![ASU School of Mathematical and Statistical Sciences - Arizona State University]

MEMORANDUM

DATE: 05/16/2023

TO: Faculty and Students

FROM: Professor(s)   Patrick Thompson
             Chair/Co-Chairs of   Barbara Villatoro
             Defense for the   PhD   in Mathematics Education
             Committee
             Members   Karen Draney
                                       Kevin Moore
                                       Kyeong-Hah Roh
                                       Marilyn Carlson

DEFENSE ANNOUNCEMENT

Candidate: Barbara Villatoro

Defense Date: June 07, 2023

Defense Time: 11:00 AM

Virtual Meeting Link: https://asu.zoom.us/j/81956646893?pwd=WjFTUXJxNU5hK214bnN3MGdOMVBaZz09

Title: Investigating Student's Systems of Thinking Regarding Graphs of Continuous Functions in Coordinate Planes.

Please share this information with colleagues and other students, especially those studying in similar fields. Faculty and students are encouraged to attend. The defending candidate will give a 40 minute talk, after which the committee members will ask questions. There may be time for questions from those in attendance. But, guests are primarily invited to attend as observers and will be excused when the committee begins its deliberations or if the committee wishes to question the candidate privately.

ABSTRACT
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Authors of calculus texts often include graphs in the text with the intent that the graph help develop the intended meanings of theorems and formulas. Similarly, graphs are often utilized in classroom lectures and discussions for the same purpose. The author or instructor includes the graphs as a tool with the intention of helping to explicate to the student the meanings of the mathematical concepts as intended by the author or instructor. David et al. (2019) showed that students interpreted calculus statements differently based on their understanding of points in the coordinate plane. As a result, students' meanings of graphs influence how they understand the mathematical ideas for which the graph is supposed to aid their understanding. Researchers studying how students understand graphs of continuous functions and coordinate planes have developed many constructs to explain potential aspects of students' thinking about coordinate points, coordinate planes, variation, covariation, and continuous functions. No current research investigates how the different ways of thinking about graphs correlate. In other words, are there some ways of thinking that tend to either occur together or not occur together? In this research, I investigate student's system of meanings to describe how the different ways of understanding coordinate planes, coordinate points, and graphs of functions in the coordinate planes are commonly related in student thinking. In particular, I determine a relationship between students understanding of number lines or coordinate planes containing an infinite collection of numbers and their ability to identify a graph which represents a dynamic situation. Additionally, I determined a relationship between students reasoning with values (instead of shape) and their ability to create a graph to represent a dynamic situation.