

WHAT DO COLLEGE CALCULUS STUDENTS BELIEVE ABOUT MATH?

Figen Uysal¹ Jessica Ellis² Chris Rasmussen²

¹Bilecik Şeyh Edebali University ²San Diego State University

Teachers' and students' mathematical beliefs have been a topic of interest in mathematics education research for the last three decades and have been studied from different perspectives. After a literature review with a different focus of categorizations or models of students' beliefs related to mathematics learning and problem solving, Op 't Eynde, De Corte and Verschaffel (2002) defined students' mathematics-related beliefs as the implicitly or explicitly held subjective conceptions students hold to be true about mathematics education, about themselves as mathematicians, and about the mathematics class context. Students' mathematics-related beliefs can have a substantial impact on their interest in mathematics, their enjoyment of mathematics, and their motivation in mathematics classes (Kloosterman, 2002, p.247). In our study, we aimed to investigate college students' mathematics-related beliefs regarding some affect-related concepts, such as confidence, enjoyment and interest, and specifically how the beliefs expressed by Calculus students relate to their persistence in Calculus, as well as other variables.

Data for this study come from a large-scale national survey of mainstream Calculus I instruction that was conducted across a stratified random sample of two- and four-year undergraduate colleges and universities in the U.S. during the Fall term of 2010. For the purpose of this analysis, we focus only on Science, Technology, Engineering, and Mathematics (STEM) intending students who responded to both pre and post term surveys and whose instructors did as well, resulting in a data set of 5345 students from 421 instructors from 145 institutions. The 19 items of the student surveys related to beliefs were subjected to principal components analysis (PCA). This revealed three factors: (a) affect; (b) beliefs about nature of mathematics; and (c) beliefs about teaching and learning of mathematics. Initial analyses reveal that students who choose to persist in Calculus express higher affect about math, and more novice beliefs about the nature of mathematics and the teaching and learning of math, when compared to students who choose to switch out of Calculus. Interestingly, over the course of Calculus I these differences in beliefs became more extreme, suggesting that persisters' beliefs are more flexible toward the novice direction than switchers.

The literature tells us that students' beliefs about mathematics are related to their success in mathematics. Thus, it is important for us to first identify the differences in beliefs between students who continue studying Calculus and those who don't.

References

- Kloosterman, P. (2002). Beliefs about mathematics and mathematics learning in the secondary school: Measurement and implications for motivation. In G.C Leder E. Pehkonen & G. Törner (Eds.), *Beliefs: A hidden variable in mathematics education?*, (pp.247-269), The Netherlands: Kluwer.
- Op 't Eynde, P., De Corte, E., & Verschaffel, L. (2002). Framing students' mathematics-related beliefs. A quest for conceptual clarity and a comprehensive categorization. In G.C Leder E. Pehkonen & G. Törner (Eds.), *Beliefs: A hidden variable in mathematics education?*, (pp.13-37), The Netherlands: Kluwer.