How can coaching knowledge be measured?

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Introduction
The Examining Mathematics Coaching (EMC) Project researches knowledge that contributes to successful coaching in two domains: Coaching Knowledge and Mathematics Content Knowledge.

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 includes the why, what, and how of teaching mathematics.

EMC Research Goals
This project is advancing understanding of coaching effectiveness and adds to the knowledge base for coaching, while it promotes teaching, training, and learning through coaching as a professional development model. New instruments have been developed, pilot-tested, validated, refined, and field-tested to provide a set of tools that can be used in multiple educational settings.

EMC Research Hypothesis
The effectiveness of a mathematics classroom coach is linked to several domains of knowledge. Coaching Knowledge and Mathematics Content Knowledge are two of these domains that contribute significantly to a coach’s effectiveness as measured by positive impact on teacher practice, attitudes, and beliefs.

Research Methods
EMC uses (1) a non-experimental correlational study of knowledge for coaching and change in teacher practice and (2) an experimental causal cross-over design measuring the effects of increased knowledge for coaching on teacher practice. The study also will yield data about the environmental characteristics of effective coaching.

Data collection uses a variety of instruments. Analysis uses mixed-methods for qualitative data, quantitative data, and ordered categorical data.

The project is measuring coaching knowledge through a combination of factor scores on Likert items about familiarity with coaching literature, factor scores on coaches’ self-reported confidence and perceived effectiveness, and character scores based on responses to scenarios.

Research Products
The EMC Project has identified domains for coaching knowledge and definitions for each domain. EMC has developed two instruments for collecting data on coaching knowledge, practices, and beliefs.

Research Hypothesis
The EMC project researchers developed eight domains of coaching knowledge using a modified Delphi process. Using the domains and existing literature on coaching, project researchers wrote items to measure knowledge of beliefs about mathematics, and practices in mathematics coaching. After two pilots, the project has a working instrument.

Factor 1: Working with teachers
Sample item: “I have difficult conversations with teachers, when necessary, about mathematics misconception they hold.”

Factor 2: Working with principals (Teacher level)
Sample item: “An effective mathematics coach asks the principal what she or he believes the teachers’ needs are.”

Factor 3: Working with principals (School level)
Sample item: “I provide feedback to the principal about whether or not the school is meeting its vision for mathematics instruction.”

Factor 4: Using student work
Sample item: “I collect students’ mathematics work from a teacher’s classroom to guide our coaching conversations.”

Factor 5: Teacher need (Pressure)
Sample item: (Reversal) “An effective mathematics coach only on teacher-stated needs.”

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This project is the product of the EMC research team, which includes Mark Greenwood and Jennifer Luebeck in the Department of Mathematical Sciences at Montana State University, and Lyn Swackhamer, Clare Heidema, and Arlene Mitchell at RMC Research Corporation, Denver. We gratefully acknowledge their contributions.

Characterizing Coaches
Can selected response items be used to identify coaching dispositions?
Sample item: “A coach and teacher have discussed a teaching strategy in detail. The coach feels that the teacher knows enough about the strategy to implement it, and the teacher has developed a plan to implement it. At this point, the coach should:…”

Each choice reflects a certain coaching disposition:
- Coach as described in majority of the literature
- Coach as mentor, lead teacher, or evaluator
- Coach as described in minority of the literature
- Coach as described in literature that is not addressed in the majority of the literature

For further information...
Or to request copies of these instruments, please contact emc@math.montana.edu. More information on this project can be obtained at the Web site http://www.math.montana.edu/~emc

Passive or light coaching
b. “Leave the teacher alone to try it out a few times so the teacher can grow comfortable with the strategy and gain ownership of it.”
d. “Wait for the teacher to ask for further support to avoid appearing pushy.”

Characterizing Coaches

- Encourages teacher reflection
- Engages teacher in mathematics teaching conversations, without enforcing teaching strategies
- Encourages teacher self-assessment
- Encourages teacher goal-setting
- Engages in partnership (as described by Knight) with teacher
- Encourages teacher to continually improve practice
- Engages in proactive coaching

- Fails to set stage for professional, reflective coaching environment
- Fails to establish leadership-style coaching role
- Fails to establish a partnership relationship where teacher and coach reflect together
- Fails to establish goals, implementation plans, reflection plans, and learning trajectory with teacher

Coaching Knowledge Survey
Project researchers developed eight domains of coaching knowledge using a modified Delphi process. Using the domains and existing literature on coaching, project researchers wrote items to measure knowledge of beliefs about mathematics, and practices in mathematics coaching. After two pilots, the project has a working instrument.

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