

DISCUSSION GROUP ON MATHEMATICS CLASSROOM DISCOURSE

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This discussion group will investigate the nature and role of discourse in mathematics classrooms. We will analyze, discuss, and interrogate various frameworks for researching the nature and impact of discourse practices in terms of both social and mathematical aspects. We will address related methodological and analytical challenges and consider ways of connecting research with practice. We will structure the sessions around three framing questions relating to theoretical frameworks, analytic techniques, and impact on mathematics education. The first session will begin with multiple analyses of one classroom episode. The second session will build from discussions begun in the first session and will focus on developing future directions for the discussion group and potential writing projects, with the focus on how we might offer a unique contribution.

Rationale for Discussion Group on Mathematics Classroom Discourse

This discussion group will investigate the nature and role of discourse in mathematics classrooms. We will analyze, discuss, and interrogate various frameworks for researching the nature and impact of discourse practices in terms of both social and mathematical aspects. We will address related methodological and analytical challenges and consider ways of connecting research with practice.

The NCTM *Standards* documents (1991, 2000) stress the role of discourse in the learning and teaching of mathematics, yet the mathematics education research community has far to go in its attempt to understand many aspects of discourse (Steinbring, Bussi, & Sierpinska, 1998). Furthermore, there is evidence that discourse practices have not changed much in the last two decades (Spillane & Zeuli, 1999; Stigler & Hiebert, 1999) and there is little evidence of the connection between the nature of discourse practices and mathematics achievement (Steinbring et al., 1998).

In addition to the need for extending present scholarship relating to mathematics classroom discourse, we need to develop more analytic tools that are specifically geared toward *mathematics* classrooms. While we can learn much about the social order of mathematics classrooms using tools developed by discourse analysts, these tools do not take into consideration the specific mathematical content of the conversations taking place (Steinbring et al., 1998). Additionally, issues associated with social class, gender, and race are rarely examined in discourse studies in mathematics classrooms. Focusing discourse studies on inequities can

help us understand the range of language use and interaction patterns students bring to mathematics learning and illuminate issues of authority and power (Atweh, Bleicher, & Cooper, 1998; Herbel-Eisenmann, 2003; Herbst, 1997; Zevenbergen, 2001).

From a practical perspective, research has shown that mathematics teachers' discourse patterns are quite traditional, including those of teachers who are attempting to change their classroom practices (Cohen, 1990; Herbel-Eisenmann, Lubienski, & Id Deen, 2004; Spillane & Zeuli, 1999) and a broader sample of mathematics teachers in the US (Stigler & Hiebert, 1999). This is important given that the reform movement in North American mathematics education has made some particular demands on teachers.

The *Standards* recommend that teachers orchestrate classroom discourse to provide a context "where students learn to mathematize situations, communicate about these situations, and use resources for mathematizing and communicating" (Moschkovich, 2002, p. 197). In order to orchestrate discourse, teachers will need to have strong pedagogical content knowledge (O'Connor & Michaels, 1996), will need to balance social and mathematical tensions, and must decide which student explanations from which to build discussion (Sherin, 2002). Similarly, demands are also made of students. For example, students are expected to take on more responsibility for their learning, posing questions, explaining their thinking, and offering their own ideas about mathematics (Hufferd-Ackles, Fuson, & Sherin, 2004). Forman, McCormick and Donato (1998) state that "new forms of instruction include more active participation of students in providing explanations, conducting arguments, and reflecting on and clarifying their thinking" (pp. 313-314).

Researchers have used various theoretical perspectives to investigate the nature and role of discourse in the learning of mathematics. For example, O'Connor and Michaels (1996), employing a sociolinguistic analysis, document how the use of linguistic moves termed *revoicing* created participant frameworks which positioned students as producers and evaluators of mathematical ideas. Voigt (1996) uses an interactionist approach as a way to connect the analysis of the individual and collective components of discourse. Forman (1996) discusses the implications of employing a sociocultural framework to analyze classroom discourse. She elaborates on how the concepts of legitimate peripheral participation, activity setting, and instructional conversation can be used to understand mathematics reform.

Format for Discussion Group

This discussion group will structure the conference sessions around three guiding questions. These questions are intended to encompass overarching issues for the study of discourse in mathematics classrooms. Research presentations and ensuing discussions will focus on addressing the three questions:

- 1 What theoretical frameworks might be used to study classroom discourse in demographically diverse settings?
- 2 What are the specific mathematical characteristics of discourse, and how do our analytic techniques account for these characteristics?
- 3 How can the study of discourse help us understand and transform the teaching and learning of mathematics?

The initial session will consist of the analysis of a videotaped classroom episode, from a set of videocases and commentaries of a middle school mathematics class (algebra) developed by Jo Boaler and Cathy Humphreys (Boaler & Humphreys, 2005). In this session, three researchers will analyze and discuss the episode, each using a different framework to address the three

questions. The ensuing discussion will focus on the constraints and affordances of each perspective.

The second session will focus on: (1) discussions emanating from the first session; (2) readings selected by the organizers, which attempt to synthesize the research on discourse (e.g., Cazden, 2001; Lampert & Cobb, 2003) or present an international perspective (e.g., Setati & Adler, 2000); and (3) developing future directions for the discussion group and potential writing projects, with the focus on how we might offer a unique contribution.

References

- Atweh, B., Bleicher, R. E., & Cooper, T. J. (1998). The construction of the social context of mathematics classrooms: A sociolinguistic analysis. *Journal for Research in Mathematics Education*, 29(1), 63-82.
- Cazden, C. (2001). *Classroom discourse: The language of teaching and learning*, 2nd edition. Portsmouth: Heinemann.
- Cohen, D. K. (1990). A revolution in one classroom: The case of Mrs. Oublier. *Educational Evaluation and Policy Analysis*, 12(3), 311-329.
- Forman, E. A. (1996). Learning mathematics as participation in classroom practice: Implications for sociocultural theory for educational reform. In L. P. Steffe, P. Nesher, P. Cobb, G. A. Goldin & B. Greer (Eds.), *Theories of mathematical learning* (pp. 115-130). Mahwah, NJ: Lawrence Erlbaum Associates.
- Forman, E. A., McCormick, D. E., & Donato, R. (1998). Learning what counts as a mathematical explanation. *Linguistics and Education*, 9(4), 313-339.
- Herbel-Eisenmann, B. A. (2003). *Refining the "norms" lens: Examining the macro- and the micro- influences in mathematics education literature*. Paper presented at the NCTM Research Presession, San Antonio, TX.
- Herbel-Eisenmann, B. A., Lubienski, S. T., & Id Deen, L. (2004). *One teacher, two curricula: How and why does her pedagogy vary?* Paper presented at the PME-NA XXVI, Toronto, Ontario.
- Herbst, P. G. (1997). *Effectiveness of a strategy as a sociomathematical norm*. Paper presented at the International Group for the Psychology of Mathematics Education, Lahti, Finland.
- Hufferd-Ackles, K., Fuson, K. C., & Sherin, M. G. (2004). Describing levels and components of a math-talk community. *Journal for Research in Mathematics Education*, 35(2), 81-116.
- Lampert, M., & Cobb, P. (2003). Communication and language. In J. Kilpatrick, W. G. Martin & D. Schifter (Eds.), *A research companion to Principles and Standards for School Mathematics* (pp. 237-249). Reston: NCTM.
- Moschkovich, J. (2002). A situated and sociocultural perspective on bilingual mathematics learners. *Mathematical Thinking and Learning*, 4(2&3), 189-212.
- NCTM. (1991). *Professional standards for teaching mathematics*. Reston, VA: Author.
- NCTM. (2000). *Principles and standards for school mathematics*. Reston, VA: Author.
- O'Connor, M. C., & Michaels, S. (1996). Shifting participant frameworks: orchestrating thinking practices in group discussion. In D. Hicks (Ed.), *Discourse, learning, and schooling* (pp. 63-103). Cambridge: Cambridge University Press.
- Setati, M., & Adler, J. (2000). Between languages and discourses: Language practices in primary multilingual mathematics classrooms in South Africa. *Educational Studies in Mathematics*, 43, 243-269.

- Sherin, M. G. (2002). A balancing act: Developing a discourse community in a mathematics classroom. *Journal of Mathematics Teacher Education*, 5, 205-233.
- Spillane, J. P., & Zeuli, J. S. (1999). Reform and teaching: Exploring patterns of practice in the context of national and state mathematics reforms. *Educational Evaluation and Policy Analysis*, 2(1), 1-27.
- Steinbring, H., Bussi, M. G. B., & Sierpinska, A. (Eds.). (1998). *Language and communication in the mathematics classroom*. Reston, VA: NCTM.
- Stigler, J. W., & Hiebert, J. (1999). *The teaching gap*. New York: The Free Press.
- Voigt, J. (1996). Negotiation of mathematical meaning in classroom processes: Social interaction and learning mathematics. In L. P. Steffe, P. Nesher, P. Cobb, G. A. Goldin & B. Greer (Eds.), *Theories of mathematical learning* (pp. 21-50). Mahwah, NJ: Lawrence Erlbaum Associates.
- Zevenbergen, R. (2001). Mathematics, social class, and linguistic capital: An analysis of mathematics classroom interactions. In B. Atweh, H. J. Forgasz & B. Nebres (Eds.), *Sociocultural research on mathematics education* (pp. 201-215). Mahwah, NJ: Lawrence Erlbaum Associates.