# ABSTRACT

STARLING, TINA T. Comparing Discourse in Face-to-Face and Synchronous Online Mathematics Teacher Education: Effects on Prospective Teachers' Development of Knowledge for Teaching Statistics with Technology. (Under the direction of Dr. Hollylynne S. Lee).

This comparative study examined discourse and opportunities for interaction in two mathematics education methods classes, one face-to-face and one synchronous, online. Due to the content taught in the course, this study also sought to determine prospective mathematics teachers' understanding of variability and the role of discourse in each learning environment in developing statistical knowledge for teaching with technology in prospective mathematics teachers.

A qualitative research design was selected to help capture and analyze discourse and developing knowledge about teaching statistics with technology. Participants included forty-two students enrolled in one of two sections of a *Teaching Mathematics with Technology* course at a large public university. Each class was comprised of juniors, seniors, graduate students, and lateral entry students studying middle grades or secondary mathematics education. Three prospective teachers from each class were selected to be members of a focus group. Video recordings of each class session for both groups were collected and were used to analyze discourse opportunities throughout the five-week study. Then, based on questions related to statistical, technological, and pedagogical content, which were identified a priori, six episodes were selected for more detailed analysis of small group and whole group interactions. Each episode was coded line-by-line for direction, form, purpose, and topic of discourse. In addition, each transcript was coded for when and how prospective teachers discussed ideas related to variability, specifically describing distributions, deviation, and the law of large numbers. An external check of coding, along with several sources of

data, helped ensure credibility of the qualitative methods described. Supporting data included a pre-/post-assessment, written assignments, and interviews of focus group members.

A community of inquiry framework, which presents the social, technological, and pedagogical presences that make up an educational experience, was used as the theoretical lens for this study (Garrison, Anderson, & Archer, 2000). Findings indicate that the ways in which prospective teachers and the instructor interacted with one another and discussed notions of variability looked very different between the face-to-face and online environments. This was because in the synchronous, online environment, prospective teachers could interact with one another in a number of ways. They used non-traditional forms of communication such as the chat window and the interactive whiteboard to share ideas and to ask questions.

Despite these differences in how prospective teachers interacted with the instructor and with one another in each group, the substance of what they said about describing distributions, deviation, and the law of large numbers was strikingly similar across settings. Specifically, their usage of informal language was prevalent and comparable as they described center and spread throughout the study. In addition, the ways technology reportedly helped prospective teachers understand standard deviation and least squares regression was especially noticeable. While the ways they described the law of large numbers were also similar, other data pointed to differences in the groups' collective understanding. These differences caused the researcher to then look for ways that discourse affected prospective teachers' developing knowledge of variability and especially the law of large numbers. Factors that may have resulted in some difference in knowledge are technological issues in the online environment, physical distance that may have caused less productive

discussions, less time for whole group and small group discussions, and more independent

work due to time constraints.