questions in mathematics coaching

Mathematics classroom coaching

- A recent development in mathematics professional development for practicing teachers.
- Built on a foundation of coaching in other professions, like business and medicine.
- Used by school districts nationwide and encouraged by National Mathematics Advisory Panel (2008).
- There are a variety of educational coaching models coaches might follow.

Examining Mathematics Coaching

EMC is a 5-year research and development project examining the effects of a coach's *knowledge for coaching* on a diverse population of K-8 teachers.

Mathematics coach: EMC definition

A mathematics coach is an **on-site professional developer** who enhances teacher quality through **collaboration,** focusing on **research-based, reform-based, and standards-based** instructional strategies and mathematics content that include the **why, what, and how** of teaching mathematics.

Coaching cycle for EMC Project

There are three distinct parts to each coaching cycle designed to examine mathematics instruction.

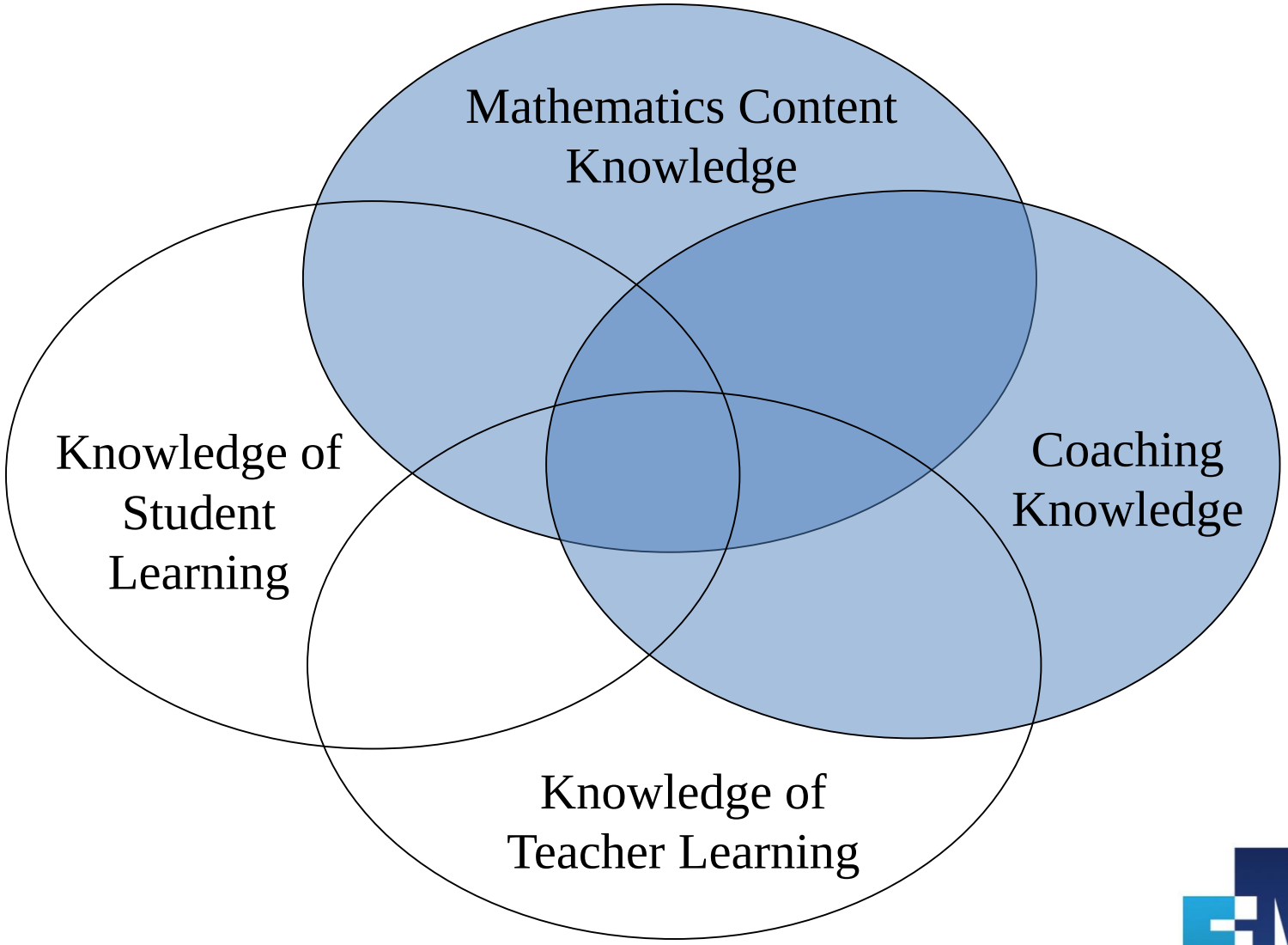
- Pre-Lesson Conference (~15 minutes)
- Lesson Observation (entire class period)
- Post-Lesson Conference (~30 minutes)

Coaches conduct 8 cycles per year, with 4 focused on number and operations.

EMC research hypothesis

The effectiveness of a mathematics classroom coach is linked to several domains of knowledge. **Coaching knowledge** and **mathematics content knowledge** both contribute to a coach's effectiveness as measured by positive impact on **teacher practice, attitudes,** and **knowledge.**

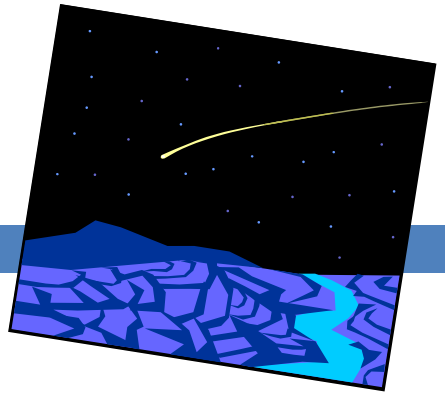
Knowledge domains



Empirical coaching results

- Positive effects on teacher practice in schools where coaching is used
- Campbell & Malkus (2011) found that student achievement increased in grades 3, 4, & 5 after 3 years of highly-trained coaches
- Schools with MCP-trained coaches (one-on-one intensive interactions) see higher achievement in students in grades 3 – 6 (Harrison, Higgins, Zollinger, Brosnan & Erchick, 2011)

Impacts of EMC study



- Understanding of **knowledge** needed for effective mathematics coaching.
- Understanding of what **practices** contribute to effective mathematics coaching.
- **Instruments** to evaluate and monitor mathematics coaching

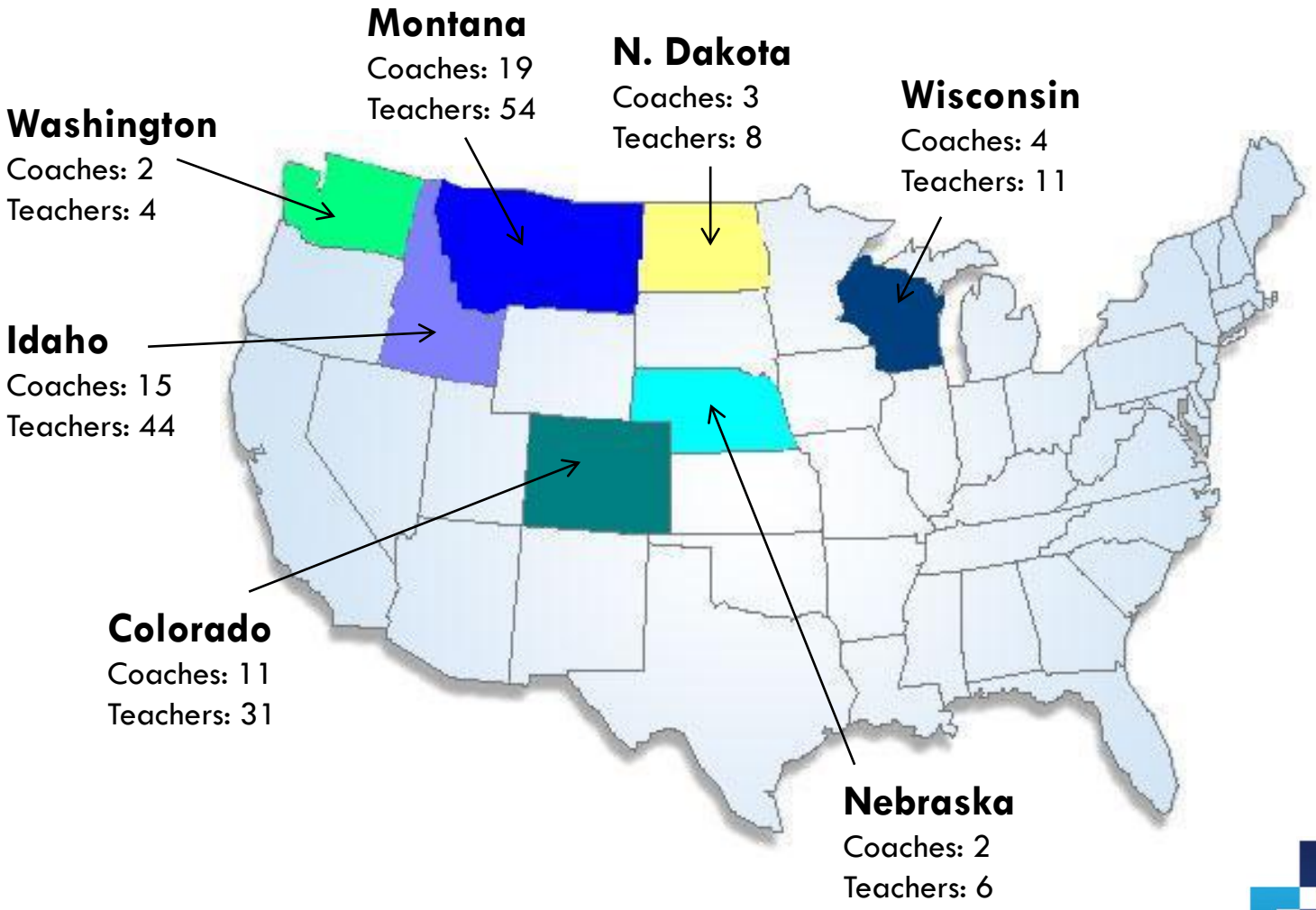
Research design

- A **non-experimental** design will answer: To what extent does a coach's **depth of content knowledge** in coaching knowledge and mathematics content knowledge correlate to **coaching effectiveness**?
- An **experimental** design randomly assigns coaches to one of two groups to answer: To what extent does professional development targeting these two knowledge domains **improve coaching effectiveness**? and To what extent are the effects of the targeted professional development **explained by increases in knowledge**?

Crossover design

	Group 1	Group 2
Year 1 2009-10	Provide orientation to EMC coaching model	
Year 2 2010-11	Mathematics Content Knowledge	
Year 3 2011-12		Coaching Knowledge
Year 4 2012-13	Coaching Knowledge	
Year 5 2013-14		Mathematics Content Knowledge

EMC participants



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Project variables and measures

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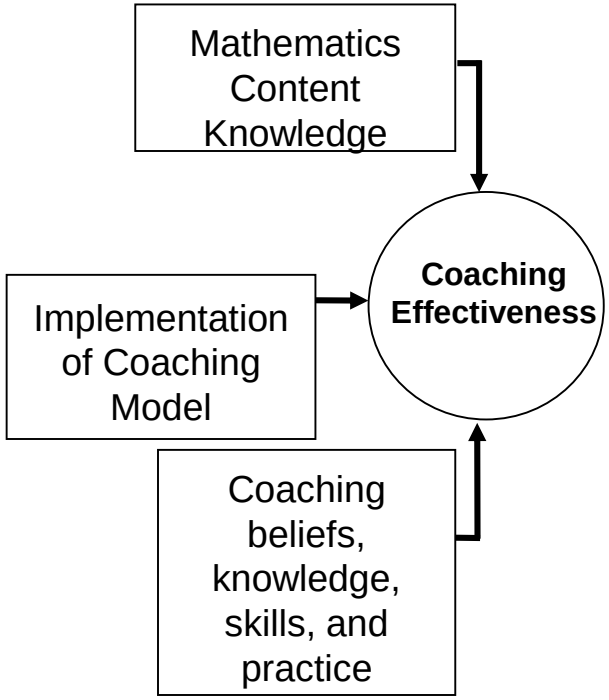

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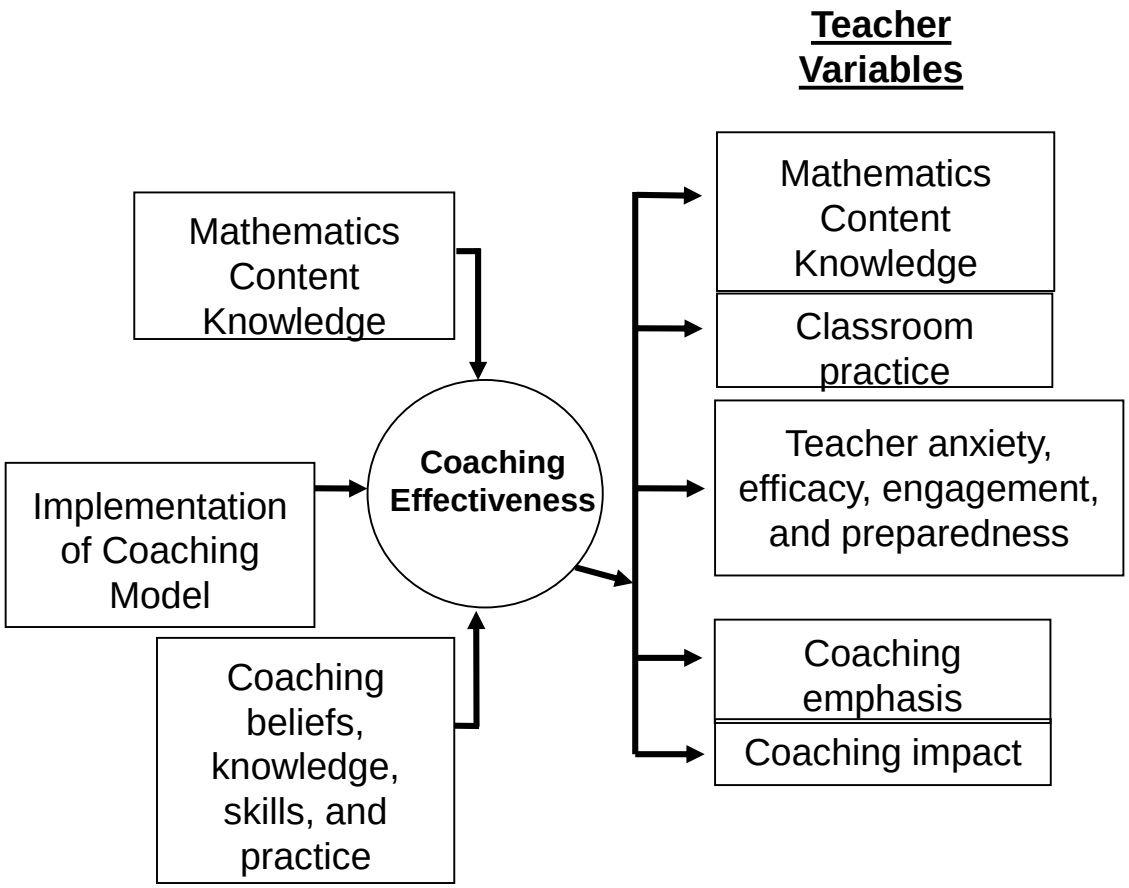

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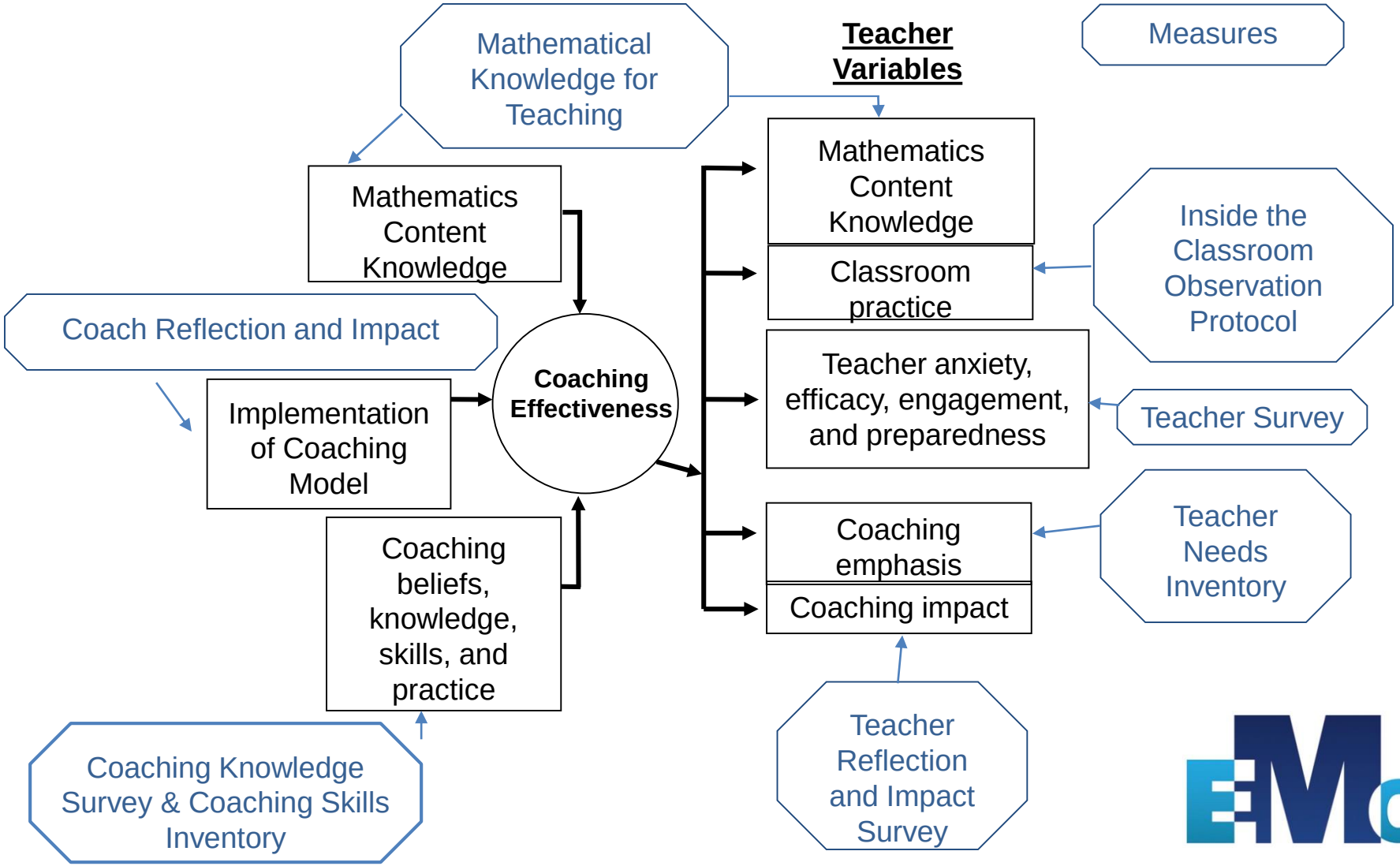

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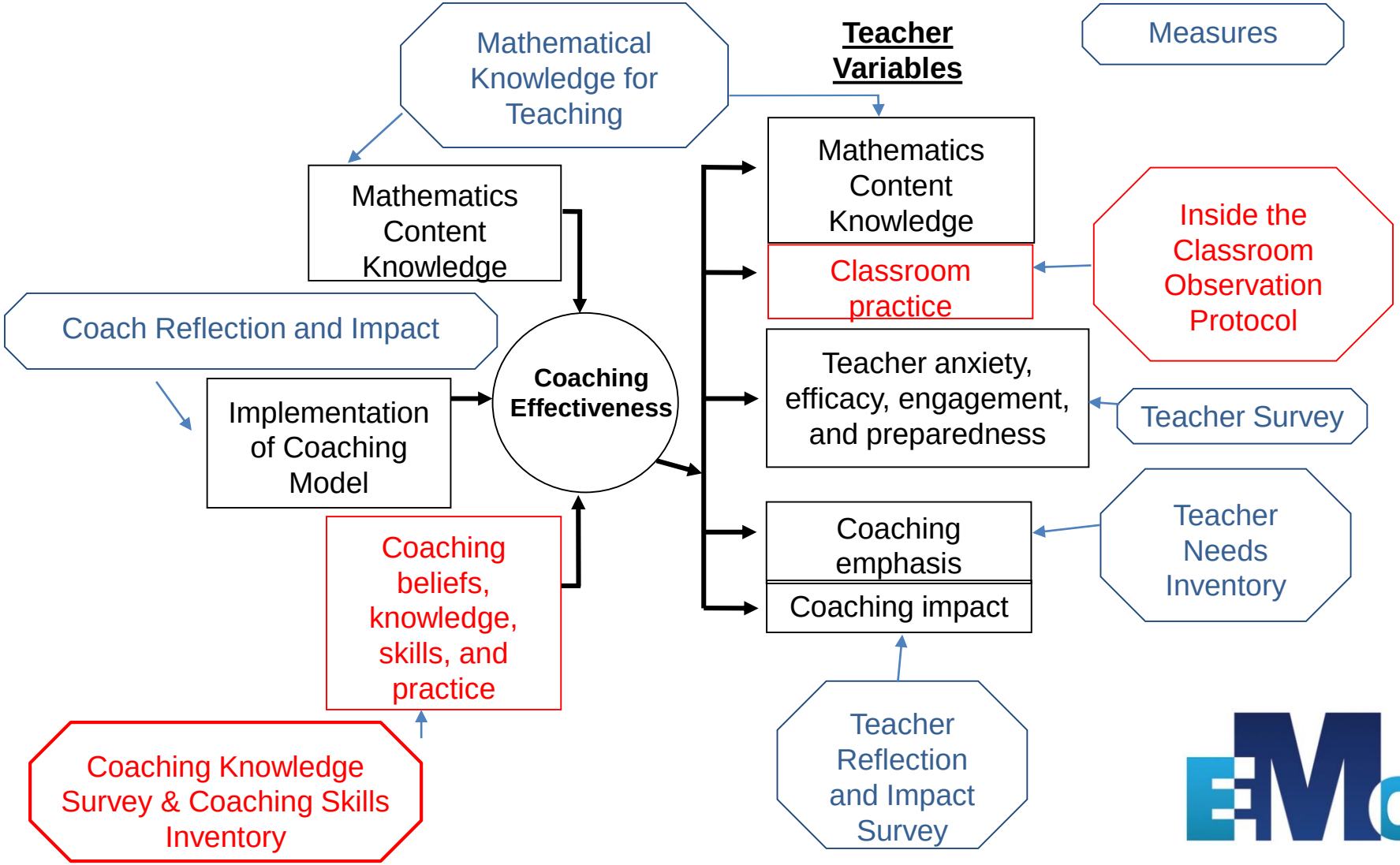


What is coaching knowledge?

What additional knowledge does a mathematics coach need, beyond what a mathematics classroom teacher needs?

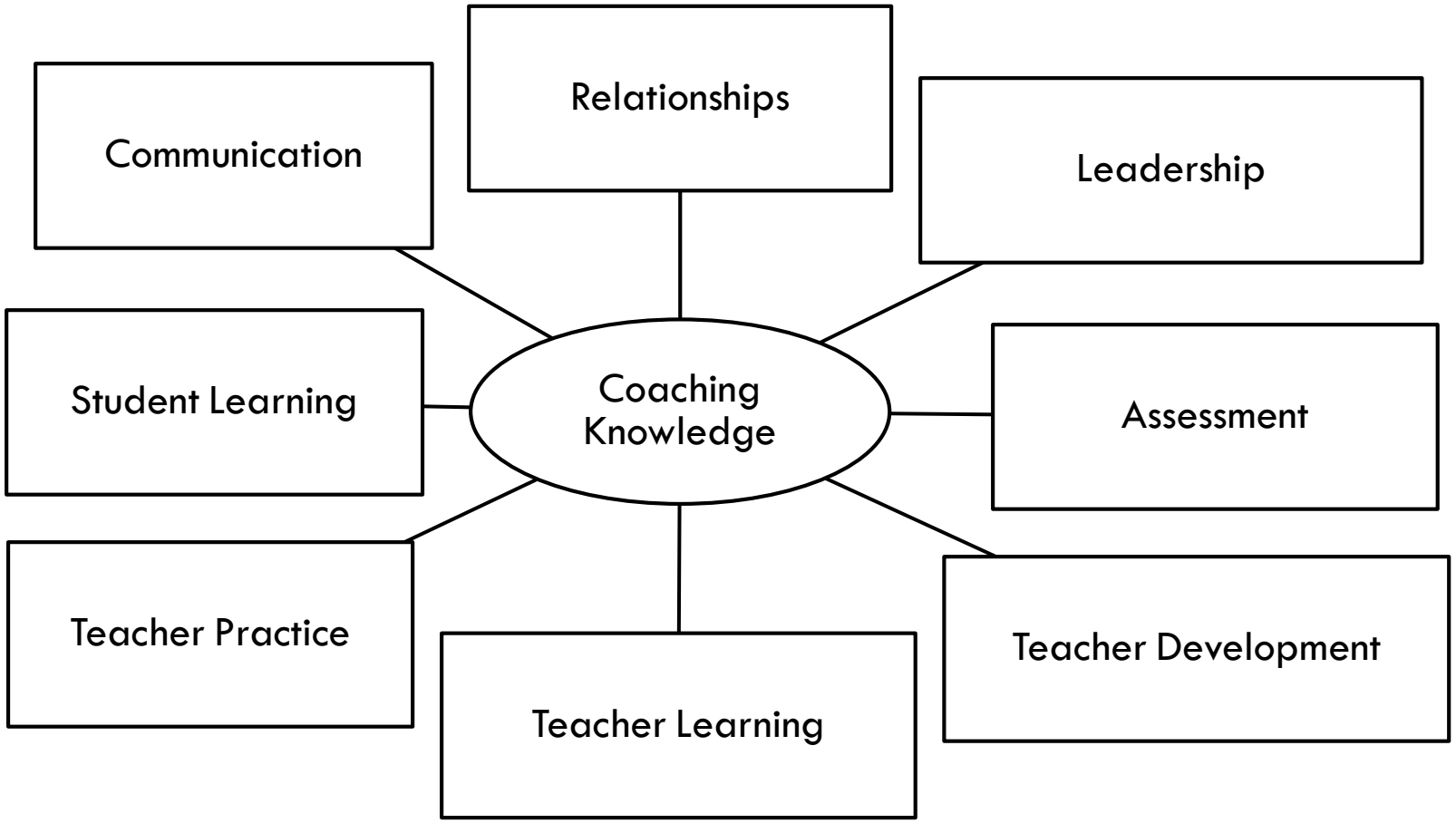
Where to look?

- Coaching authors address the same areas: trust, relationship, feedback, reflective questioning, co-teaching, lesson modeling
- But, in the details, there is not wide agreement among authors about what coaches know and do

Defining coaching knowledge

- Three-phase process engaging coaching authors and practitioners
- Panelists responded to an open-ended question to define what coaching knowledge effective instructional coaches hold, as distinct from effective teachers.
- We used qualitative methods to identify domains of knowledge and levels of agreement about definitions for each domain.

Domains: Coaches know about



Coaching knowledge topics

Monday	Tuesday	Wednesday	Thursday	Friday
Teacher Learning	Student Learning & Teacher Practices I	Communication for Coaching	Teacher Practices & Student Learning, II	Logistics of Coaching
Themes: Teacher Development and Teacher Learning	Themes: Teacher Practice and Student Learning	Themes: Communication and Assessment	Themes: Teacher Practice and Student Learning	Themes: Relationships and Leadership

Coaching Knowledge Survey

- Practices

  I meet with a school's principal to get the principal's impression of which teachers need to improve their mathematics instruction.

- Beliefs

  An effective mathematics coach gets input from a school's principal on which teachers need to improve their mathematics instruction.

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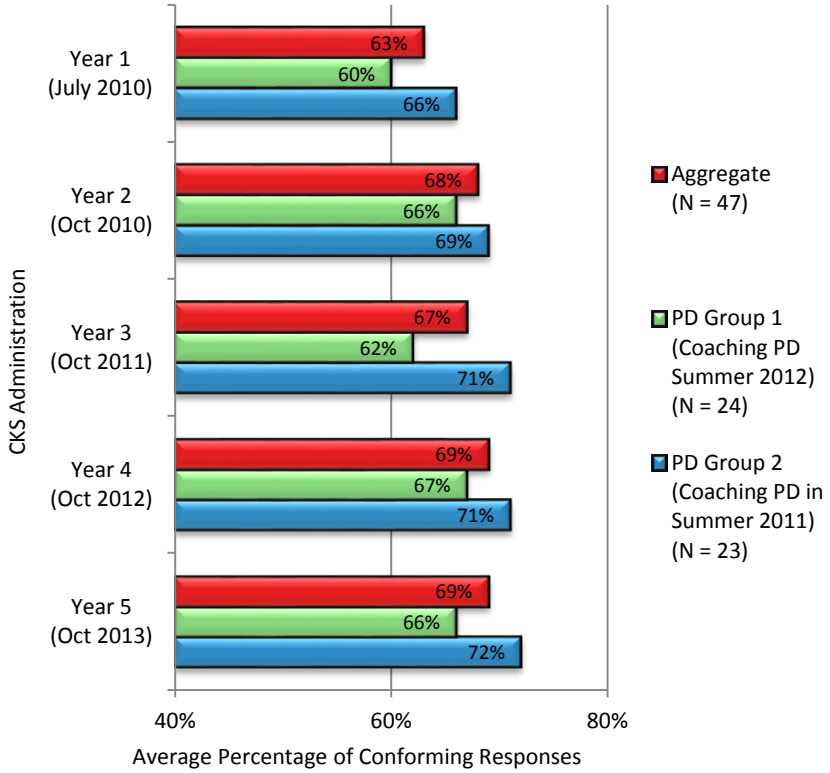
Coaching Knowledge Survey



Items with high agreement and movement over time

- I collect students' mathematics work from a teacher's classroom to guide our coaching conversations
- When decisions about mathematics instruction are being made, I ensure that the decision-makers interpret research literature accurately.
- I have difficult conversations with teachers, when necessary, about mathematics misconceptions they hold.
- I always make sure that coaching conversations with mathematics teachers are grounded in mathematics content.
- I use student work when coaching mathematics teachers

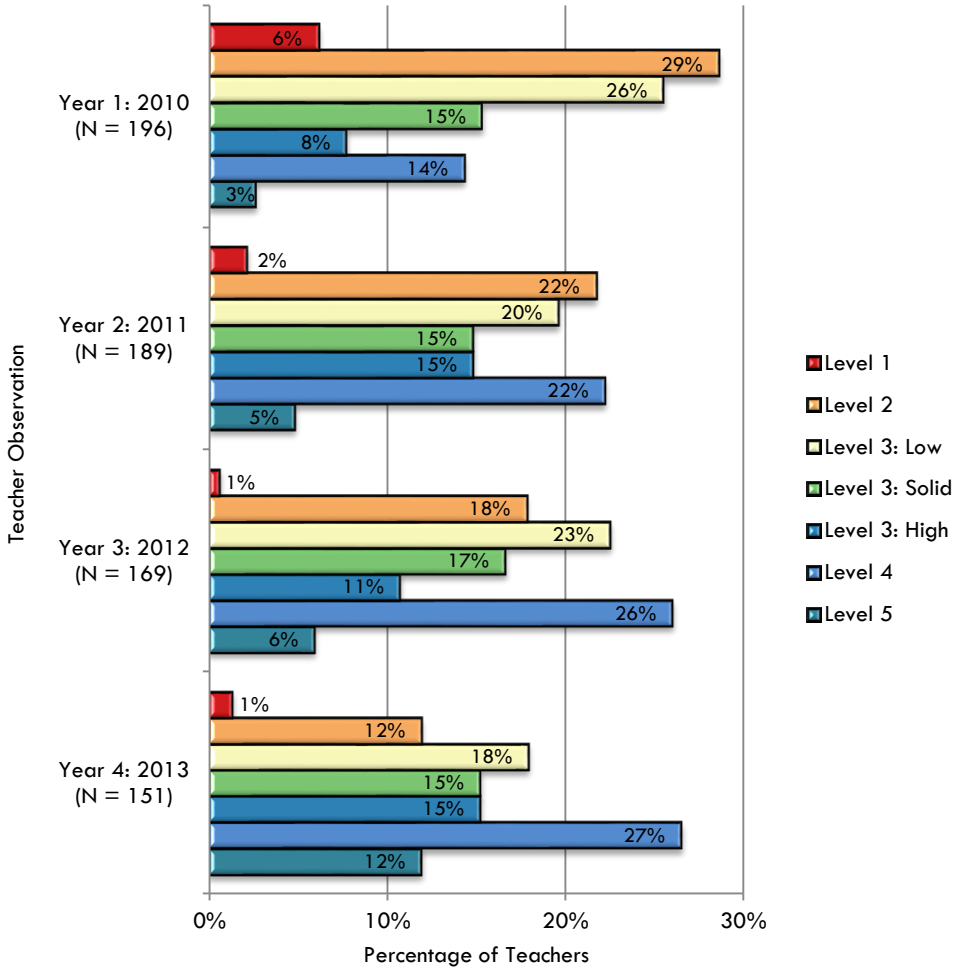
Items without great agreement

- When a teacher says she doesn't want any coaching, an effective mathematics coach respectfully does not try to persuade the teacher to accept coaching (R)
- An effective mathematics coach gets input from a school's principal on which teachers need to improve their mathematics instruction
- An effective coach sticks to the coaching objectives established with a teacher at the beginning of the school year (R)
- I encourage teachers to include, in each lesson they teach, summaries of what students learned or discovered.

Without agreement (continued)

- I provide feedback to teachers about whether or not the school is meeting its vision for mathematics instruction.
- I ask the principal what she believes the mathematics teachers' needs are.
- I provide feedback to the principal about whether or not the school is meeting its vision for mathematics instruction.

Classroom observations



Discuss

- Do you expect that the answers with high agreement identify important coaching practices?
- Why do the low-agreement answers have low agreement?
- Are there other items you would expect identify high-leverage coaching practices?

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Research question 3

- To what extent are the effects of targeted professional development on coaching effectiveness explained by increases in coaching knowledge and mathematics content knowledge?
- Analysis uses 51coaches randomly assigned to PD groups; 5 years of data
- Analysis uses linear modeling, and control for outside mathematics or coaching training

Summary of findings for RQ3

- No evidence for direct effects of professional development on coaches' MKT scores either in terms of differences in groups or differences in changes over time.
- There is evidence of a change over time in MKT scores of the coaches in the study, with the highest average score in the last year of the study.
- There is evidence of a time effect and a PD effect on the mean scores of the CKS.

Research question 2

- To what extent does professional development targeting these two knowledge domains improve coaching effectiveness?
- Control for coaching intensity and outside PD
- Effects are examined on changes in teachers' MKT, teachers' attitudes, and teachers' practice
- Hierarchical linear models
- Four years of data (more to be collected)

Summary of findings for RQ2

- No detected coach-level PD effects on teacher content knowledge or teacher attitude
- Some evidence of PD effects on teacher practice
- Coaching intensity relates to increases in ITCOP scores
- For all models, there are changes over time
- Suggestive evidence that changes happened in the different groups at different times; follow-up analyses will be conducted

Research question 1

- To what extent does a coach's depth of knowledge in coaching knowledge and mathematics content knowledge influence coaching effectiveness?
- Models examine how variation in these aspects of the coaches propagates into teachers' measures.
- Four years of data

Summary of findings for RQ1

- Improvements in coaches' CKS scores and CSI (self-efficacy measure of coaching skills) are related to increases in teachers' mathematics knowledge
- Variation in coaching intensity and CSI scores are related to higher classroom practice scores.
- Coaches with higher MKT scores are associated with teachers with higher MKT scores.

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- **Generating research directions and questions in mathematics coaching**

What's next?

- Projects and studies have the opportunity to collect data about coaching effectiveness and coaching needs
- What do we need to understand about coaching?
- How do we support coaching?

Discuss

- What research questions about classroom coaching can be answered empirically?
- What do coaches need?
- How can we support coaches?

What we learn from participants

- Coaches want to learn how to have hard conversations with teachers about mathematics content
- And about student learning
- Coaches expend a lot of energy on resistant teachers
- Professional development in coaching knowledge

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Thank you!

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