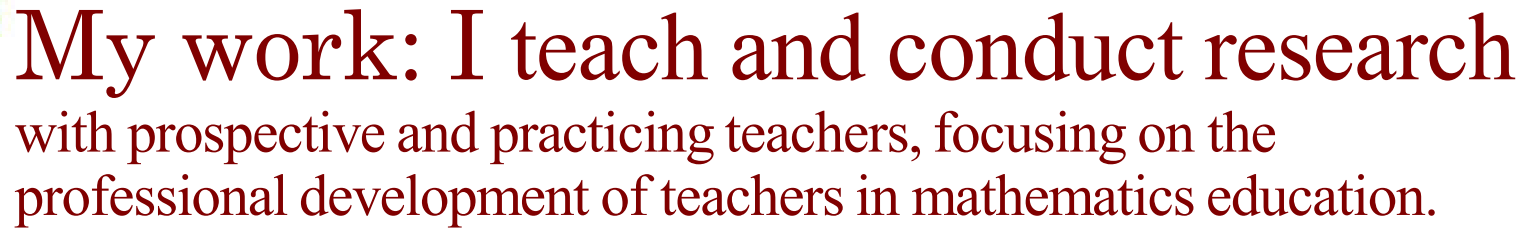


Research Foci and Funding Across My Career: Key Projects and Turning Points....



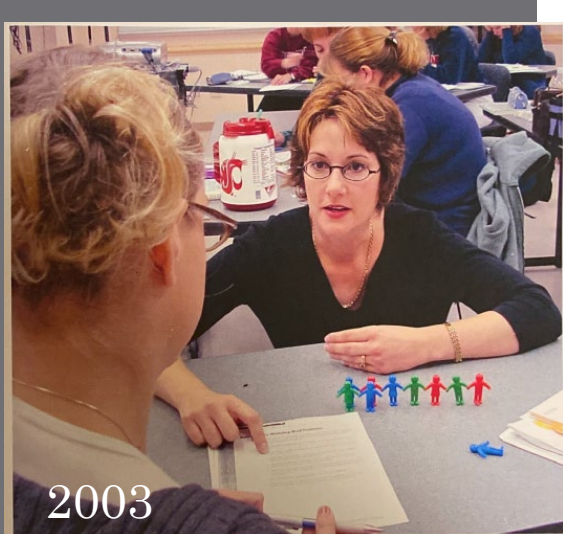
Amy Roth McDuffie, Professor of Mathematics Education
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Specifically, I investigate supports and barriers to teachers' learning in and from practice with attention to teachers' use of curriculum resources and equitable pedagogies.

I also research university practices that support or impede the process of becoming a teacher, including structural factors (e.g., institutionalized racism).





Promoting Mathematical Discourse through Children's Literature

Discourse in mathematics instruction has received considerable attention since the *Standards* were first published (NCTM 1989, 1991, 2000); however, prompting mathematical discussions and creating an environment that fosters discourse are challenging tasks for teachers (Corwin 1996). Moreover, students who are not used to talking about mathematics may be uncomfortable with or reluctant to participate in discussions. Discourse in mathematics involves expressing and justifying mathematical thinking and ideas. The primary purposes of facilitating discourse are to help students become aware of others' perspectives and strategies, and to clarify and expand students' own thinking and approaches (NCTM 2000).

Children's literature involving mathematics creates a natural context for talking about mathematics (see Helliwig, Monroe, and Jacobs [2000]; Moyer [2000a, 2000b]). Because teachers and students are accustomed to using books for discussion in other subjects, such as social studies and language arts, using literature in mathematics might help teachers who are just beginning to incorporate mathematics discussions in instruction to create an environment that promotes discourse. Moreover, teachers who already use discourse in mathematics find that literature offers another opportunity for students to make meaning and build connections between mathematics and their lives (Austin 1998; Moyer 2000a).

To explain how literature can serve as a fertile ground for fostering discourse communities in mathematics, we offer four examples of books to read aloud with a class and use in mathematical discussions. Although any of these books could be used to develop a mathematics activity, we are focusing on the mathematics discussions that might emanate from using such books in instruction. We have selected recent titles from various grade levels in order to expose readers to newer, high-quality literature for teaching and learning mathematics.

A Pig Is Big

Summary

Florian (2000) wrote *A Pig Is Big* in rhyme and painted simple watercolor illustrations that appeal to young children. The book begins with the question "What's big?" On the next page, we find an answer to the question: a pig. The story continues with each page asking for something that is bigger. For example, after asking, "What's bigger than a cow?" Florian writes:

A car.
It's bigger than a cow by far.
Inside a car a cow can squeeze
And drive a pig to town with ease.

The story builds to bigger and bigger things and ends with the universe as the "biggest thing of all. Compared to it all things seem small." We

Amy M. Roth McDuffie
and Terrell A. Young

Amy Roth McDuffie, mcduffie@tricity.wsu.edu, assistant professor in mathematics education, and Terrell Young, young@tricity.wsu.edu, associate professor in literacy education, are colleagues at Washington State University Tri-Cities in Richland, Washington. They are interested in supporting preservice and in-service teachers in professional development toward reform-based practices.

Teaching Children Mathematics, 2003

AMY ROTH MCDUFFIE

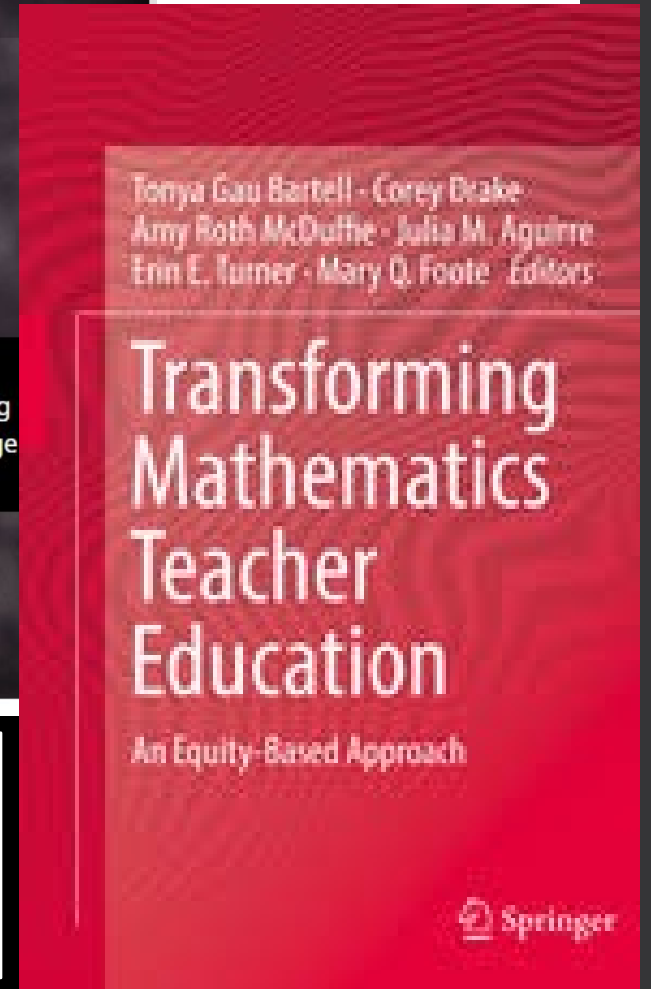
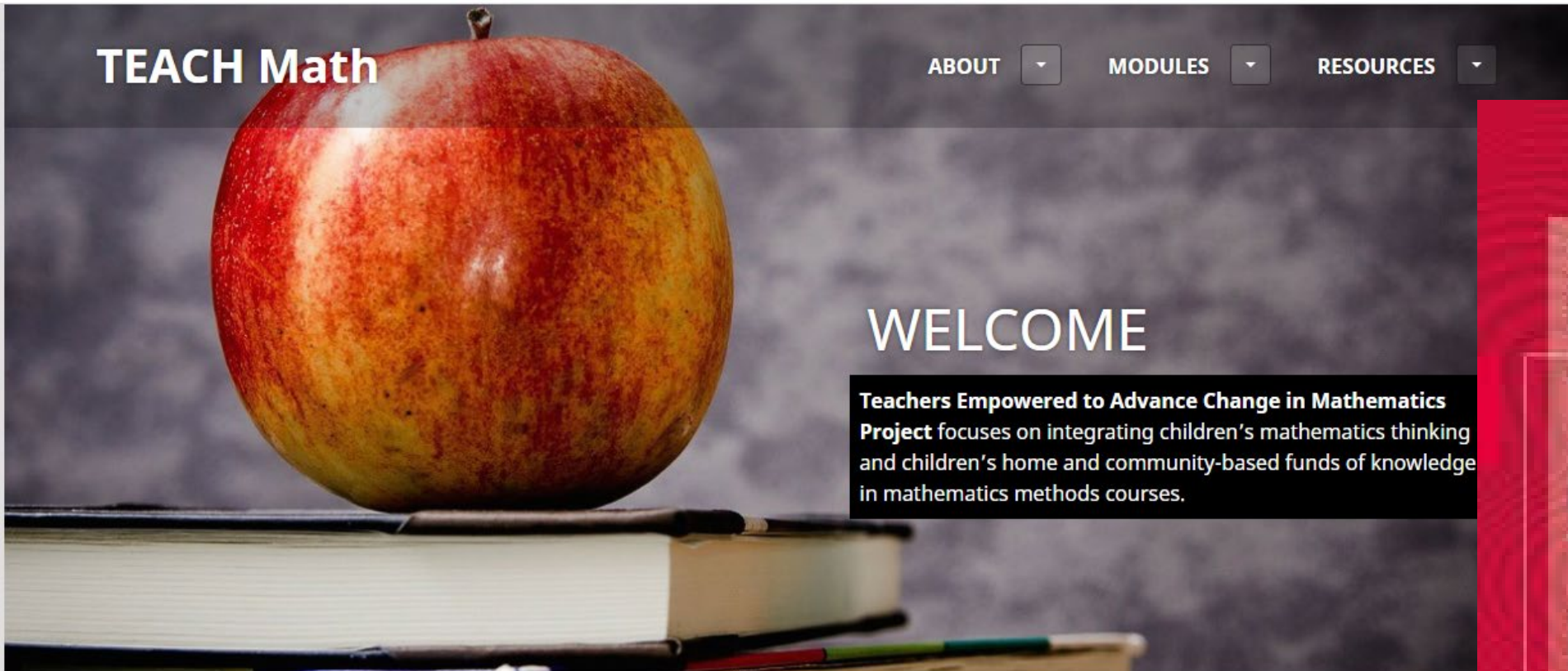
MATHEMATICS TEACHING AS A DELIBERATE PRACTICE: AN INVESTIGATION OF ELEMENTARY PRE-SERVICE TEACHERS' REFLECTIVE THINKING DURING STUDENT TEACHING

ABSTRACT. In this case study I examine the reflective practices of two elementary pre-service teachers during their student teaching internship. I extend current views of reflective practice to create a framework for a 'deliberate practitioner'. With this framework, I investigate the pre-service teachers' thinking with regard to reflective processes and how they use their pedagogical content knowledge in their practices. My findings indicate that the pre-service teachers use their pedagogical content knowledge in anticipating problematic events, and in reflecting on problematic events in instruction. However, limits in pedagogical content knowledge and lack of confidence impede the pre-service teachers' reflection while in the act of teaching. They were more likely to reflect on their practices outside of the act of teaching. Implications for teacher educators and pre-service teachers are discussed.

KEY WORDS: mathematics education, pedagogical content knowledge, reflective practice, student teaching, teacher education

With the emergence of recent reforms in education in the United States (e.g., National Council of Teachers of Mathematics [NCTM], 1989, 1991, 2000), researchers and educators have re-examined teaching by moving away from a technical model of teaching by prescribed methods to one that regards it as a, complex, demanding practice. Two separate but compatible perspectives have made substantial contributions as to how we view teaching, and correspondingly, to how we approach teacher education. First, viewing teachers as reflective practitioners has underscored the problem solving nature of teaching (McIntyre, Byrd & Foxx, 1996; Russell & Munby, 1991; Schön, 1983, 1987; Valli, 1992; Zeichner, 1993). Consequently, the focus of many teacher education programs is on the development of reflective practitioners (Christensen, 1996). This focus is consistent with a constructivist perspective for teaching and learning that is the basis of many teacher education programs (e.g., McIntyre, Byrd & Foxx, 1996). Second, the conceptualizing of pedagogical content knowledge (Grossman, 1990; Shulman, 1986, 1987) as a unique type of knowledge for teaching has helped researchers, teachers, and teacher educators gain an understanding of the knowledge base that teachers need for successful practice.

NSF Project 1: Teachers Empowered to Advance Change in Mathematics (TEACHMath) www.teachmath.info , 2010-2016 (work started in 2009, 2006?)



Funded by the National Science Foundation #1228034

Collaborators: Corey Drake (Michigan State University), Erin Turner (University of Arizona), Julia Aguirre (UW Tacoma), Tonya Bartell (MSU), & Mary Foote (Queens College CUNY)
RAs: Cathy Bolson, Angela Witters

Middle School Mathematics Teachers' Perceptions of the Common Core State Standards for Mathematics and Related Assessment and Teacher Evaluation Systems

Amy Roth McDuffie¹, Corey Drake²,
Jeffrey Choppin³, Jon D. Davis⁴,
Margarita V. Magaña¹, and Cynthia Carson³

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Middle school teachers' differing perceptions and use of curriculum materials and the common core

Amy Roth McDuffie¹ · Jeffrey Choppin² · Corey Drake³ ·
Jon D. Davis⁴ · Jennifer Brown⁵

Abstract

In this study, U.S. middle school teachers' perceptions of Common Core State Standards for Mathematics (CCSSM), CCSSM-related assessment processes, and resources for implementing were investigated. Using a mixed methods design, a national sample of teachers was surveyed, and 24 teachers were interviewed. Findings indicated that teachers viewed CCSSM as including new content for their grade level. Teachers also reported using multiple curriculum resources to a CCSSM and indicated that new assessments would serve as a part of CCSSM. Implications for rapidly changing policy, curriculum, assessment, instruction, and professional development related to CCSSM are discussed.

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Abstract Eight middle school mathematics teachers' perceptions and uses of curriculum materials and the Common Core State Standards for Mathematics (CCSSM) were investigated. Adapting a noticing framework and models of dialogic instruction and direct instruction, teachers' noticing practices with curriculum materials and the CCSSM when planning, enacting, and reflecting on lessons were examined. Teachers who were committed to implementing the CCSSM and who were using one of two substantively different curriculum programs were purposefully selected. Data sources included multiple forms of interviews and classroom observations. The teaching evidenced three distinct noticing patterns. These patterns indicated that teachers' curriculum materials were associated with how teachers perceived and enacted the CCSSM. Teaching with a curriculum program that was designed as a thinking device prioritized the Standards for Mathematical Practice of CCSSM evidenced noticing that was consistent with dialogic instruction. Teaching with a curriculum program that was designed as a delivery mechanism prioritized the Content Standards of CCSSM and evidenced noticing consistent with direct instruction. Findings indicated that the designated curriculum and contributed to differing interpretations of CCSSM and served as a lens for noticing. However, a dialogic curriculum program was not sufficient to support dialogic approaches in practice. One pattern showed teachers planning dialogic lessons, but the lesson enactments were not consistent with teachers' plans, with evidence that the teachers were not aware that their practices differed from dialogic approaches. Implications for research and practice are discussed.

NSF Project 2: Developing Principles for Mathematics Curriculum Design and Use in the Common Core Era, 2012-2018 (work started in 2010)

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Middle school mathematics teachers' orientations and noticing of features of mathematics curriculum materials

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ARTICLE INFO

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Curriculum analysis
Teacher orientation
Middle school mathematics
Teacher noticing

ABSTRACT

We report findings on teachers' noticing of features in the teacher resources of mathematics curriculum programs. Based on prior analysis, we selected teachers using one of two curriculum types: delivery mechanism or thinking device. The participating teachers and the curriculum programs aimed to align with the Common Core Standards for Mathematics, and thus, they ostensibly held a common aim for instruction. We analyzed 147 lesson planning interviews with 20 middle school mathematics teachers. We found that teachers attended to similar features of teacher resources; however, patterns for interpreting and planning decisions varied based on teachers' orientations and curriculum type.

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Collaborators: Jeff Choppin (University of Rochester), Corey Drake (Michigan State University), & Jon Davis (Western Michigan University)
RAs: Margarita V. Magana, Jennifer Brown



NSF Project 3: Mathematical Modeling with Cultural and Community Contexts (M2C3), 2016- 2020, spin-off from TEACHMath

<https://sites.google.com/prod/qc.cuny.edu/m2c3/home>

Project Information

Project Overview

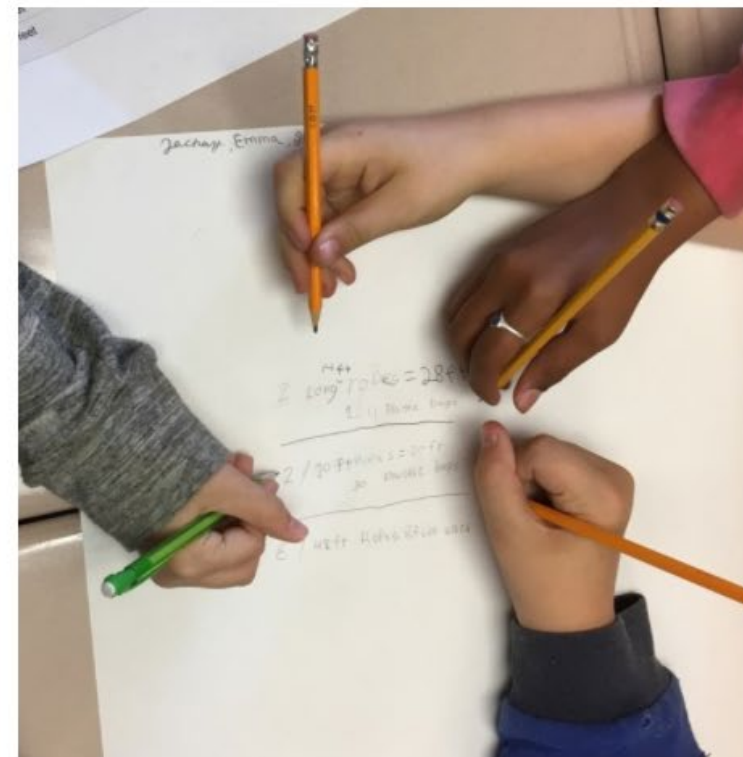
Mathematical Modeling With Cultural and Community Contexts (M2C3) is a project focused on teaching and learning mathematical modeling in diverse elementary classrooms.

Project Personnel

M2C3 brings together PIs who are extending their work in the TeachMath Project to focus on supporting elementary teachers in using cultural and community contexts in mathematical modeling tasks. They are joined by a team of other key personnel and graduate students.

People at Work (Gallery)

Photos of participants in M2C3 professional development sessions as well as working in classrooms.



Collaborators: Erin Turner (University of Arizona), Julia Aguirre (UW Tacoma), & Mary Foote (Queens College CUNY)
RA: Candace Chappelle

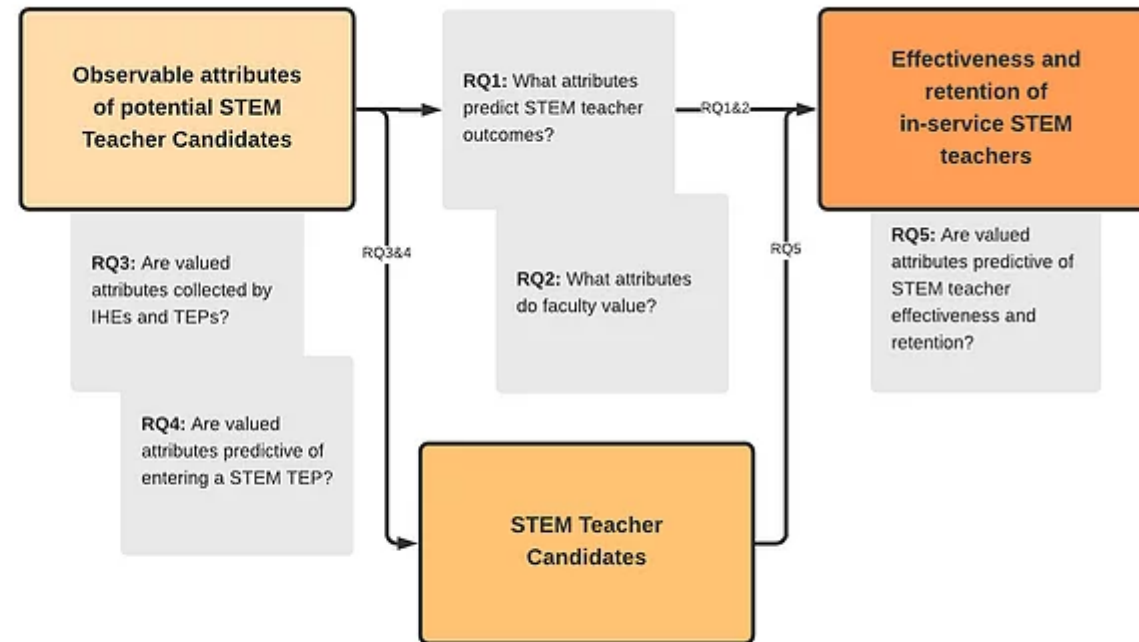


Funded by the
National Science
Foundation, EHR
1561311

NSF Project 4: Applicant Information, Selection, & STEM Teacher Retention and Effectiveness, 2020-2025, work started 2019

NSF Noyce
Project

*Applicant
Information,
Selection, and
STEM Teacher
Retention and
Effectiveness*



Funded by the National Science
Foundation. DUE 1950030

<https://www.telc.us/noyce>

Collaborators: Dave Slavitt (WSU), Dan Goldhaber (UW & American Institute of Research), Roderick Theobald (UW), & Jennifer Decgaube-Berkas (Central Washington University) .

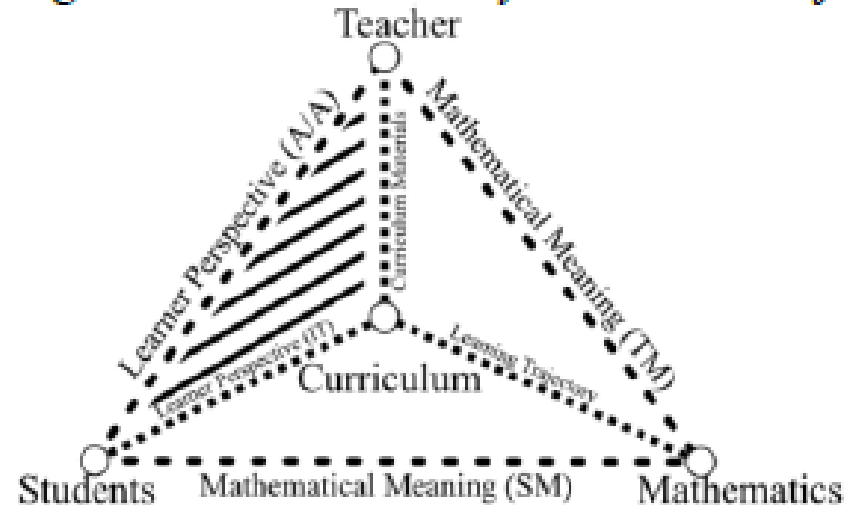
RAs: Nicole Griggs, Melissa Percy, Candace Chappelle

NSF Project 5: Quantifying Curricular Reasoning as a Critical Practice in Teaching Mathematics, 2022-2026, work started 2020, 2016?, 2009?

Project aims to develop and validate two quantitative measures of *Curricular Reasoning* in order to improve middle level mathematics teaching and learning:

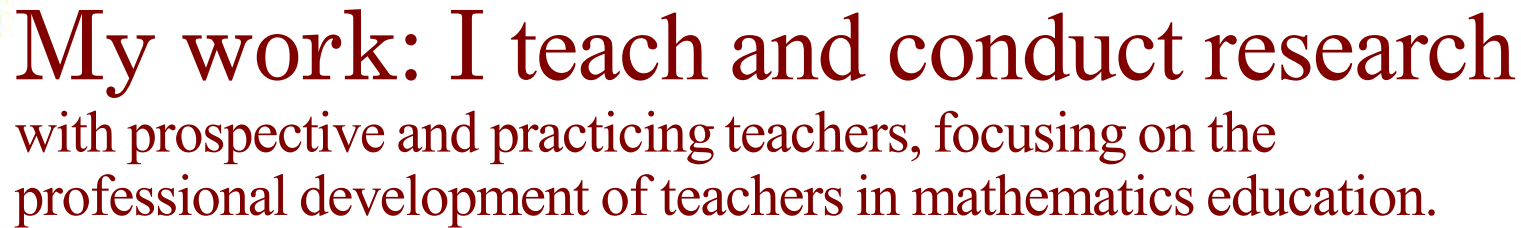
- a teacher survey, and
- an observation protocol.

Figure 3. *Instructional Pyramid Model of CR*



Funded by the National Science Foundation.DRK-12, 2201167

Collaborators: Dawn Teuscher (Brigham Young), Shannon Dingman (University of Arkansas), Jonathan Bostic (Bowling Green State University), Toni May and Kristin Koskey (Drexel University), and Travis Olson (University of Nevada, Las Vegas)
RA: Tara Heikila



Specifically, I investigate supports and barriers to teachers' learning in and from practice with attention to teachers' use of curriculum resources and equitable pedagogies.

I also research university practices that support or impede the process of becoming a teacher, including structural factors (e.g., institutionalized racism).



Questions, Comments, &
Discussion...

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