Using Digital Video to Explore the Details of Student Talk in the Adult Mathematics Classroom

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An established body of evidence suggests a strong relationship between classroom dialogue and student learning. Despite the growing number of studies of young people in this area, productive dialogue in the adult mathematics classroom is less well understood. Use of video as a methodology offers a promising means to understand the development of adult student's mathematical thinking. This paper explores student participation and learning in an adult algebra classroom. Using videotaped whole-class and small-group discussions in one algebra classroom, I analysed how students engaged with each other's mathematical ideas. The results suggest that attending to the details of student participation is central for understanding productive classroom dialogue and how to promote it.

Introduction

The adult algebra class is astir as eighteen students work on a task based on J.A.H. Hunter's poem, A Tale of the Cats. An iPad captures the instructor as she moves from table to table to support student thinking. Six iPods mounted on desktop tripods record pairs of students as they read and re-read the problem, pose questions, add to an idea, challenge a claim, correct a misconception, and reason about a proposed solution for the mystery of the cats on Algebra Street. The digital video cameras in this classroom produce hours of footage that will help identify and describe how productive dialogue can facilitate the development of adult's mathematical thinking.

Although the study of classroom dialogue dates back four decades (e.g. Howe, C., & Abedin, M., 2013), there is an increased focus on dialogic interaction that promotes student learning (Resnick, Asterhan, & Clarke, 2015; Webb et al., 2019). Especially notable has been the extension of research on student participation to adult mathematics classrooms (e.g. Díez-Palomar, J., 2017). This paper builds upon previous research that shows how attending to the mathematical details of student participation, teacher support of student participation, and classroom settings in which conversations take place is central for understanding productive dialogic interaction and how to promote it in the adult education classroom.

Much previous research has described the benefits of student talk. Explanation and engagement with each other's ideas can deepen a student's own, and their peers', understanding. Students enrich their mathematical understanding through multiple means when interacting with a peer: they construct shared meanings, monitor thinking, address misconceptions, reconcile discrepancies, supplement gaps in understanding, acquire new knowledge, and gain confidence and improve perceptions of mathematical competence while doing so (Bargh & Schul, 1980;

Boaler & Greeno, 2000; Brown, Campione, Webber, & McGilly, 1992; Chi, 2000; Forman & Cazden, 1985; Gresalfi, 2009). Empirical findings from previous studies also suggest that active student participation is beneficial to student learning (e.g. Chinn, O'Donnell, & Jinks, 2000). Notably, researchers have found relationships between giving explanations and learning outcomes (Ing et al., 2015; Veenman et al., 2005); results that suggest students, guided to elaborate their own ideas, demonstrated greater learning outcomes than students without guidance (Gillies, 2004; Mercer et al., 2004).

Paying attention to the details of classroom interaction matters. I examine the role of digital video in facilitating research to investigate 1) the nature of student participation in dialogic interaction—specifically, explaining one's own thinking and engaging with others' ideas—that is most predictive of student learning outcomes, and 2) the nature of teachers' ongoing interaction with students that supports their engagement with each other and the mathematics.

Methods

The sample included one instructor and her students (n = 18) in an adult algebra classroom from a community adult school in a large urban metropolitan area in the United States. The teacher was selected based on her 1) commitment to creating a classroom environment that promotes student participation and 2) her willingness incorporate activities derived from Cognitively Guided Instruction (CGI) to help her attend to the details of students' mathematical thinking (Carpenter, Fennema, Franke, Empson, & Levi, 1999).

I collaborated with the instructor for 14 weeks to modify tasks and support moves to better elicit student's mathematical thinking. For ten observation days during the 2019 spring trimester, I video recorded student-student and student-teacher interaction during the first hour of a 2.5-hour class. Multiple cameras captured all teacher and student interaction in three classroom participation structures: small-group problem solving, whole-class discussion, and turn-and-talk.

In examining student participation, analysis will be based on the application of video coding software to develop and describe profiles of student participation across multiple classroom structures. Coding of student explanations will focus on the level of detail of explanations (fully detailed or partially detailed); coding of student engagement will focus on the extent to which students engaged with each other's ideas (adding onto another's idea or referencing the details of another's idea but not adding on).

Expected Findings

The expected findings will show how attending to mathematical details of student's dialogic interaction and teacher support of student participation are important for understanding classroom interaction and for shaping conclusions about classroom dialogue that is productive for student learning. In addition, coding student participation and teacher practices for each phase of the lesson (whole-class, small group, turn-and-talk) will help to gain a better understanding of the interrelationships between interaction in these contexts.

These outcomes will help instructors of adult education mathematics identify and develop tasks, vary classroom participation structures, and integrate teacher moves that support students to

explain their ideas and engage with their peer's ideas. This study aims to not only improve student learning, but to also explore a potential increase in student retention and achievement.

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