

What is math?

Shaping teachers' mindsets and views of math as a discipline through participation in Math Teachers' Circles

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Introduction

- **Math Teacher's Circles (MTC)** is a nation-wide intervention for K-12 math teachers where teachers and mathematicians engage in community building and investigation of non-routine problems
- Through integrating the teaching and practice of math, teachers are encouraged to engage with their students as mathematical problem solvers
- Teachers who participate in MTC adopt more incremental mindsets about learning, show higher levels of professional engagement, and implement high-leverage teaching practices in their classrooms (e.g., using tasks promoting reasoning and problem solving, facilitating meaningful mathematical discourse, and supporting productive struggle in learning mathematics)^{1,2}

This study 1) validated the Conceptions of Mathematics as a Discipline scale and 2) used this measure to predict the relationship between MTC participation, conceptions of math and K-12 math teachers' healthy mindsets and pedagogical strategies.

Conceptions of Math as a Discipline Scale

- The newly developed 12-item Conceptions of Math as a Discipline scale measures the level of endorsement of two orientations to mathematics
 - 1) A “research” view of math which represents math as a subject in which the core practice is the creative process of understanding relationships and patterns.
 - Example item: “Good solutions to mathematics problems typically lead to more questions”
 - 2) A “traditional-school” view which represents math as a formula-driven domain with clear steps and procedures.
 - Example item: “Knowing what steps to take is an essential part of approaching mathematics problems”

Subscales indexing the “research” and “traditional-school” views had high internal reliability (Cronbach’s $\alpha = .76$ and $.70$, respectively)

Design and Procedures

Participants: 249 K-12 Math teachers who have participated or were planning to participate in MTC.

Procedure: Data was collected through the American Institute of Mathematics, the developer of MTC intervention. K-12 math teachers who had already participated or were anticipating participating in MTC were solicited to complete a questionnaire. As MTC takes place in several states across the US, the sample includes math teachers from across the nation.

Measures:

- Sense of belonging to math³; 28 items; $\alpha = .96$
- Math identification⁴; 4 items; $\alpha = .86$
- Entity Theory of Intelligence⁵; 7 items; $\alpha = .89$
- Perceptions of Environmental Entity Theory³; 4 items; $\alpha = .96$

Design and Procedures (cont.)

- Patterns of Adaptive Learning Scale: Mastery Approach⁶; 4 items; $\alpha = .76$
- Patterns of Adaptive Learning Scale: Performance Approach⁶; 5 items; $\alpha = .78$
- Instructor beliefs about mistakes⁷
“[...] making mistakes is a key part of learning math.”
- Math Confidence; 4 items, $\alpha = .92$
- Conceptions of Math as a Discipline Scale; 12 items; $\alpha = .70$

Model of Participation in MTC

