Career: Teaching Mathematics Well in Community Colleges: Understanding the Impact of Reform-Based Instructional Resources
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Project Summary

Taking on the calls for reform of mathematics teaching in two-year colleges, this program of research establishes a new perspective from which we may understand what it takes to implement such reforms in community colleges—one that emphasizes teaching and the context in which it happens. The proposed work investigates how suggestions regarding shifts towards student-centered instruction can be actualized in real, diverse, and under-resourced settings. An attention to the teaching of mathematics as it happens in community colleges provides a lens for understanding deeper issues of mathematics teaching in undergraduate settings. The studies proposed support a long-term program of research on the role of resources in developing teaching expertise in undergraduate mathematics.

I propose a research program that seeks to study how standards recommendations regarding a more student-centered approach to mathematics instruction can be actualized so that systematic investigations of its impact on students’ learning can be carried out. I will describe mathematics teaching in one community college, investigate the conditions under which processes for altering planning, classroom interaction, and verification strategies can be implemented, and study the potential impact of those implementations on students’ learning and success in pre-college, non-developmental, mathematics courses.

I propose a series of interrelated studies, (1) sensitizing studies: to understand the contexts in which mathematics faculty in community colleges teach; (2) probing studies: to test conditions under which teaching strategies designed to influence planning, classroom interaction, and verification practices affect instruction; and (3) quasi-experimental studies: to determine the relationship between changing teaching strategies and students’ learning and success in mathematics. I use a combination of qualitative and quantitative methods for data collection, analysis, and interpretation.

The intellectual merit of this program of studies resides in its emphasis on understanding the mechanisms by which specific proposals for reforming practice happen in community college mathematics classrooms. This essential aspect of research complements existing research in mathematics education in undergraduate settings that attends to students’ learning of advanced notions in mathematics with students in four-year institutions. This work will develop our understanding of artifacts in teaching, how planning is affected and how classroom interaction can be changed. This work also contributes to our understanding of design issues related to investigating the link between complex resources associated with mathematics teaching and students’ learning.

The broader impact of this program will be to improve the teaching of mathematics at the undergraduate level by better understanding the mechanisms by which proposals for reform of teaching practice can be actualized in classrooms and by demonstrating the impact on students’ learning. These efforts will infuse a different research perspective into teaching of undergraduate mathematics and will build a new line for faculty development that is content based. The linked studies proposed are likely to impact how educational reform is conceptualized at this level, by understanding contextual and classroom conditions and by understanding how to measure its effects on practice. The results of this program will highlight the critical conditions under which mathematics is delivered in community colleges and contribute to raise awareness of the need to support them as they strive to improve their practices. Future mathematics faculty will benefit from findings from this work, as representations of classroom episodes will be useful in devising programs for preparing future faculty. Ultimately, this program will reach community college students, and establish models for reaching them so that they will be better prepared to take on more mathematics courses in their careers, and therefore increase their chances to pursue STEM degrees.