A Case Study of Student Motivation and Course Structures in Introductory Calculus

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Student success in introductory calculus is imperative to obtaining a degree in STEM. Calculus I is a main gatekeeper course for STEM majors, and many students leave the class with a diminished motivation to pursue further courses related to mathematics. This poster reports a qualitative case study from a larger mixed-methods project aimed at exploring the relationship between course structures (hybrid, traditional, and large active learning) and student motivation in calculus. Using the theoretical framework of self-determination theory (SDT), six students were interviewed to investigate how each course structure was related to students' perceptions of their competence, autonomy, and relatedness. Emerging themes showing differences in student motivation between the three course types will be presented.

Keywords: Calculus Success, Motivation, Active Learning

The Mathematical Association of America (MAA) national study of *Characteristics of Successful Programs in College Calculus* revealed that introductory calculus occupies a gatekeeper role for STEM majors across the country. Even if students persist through Calculus I, they leave the class with a diminished confidence and enjoyment of mathematics and a decreased desire to continue pursuing further mathematics (Bressoud 2015). Thus, the goal of this research study was to provide a better understanding of the relationship between learning environments and student motivation in introductory college calculus. Results of this work will help guide mathematics faculty and administrators to create environments that are most conducive to fostering students' motivation, thus supporting their academic achievement in calculus.

The theoretical framework of self-determination theory (SDT) was used to guide this study. SDT is a macro-theory of motivation and has been widely used to study the social factors of an environment under which people thrive (Ryan & Deci 2000). According to SDT, three basic psychological needs are essential to fostering a student's motivation and engagement: competence, autonomy, and relatedness. Competence refers to students feeling confident and effective in the classroom, autonomy means they have a sense of agency and authority, and relatedness incorporates students' need to feel a sense of belonging in the classroom (Niemiec & Ryan 2009).

This poster will report the qualitative piece of a larger mixed-methods design that investigated the interaction of course structures, students' basic psychological needs satisfaction, and motivation. Three different course types of Calculus I were sampled at a large research university, which included traditional methods, hybrid online, and a large-enrollment active learning classroom. The Basic Psychological Needs Scale (BPNS) and the Situational Motivation Scale (SIMS) were administered to students in the three course types (N=323). Six students were purposefully selected based on their survey responses, and one-on-one interviews were conducted to determine what aspects of each course structure were contributing to students' perceptions of their competence, autonomy, and relatedness. This poster will present emerging themes from the case study analysis (Merriam 1998), and implications for mathematics faculty will be discussed.

References

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