Negotiating the Meaning of Representations in the Mathematics Classroom

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Project Background and Presentation Focus

Multiple representations of mathematical concepts are used in the classroom to access existing conceptions of ideas, build on or challenge developing ideas, and to communicate through traditional and standardized mathematical symbols. Complexities in the dynamic environments of classrooms and the competing and sometimes conflicting meanings students and their teachers assign to representations can obfuscate seamless translation between representations and impact student understandings. This poster presentation illustrates the dynamics of student and teacher negotiation and interpretation of representations present during a four-day series of geometric-based fraction lessons in a fifth grade classroom.

Theoretical Perspectives

Learning mathematics depends partly on the representations that are created, shared, and used as tools of comprehension and communication in the discipline. Most educators support learners in developing and using a repertoire of mathematical representations and foster meaningful discourse in learning environments. Even though representations are standard in mathematical practice, capturing the richness of these multiple and often-complex forms of representation pose special challenges. These forms may differ from the internal, personal, and invented forms of representation on the part of the learner (Meira, 1995; Goldin & Shteingold, 2001). Mathematical discourse has a register that is unique to its users. It is often vague, which challenges those engaging in it to link various referents and develop understanding of the patterns and styles of linguistic communication present in dialogue (Steinbring, et. al., 1998; Cobb et. al., 2000). Developing expertise in the content requires making sense of the math amidst many forms of representations, the social norms of the classroom, and the cues provided in various utterances that link all of these with existing preconceptions and the goals of the task at hand.

Research Questions, Methods, and Findings

Through the analysis of video, teacher notes, student work, and discourse samples, we highlight four ways that representational work in the classroom is shown to be complex for both teachers and students. The analysis: (1) explores the range and dynamics of student interpretations and uses of representations; (2) highlights the "noise" of negotiated, shared understandings around them; (3) identifies the need for reading, interpreting, and moving among representations as being dependent on emergent cues embedded in layers of classroom contexts; and, (4) shows the ways in which the teacher's response to the complexity of work with representations is considered, planned, employed, yet unable to provide clarity. Findings suggest that misunderstandings around representations are not necessarily due to the representation alone. Instead of abandoning specific representations when conflicts arise, the situations may provide critical moments to elucidate important issues in the teaching and learning of mathematics.

References

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