Professional Development for Grades K-8 Mathematics Coaches

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EMC
EXAMINING MATHEMATICS COACHING

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EMC Project Description

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.

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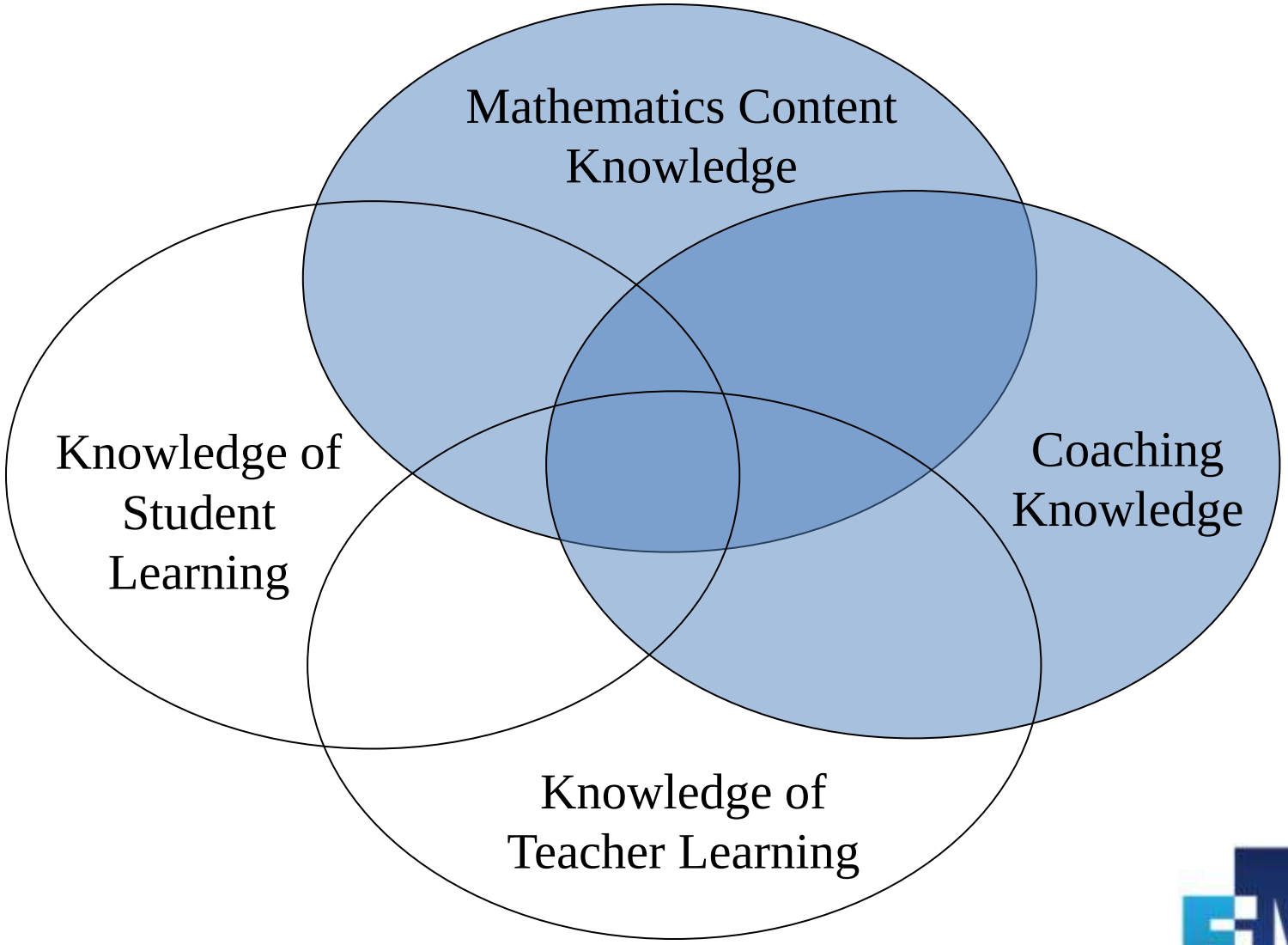
EMC research hypothesis

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

Professional Development challenge

- Create two distinct one-week professional development courses
- One course should shift participants' knowledge of mathematics content, specifically in the area of number and operation, with a focus on ratio and proportion
- One course should shift participants' knowledge of coaching, as described in the literature, addressing eight themes identified by coaching experts

Knowledge Domains



Research design

- Each coach (n = 60) is randomly assigned to Group 1 or Group 2
- Group 1 coaches have mathematics content PD, followed two summers later by coaching knowledge PD
- Group 2 coaches have coaching knowledge PD, followed two summers later by mathematics content PD.

Professional Development design

- 45 hours, 1 week, residential
- Participants are all coaches enrolled in the research project
- Experience in mathematics coaching varies considerably
- Mathematical knowledge varies considerably

Mathematics Content

Mathematics Content Topics

Monday	Tuesday	Wednesday	Thursday	Friday
Number Sense	Computation	Fraction Concepts	Fraction Operations and Ratios	Proportional Reasoning and Percents

CCSS: Mathematical Practices K-12
Common Core State Standards

- Make sense of problems and persevere in solving them
- Reason abstractly and quantitatively
- Construct viable arguments and critique the reasoning of others
- Model with arithmetic
- Use appropriate tools strategically
- Attend to precision
- Look for and make use of structure
- Look for and express regularity in repeated reasoning.

Mathematical Themes: Number Sense

- It is important to select appropriate representations of numbers or numerical problems based on context.

- Factorization, divisibility and divisibility rules are based on **mathematical structure**.

Mathematical Themes: Computation

- The properties of numbers and operations on numbers create **structure** that underlies computational methods, including algorithms.
- Multiplicative thinking is a skill to develop with all students.
- **Models** can be used to solve contextual problems, decide what operation is involved, and give meaning to number sentences.

Mathematical Themes: Fraction Concepts

- Unitizing is the basis for fraction understanding.

- There are various **models for representing fractions** and these complement each other and enrich the meaning of fractions.

Mathematical Themes: Fraction Operations and Ratios

- Models for fractions and their operations reveal **structure** that underlies computational methods.

- Various mathematical connections link ratios and fractions.

Mathematical Themes: Percents

- Multiplicative reasoning is a fundamental component of proportional reasoning
- Proportional situations can be represented by a variety of models, and certain **models promote sense-making** in solving proportions

Coaching Knowledge

Coaching knowledge topics

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

Teaching coaches to recognize standards-based mathematics

- Develops mathematical processes (problem solving, reasoning and proof, etc.)
- Develops mathematical practices (make sense and persevere, model and use structure, etc.).
- Addresses mathematical strands of proficiency

Example: Assignment

Every new document produced uses its own terminology to express elements/characteristics of standards-based mathematics.

What similarities/differences occur between these three documents?

- Helping Children Learn Mathematics
- Mathematical practices of Common Core State Standards
- NCTM process standards

Warning! Participants tend to brush aside important differences

“They are all the same.”

CCSS Practices highlighted

- Understanding research on the “growth mindset”: advocating “persistence in problem solving”

CCSS Practices highlighted

- Understanding research on the "growth mindset": advocating "persistence in problem solving"
- Understanding research on "learning styles": Providing **all students** with the opportunity and expectation to understand mathematics using a **wide variety of instructional models and representations** CCSS "tools" and "structure" practices

Participants' questions

Nearly universally, participants seek to understand details of CCSS assessment plans.

Adjustments the next time around

- Be more explicit to participants about CCSS connections in mathematics content themes and in grade-level alignment
- Challenge participants to identify and understand the depth of differences in CCSS practices from previous documents

Thank you!

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Project Variables and Measures