This study seeks to uncover prospective teachers’ construction of mathematical meanings after engaging in a two semester calculus sequence. The research question for this work is: How might the learning of calculus impact prospective teachers’ mathematical meanings of functions, and in particular, prospective teachers’ meanings of covariation? The purpose of this study is to understand whether, and if so, how, the study of calculus is useful for prospective teachers, and to place a lens on meanings that students develop on covariation, a concept that permeates the secondary school mathematics curriculum.

Because not all secondary school teachers will teach calculus or more advanced mathematics, the importance of success in calculus remains a question for students. Even when it is accepted that calculus may be useful, learning more advanced mathematics continues to be questioned, especially as the undergraduate mathematics courses increase in levels of abstraction. At the teaching university where this study takes place, this is a relevant issue because students who major in mathematics will become middle or high school teachers. This study may contribute to our understanding of the need of calculus as prerequisite knowledge for teaching.

The courses in which this study takes place include Calculus 1 and 2. The site of this study is a small private university with a primary goal of training prospective teachers at the undergraduate and graduate levels. Students who enroll in the calculus sequence are undergraduate double majors in mathematics and in education. Because I teach both courses as well as the mathematics methods courses for middle and high school teaching, I have a unique opportunity to get to know students well as they form mathematical meanings and acquire pedagogical content knowledge in mathematics.

Research Design and Theory

The study is taking place in two calculus courses during the 2016-17 academic year (Calculus 1, Fall 2016; Calculus II, Spring 2017). The first stage of the project involves participants’ completion of an assessment that measures meanings students form with respect to specific mathematics concepts related to covariation. Items in this instrument were developed by Dr. Patrick Thompson (2016) and his research team through Project Aspire (Mathematical Meanings for Teaching secondary mathematics). This instrument has been designed to assess pre-service and current teachers’ mathematical meanings for teaching secondary mathematics.

The second part of the project consists of administering the same assessment tool at the end of Calculus I to understand whether there have been any changes in students’ meanings. At this time, I will interview students to check my interpretations of their written work and to allow students to elaborate on their responses. Students will also be asked to reflect on any changes in their responses on the two completed assessments. Students who continue to Calculus II will revisit this assessment at the end of the semester in Spring 2017, as the research cycle is repeated. Theoretical lenses used to guide this work include theory of meanings (Thompson, Carlson et al., 2014), as well as the concept of backward transfer of mathematical meanings that may be productive for teaching (Hohensee, 2014).
References

