PRIME-ing Teaching Assistants for Inclusive and Effective Instruction in Gateway Math Courses

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Preparing Responsive and Inclusive Instruction for Meaningful Mathematical Experiences (PRIME) builds on research demonstrating the critical role of instructor beliefs, expectations, and pedagogy in shaping student outcomes in mathematics (Boaler, 2015). In this novel, in-service training and professional development community, the role of the graduate teaching assistant (GTA) is leveraged to implement evidenced-based practices for math learning in gateway college algebra, precalculus and calculus courses with historically high DFW (drop, fail, withdraw) rates.

Recent work has identified the critical and impactful role of GTAs in freshman and sophomore-level math courses (Bressoud et al., 2015; Pilgrim et al., 2025; Speer et al., 2005). We posit that GTAs are uniquely positioned to impact student belonging and mindset, two conditions critical for math learning (Fitz, 2025). Furthermore, GTAs who lead discussion sections in large-enrollment math courses self-report as being under-supported. Thus, this pilot program was developed to support and prepare GTAs to enact responsive pedagogy grounded in academic mindsets and growth-oriented instruction.

PRIME GTAs were supported with a $1500 stipend and a semester-long series of working sessions intended to build a community of learning and support. The primary learning objectives were (1) identify a capacity to learn in every student (2) foster meaningful mathematical discourse and (3) recognize and develop the elements of an effective math discussion section. Curricular components were informed by Farrington's work (2012) which identifies academic mindsets—including students' sense of belonging, growth orientations, and students' perceived value of their work—as foundational to deeper learning.

Survey data from GTAs and undergraduates, short participant reflections, and end of course grades were collected to investigate two primary research questions:

1. How does participation in the PRIME program impact GTA instructional practices in gateway math courses?
2. What effect does GTA participation in PRIME have on undergraduate students' sense of belonging, engagement, and learning in mathematics?

We consider the efficacy of PRIME in terms of the GTAs' behaviors & self-reflections and their undergraduate students' reports of belonging, learning and persistence. However, this work also examines the praxis of instructional reform within the context of our institution. The value of collaborative efforts between teaching and learning centers and disciplinary departments to implement sustainable change in teaching practices is well-documented (Condon et al., 2016; Finelli et al., 2014). Typically departmental change is initiated internally, but PRIME was designed and proposed by staff from the university's teaching and learning center. Still, over the course of this project, positive, collaborative relationships with mathematics faculty and department leadership have grown in ways that may pave the way to further pedagogical and instructional change with the math department, and this endeavor may later serve as an institutional case study for implementing inclusive and effective instruction across other STEM departments and gateway courses.

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