Exploring the Role of Active Learning in a Large-Scale Precalculus Class

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In a large undergraduate mathematics classroom, introducing evidence based learning practices can be challenging. Due to persisting outdated methods of teaching, results of recent research call for more investigation of active-learning in all STEM classrooms, including large scale ones. Using Fraser's (1989) lens on perception, results from this study indicate that students who participated in Team Activities and other learner-centered activities in a large scale precalculus undergraduate class reported good experiences and are more positive in their attitudes towards mathematics.

Keywords: Large-Scale Classrooms, Precalculus, Evidence-Based Practices

Researchers and curriculum developers have responded to the call for instructional improvements, developing numerous learner-centered curricular innovations particularly using collaborative and open-ended activities. Learner-centered instruction has been shown to support conceptual learning gains (e.g.; Kwon, Rasmussen, & Allen, 2005), diminish the achievement gap (Kogan & Laursen, 2013; Riordan & Noyce, 2001), and improve STEM retention rates (Hutcheson, Pampaka, & Williams 2011; Rasmussen, Ellis, & Bressoud, 2013; Seymour & Hewitt 1997). The objective of this research was to investigate student outcomes from the introduction of a small number of evidence-based active learning practices in a large size Precalculus classroom. For this study, outcomes were defined as students' attitudes towards mathematics and themselves as mathematics learners, interest in mathematics, and self-efficacy. The research question was: "What are students' experiences in a large-sized undergraduate Precalculus class when active learning strategies are present?

Fraser (1989) stated that "the strongest tradition in past classroom environment research has involved investigation of associations between students' cognitive and affective learning outcomes and their perceptions of psychosocial characteristics of their classrooms" (p. 315). We choose to use Fraser's lens to study associations between students' perceptions of a large-scale classroom environment and their cognitive and learning outcomes.

This mixed methodological exploratory research study (Creswell, 2013) was designed to introduce evidence-based instruction to students in order to study how these new practices are implemented and how they affect student outcomes. Data collection included interviews and surveys (pre-and post-) administered to the 14 participants at a very large, public southeastern university. Semi-structured interviews were conducted by the researches and were utilized for students to share their experiences. Video recordings of each interview were then transcribed and coded by the authors. Quantitative analysis was then completed to compare the Likert-scale scores from the pre- and post-surveys. Results will be shown on the poster.

Several themes arose as we analyzed the codes. Overall, (1) students were neutral about math in application, (2) collaboration was important for students, and (3) active learning was important for students. The results are noteworthy as we are finding that it makes a difference even to include just a few instructional strategies that are considered learner-centered even in large scale classrooms. This result leads to a significant question: How important is it to include learner centered instruction fully implemented or can a partial implementation work?

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