Center for Education Policy Research
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DEVELOPING AMBITIOUS MATHEMATICS INSTRUCTION THROUGH MQI COACHING

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RESEARCH STUDY OVERVIEW

Research Question: What is the impact of MQI Coaching on teacher instructional practice and student achievement outcomes?

Method: Randomized controlled trial of a 1:1 web-based math coaching model

Participants: 23 math coaches & 142 math teachers (Grades 3–8) in two midwestern districts

- 72 teachers randomly assigned to receive MQI Coaching (treatment group)
- 70 teachers randomly assigned to not receive coaching (control group)

Participation: Teacher participation in MQI Coaching was high overall, but variable across individual teachers. During the 2014–2015 school year, 63 of 72 treatment teachers participated in at least one coaching session, with an average of 9.7 cycles among them.

142 MATH TEACHERS

23 MATH COACHES

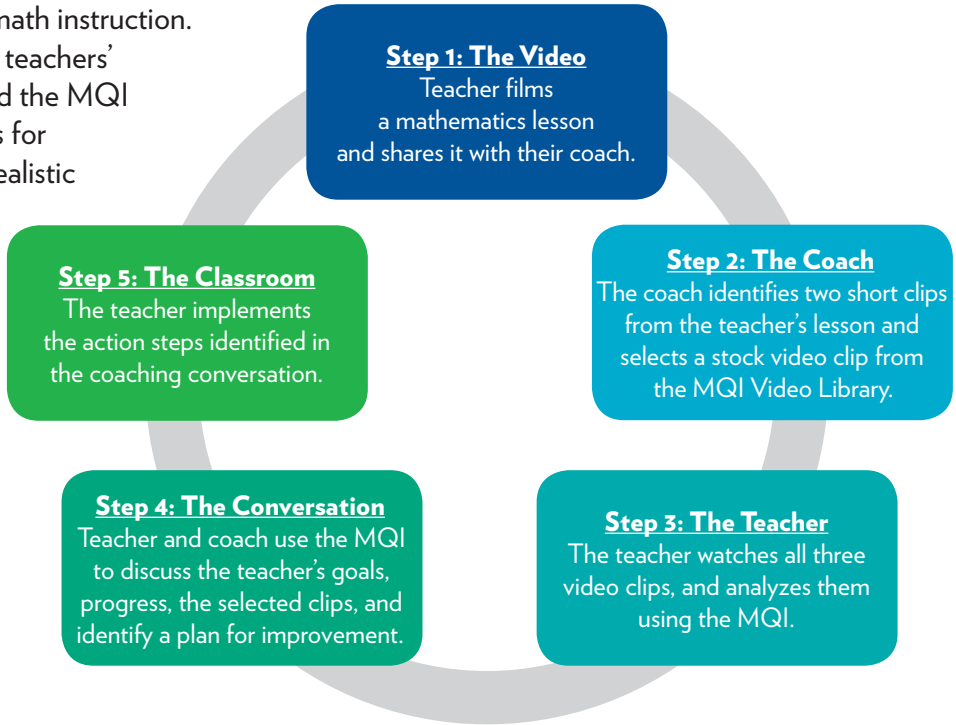
KEY FINDINGS

• Mathematics instruction improved • Math teacher retention increased • No significant impact on test scores

HOW MQI COACHING APPROACHES INSTRUCTIONAL IMROVEMENT

MQI Coaching Theory of Action: Coaching Cycles Support Teacher-Driven Improvement

The MQI Coaching model uses a well-established observational instrument, the Mathematical Quality of Instruction (MQI) rubric, to help structure teachers' and coaches' reflections on and conversations about math instruction. In MQI Coaching cycles, coaches guide teachers' self-reflection, using classroom video and the MQI rubric to help teachers self-identify areas for instructional growth, and to commit to realistic and actionable next steps in their classrooms. A key program philosophy is that teachers drive their own learning, guided by video, the MQI rubric, and their coach.



About the MQI Coaching Cycle

As part of a year-long experience, teachers learn about the MQI rubric, use it to critically analyze video, and then work with an MQI-expert coach to improve their own instruction.

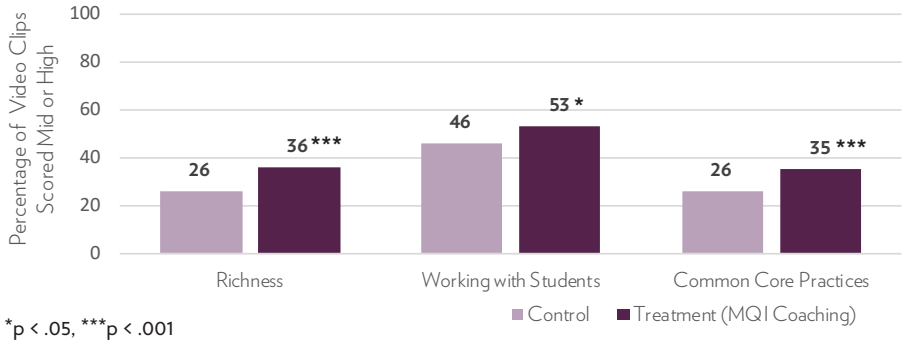
KEY FINDING 1: MATHEMATICS INSTRUCTION IMPROVED

MQI Coaching resulted in significant improvements in the quality of teachers' mathematics instruction, as measured by classroom video and student surveys.

MQI SCORES FROM VIDEO OF CLASSROOM INSTRUCTION

MQI Coaching improved teachers' practice to include more rich, cognitively demanding mathematics instruction, measured in the year after they received coaching.

Figure 1. Instruction Improved in Three MQI Domains



*p < .05, ***p < .001

Note. Differences between treatment and control groups are statistically significant in three MQI domains.

The MQI measures the quality of mathematics instruction in several domains: the depth of the mathematics offered to students (Richness), the teacher's instructional use of student ideas and misconceptions (Working With Students), and the amount of student participation in cognitively demanding mathematics (Common Core-Aligned Student Practices).

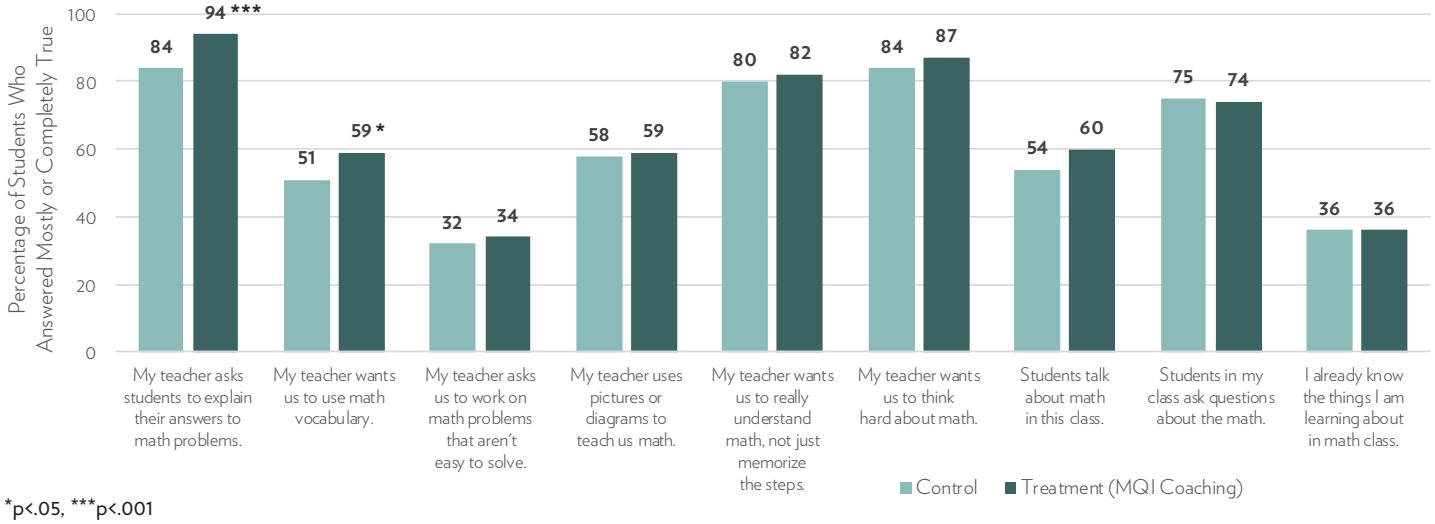
STUDENT SURVEYS

MQI Coaching also improved teachers' instructional practice in the year they received coaching.

Students of coached teachers reported that:

- their teachers asked for more mathematical explanations from students, and
- their teachers required more use of mathematical vocabulary.

Figure 2. Student Survey Responses Indicate Instruction Improved



*p<.05, ***p<.001

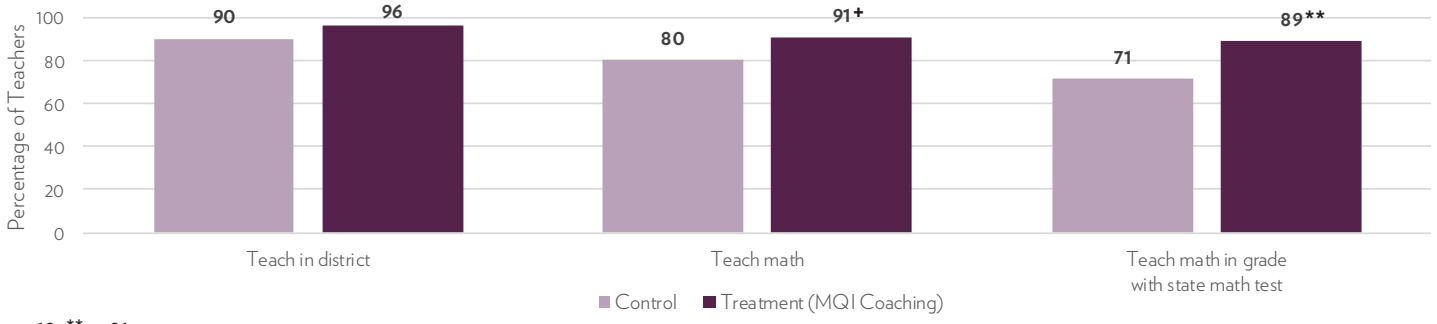
Note. Differences between control and treatment groups are statistically significant in the first two items.

KEY FINDING 2:
MQI COACHING INCREASED MATH TEACHER RETENTION

Participation in MQI Coaching increased the probability that a teacher would continue to teach math in a tested grade the following year.

Being randomly assigned to receive MQI Coaching significantly increased the probability that a teacher remained in the district, taught math, and taught math in a grade with state tests in the following year.
Teacher retention may have resulted from participation in MQI Coaching affecting teachers' career decisions, and/or administrators' decisions about teacher placement.

Figure 3. Teacher Retention Increased in the Following Year



+p<.10, **p<.01
Note. Differences between control and treatment groups are statistically significant for the teachers who teach math and teach math in grade with state math test.

KEY FINDING 3:
NO SIGNIFICANT IMPACT ON STUDENT TEST SCORES

The sizable instructional improvements did not lead to measurable improvements in student test scores.

Changes in teachers' instruction did not produce measurable improvements in student achievement on formative or summative math tests. Possible explanations include:

- Students' math skills did not improve.
- Better mathematics instruction improved students' abilities in ways not captured by the state standardized test or the formative assessment.
- Resulting effects on math achievement were too small to detect, given the power of our research design.

We view the teachers' instructional changes as important outcomes in their own right. Coaching helped teachers provide their students with more opportunities both to reason mathematically and to make sense of mathematics. These are key goals of recent mathematics reforms.

IMPLICATIONS FOR THE FIELD

Broadly, the literature on professional development programs is mixed, however, teacher coaching appears to be a bright spot. This study and others indicate that investment in mathematics coaching is worthwhile. *Our insights for coaching program design and implementation are outlined below.*

1. PROVIDE ONGOING TRAINING AND SUPPORT FOR COACHES

Ongoing training and support for coaches is a key element of any coaching model. In this study, we provided coaches extensive initial training and monthly professional development sessions. In our judgment, the quality of coaching improved substantially as the coaches gained experience and continued to receive on-the-job training.

2. CONSIDER COST EFFECTIVENESS

Costs are often a core constraint to adopting or expanding teacher coaching. We expect, however, that on a per-cycle basis, web-based programs like MQI Coaching are likely to be more cost effective than site-based programs, even accounting for additional technology costs.

3. ALIGN COACHING PROGRAM AND LOCAL GOALS

It is important that there be alignment between the aims of a coaching program and the instructional environment in classrooms. Teachers in our study reported that their efforts to deliver higher-quality lessons were sometimes circumscribed by pressure to cover extensive content or to promote simple solution methods. Providing students space to use multiple methods, learn from their mistakes, and discuss math concepts requires time that is not always afforded by school calendars or curriculum pacing guides.

4. IDENTIFY PRIORITIES AND DEFINE MEASURES OF SUCCESS

The potential benefits of this type of reform-based math instruction may not be captured by multiple-choice question on state standardized tests. Schools focused on increasing student performance on standardized tests will have to consider carefully the theory of action of how a given math coaching model is aligned with these tests.

5. EXPERIMENT WITH NEW AND EXISTING MATH COACHING MODELS

Developing and refining coaching models takes time. Compared to the decades-long history of literacy coaching and its rich evidentiary base, math coaching practice and research is still in its infancy. This study suggests that experimenting with new and existing math coaching models such as MQI Coaching is a worthwhile investment.

FOR MORE INFORMATION ABOUT THE MQI RUBRIC AND RESEARCH BASIS

cepr.harvard.edu/mqi