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The Effects of Small-Group Discourse in Collective Argumentation on Secondary Students' Mathematical Arguments and Mathematical Identities

ABSTRACT

The development of proofs and argumentation remains a standard for mathematical practices in K-12 education. Further, the use of discourse is considered essential in the learning of mathematical concepts in elementary, middle, and high schools. However, K-12 educators are still confounding how to best utilize student discourse in their classrooms in a way that advances student knowledge in creating valid mathematical arguments. Further, there remains research into the power of student discourse with one another on the impact of students' empowerment and identities as doers of mathematics. In my mixed methods study, I examine the nature of student discourse, particularly in small-group interactions, as they create collective arguments that are based on mathematical evidence. This study will contribute to the research community in understanding how best to connect the standards of mathematical argument and proof development to the practice of student discourse. Further, it will inform K-12 practitioners about the best pedagogical practices to foster such discourse in their classrooms as mathematical learning communities. I will examine the patterns of discourse in these small group discussions to make conclusions on what types of discourse students engage in as they develop more analytical thoughts in creating mathematical proofs and arguments. The impact of interpersonal discourse will lead to further potential research and findings on how to create mathematical learning communities that support student collective argument development, as well as research about the teaching strategies that effectively foster student identity as doers and learners of mathematics. Ultimately, this dissertation will seek to provide insight for mathematics teachers and mathematics teacher educators in supporting student voice in developing higher thinking towards better justification of their mathematical thinking in creating valid mathematical arguments.