REVISITING DISCOURSE AS AN INSTRUCTIONAL RESOURCE: PRACTICES THAT CREATE SPACES FOR LEARNING AND STUDENT CONTRIBUTIONS

Lynn Liao Hodge*, Qing Zhao, Jana Visnovska, and Paul Cobb
The University of Tennessee*, Vanderbilt University

In this paper, we revisit the overall idea of classroom discourse as an instructional resource. We take the perspective of access in describing how discourse can create opportunities for students to learn important concepts and to share their ideas as part of the legitimate and sanctioned space of the classroom. We provide illustrations from a middle grades class in order to investigate how discourse can be drawn upon to advance the instructional agenda and to support students in experiencing voice in class.

INTRODUCTION

Today, mathematics teachers are faced with challenging decisions regarding the kinds of resources on which they will draw in developing lessons and teaching particular concepts. The focus of this paper is on one resource that is often under utilized in mathematics classrooms. This resource is the discourse – conversations and discussions – that develops in a class. The idea of discourse is not a new one. Reform recommendations (NCTM Standards, 1989; 1991; 2000) have emphasized the importance of discourse to all mathematics classrooms. The first Standards documents (1989) defined discourse in this way:

Discourse refers to the ways of representing, thinking, talking, and agreeing and disagreeing that teachers and students use to engage in those tasks. The discourse embeds fundamental values about knowledge and authority. Its nature is reflected in what makes an answer right and what counts as legitimate mathematical activity, argument, and thinking. Teachers, through the ways in which they orchestrate discourse, convey messages about whose knowledge and ways of thinking and knowing are valued, who is considered about to contribute, and who has status in the group. (p. 20)

This definition implies that on one hand discourse has to do with the moment-to-moment interactions and conversations in mathematics class. On the other hand, discourse importantly reflects values and status within a class. The Standards have drawn attention to the critical role that discourse plays in mathematical learning as well as how discourse pervades every aspect of the classroom. Many scholars have described classroom discourse as an instructional resource for teachers and students, and in doing so have documented how it might play out in particular classrooms (Cobb, 2000; Gutierrez et al., 1999; Lampert, 1990; Thompson, Philipp et al. 1994). Building on previous researchers, our purpose in this paper is to illustrate how particular discourse practices can serve as resources in responding to all learners in a mathematics class. We take the perspective of access and provide illustrations from a middle school statistics project in order to examine

the kinds of practices that have the potential to create opportunities for all students to gain access to more positive views of their mathematical learning.

ACCESS, DISCOURSE, AND LEARNING MATHEMATICS

In this paper, we take the perspective that particular classroom practices can create access to substantial learning and a sense of value in learning mathematics (Nasir & Cobb, 2002). In this view, aspects of the classroom social context are seen as supporting (or delimiting) students’ opportunities to engage meaningfully with the discipline. Students’ orientations toward learning mathematics can then be seen to stem from the arrangement of lessons and the participation structure that come to define life in classrooms. This perspective calls attention to how instructional practices can create spaces that give students opportunities to share their ideas, have their ideas valued, and at the same time learning important ideas.

Research in math education has emphasized how classroom discourse can afford students access to mathematical ideas and task interpretations (Cobb, 2000; Lampert, 1990) as well as a better understanding of the real world contexts that are presented in instructional tasks (Boaler, 2002). However, the issue of how discourse can provide access to more positive orientations towards learning math has not been investigated as fully. Gutierrez and her colleagues show the significance of examining discourse practices in such a way.

In their analysis, Gutierrez, Baquedano-Lopez, and Tejeda (1999) draw attention to a third discursive space in an elementary class that sheds light on how discourse can support students’ access to an affiliation with learning in particular classrooms. Gutierrez et al. analyze literacy practices of an immersion Spanish elementary school class and illustrate the notion of a third space that can emerge in discourse. In their ethnographic study, Gutierrez et al. define the official space of the classroom as consisting of the sanctioned, legitimate ways of participating in classroom discourse while the unofficial space includes students’ ways of participating that do not comply with the teacher’s view of appropriate participation. For example, Gutierrez et al. describe how students often engage in a counter narrative within the unofficial space of the classroom through practices such as giggling about sensitive topics, using colloquialisms, and using home and local knowledge in their comments. They describe how the classroom teacher included students’ comments as part of discussions and in doing so sanctioned them as legitimate aspects of the classroom. Their analysis raises explicitly the central issue of how such practices, as guided by the teacher, can create access to experiences of voice in class while simultaneously advancing the instructional agenda in mathematics classroom.

The relationship between students’ experiences of voice and their developing sense of affiliation with classroom learning hinges on Wenger’s (1998) notion of field of negotiability. This idea refers to the realm over which students perceive themselves to have control in the classroom. This field of negotiability relates to students’ perceptions of the extent to which they can contribute to the ideas that matter in the classroom. In practice, contributing to the ideas that matter in the mathematics classroom may involve making decisions about the legitimacy of task interpretations and the relative efficiency
and sophistication of the methods used in approaching problems. Students who have an expansive field of negotiability view themselves to have significant roles in the classroom in justifying interpretations and conjectures. They do not confine decision making about the mathematical content to the role of the teacher. Students with restrictive fields of negotiability view themselves as having little voice or involvement in such decisions in the classroom. More often, they view the teacher and the textbook as having intellectual authority, not students. Of significance is that Wenger describes how changes in field of negotiability have the most profound impact on students’ identification and affiliation with a community of practice in the long term (1998). Therefore, isolated classroom experiences that contribute to more expansive fields of negotiability can build and place students on a trajectory toward growing affiliation with mathematics.

BACKGROUND

In the middle-school class we studied, students participated in a statistics project that focused on supporting their understanding of statistical data analysis (Cobb, McClain, & Gravemeijer, 2003). A member of the research team served as the teacher in the project that spanned two years. Twenty-nine seventh-grade students participated in the project for the first year that took place over a twelve-week period and involved 34 classroom sessions of approximately 40 minutes in length. The following school year, a smaller contingent of students from the same class (now eighth graders) participated in a fourteen-week project continuation involving 41 classroom sessions of 40 minutes. This second year of the project addressed students’ understanding of bivariate data.

Both field notes and videorecordings of all classroom sessions were collected during the project.

During the second year, we conducted interviews with students to examine their perspective on their learning in the class. An analysis of the interview data indicated that, for the most part, students came to value their experiences and learning in the class (Cobb, Hodge, Visnovska, & Zhao, submitted). The findings from this analysis prompted us to return to the data of classroom videorecordings and field notes. We examined the data systematically in order to identify classroom practices that contributed to the students’ affiliation with the type of mathematical learning that became constituted in the classroom.

DATA ANALYSIS

We analysed the classroom data by drawing on methods outlined by Glaser & Strauss (1967). Our analysis involved multiple overlapping phases. First, we moved through field notes and videorecordings in order to identify critical sessions in which aspects of discourse or instructional practices seemed to contribute to students’ participation in whole-class discussions. We were interested in situations in which students’ contributions became significant topics of conversation. Additionally, we were interested in situations in which students might have perceived themselves to be silenced. We examined moments in discussions in which students’ seemingly unrelated comments emerged and how they played out in interaction. Second, we
examined data across sessions at a meta-level in order to identify discursive practices that were consistent or that changed over time, noting their implications for students’ participation. In both these phases, we focused on the opportunities that classroom discourse created for discussing important ideas and for students’ participation in these discussions.

THE ROLE OF INTRODUCTORY DISCUSSIONS

We confine our illustrations from the middle grades class to whole-class discussions that introduced instructional activities. The rationale for our focus has to do with the important role of introductory discussions in the statistics project. The teacher drew on discussions to introduce instructional tasks to students and to develop their interest in the issue to be investigated. These discussions provided students with reasons to analyse specific datasets. We should mention that, overall, instructional tasks in the statistics project were designed to capture the authentic investigative spirit of analyzing data. As part of this effort, students were invited to analyze data that served the purpose of answering questions that were relevant from their perspective. Most of the instructional tasks involved comparing two data sets in order to make a decision or judgment (e.g., determining whether installing airbags in cars does have an impact on automobile safety or investigating the effectiveness of two Aids treatments on raising T-cell counts).

In the course of these introductory discussions, which were often times quite lengthy, the teacher and students together delineated the particular issue under investigation, clarified its significance, identified relevant aspects of the issue that should be measured, and considered how they might be measured. In this way, the introductory discussion served to clarify aspects of the problem context and their relationship to the question at hand. At the same time, the introductory discussion also created opportunities for students to understand the relevance of the issues presented in the tasks. Following the introductory discussion, the teacher then introduced the data as having been generated by a systematic process and the students conducted their analyses individually or in small groups. The final phase of an instructional activity consisted of a whole-class discussion of the students’ analyses.

INCLUDING STUDENTS’ CONTRIBUTIONS

One of the challenges that Gutierrez et al.’s (1999) work has indicated is how to include students in discussions while at the same time addressing important ideas (Ball, 1993). In moment-to-moment interactions, it is often difficult to make decisions quickly about how to include students’ comments in such a way as to move in the direction of goals for a particular lesson, and additionally, how to respond to students’ seemingly extraneous comments. We address both sides of this coin as we examine illustrations from the introductory discussions: Including and treating students’ ideas as valued aspects of whole-class discussion and drawing on students’ contributions strategically to advance the instructional agenda. As we discuss this tension, we emphasize one practice that supported students’ access to mathematical learning in class.
From the description we have given thus far, we hope to be clear that the introductory discussions are quite different from teacher explanations of the directions students are to follow as they solve problems. These discussions involve making the activity or problems “come to life” for students by having students contribute to the construction of contexts and issues within the classroom. These introductory discussions can be described in terms of various phases that clarify:

- The overall problem or broader issue
- The significance of the problem to particular audiences
- The students’ job in working on the problem and specific products that will result
- The different aspects of the problem to consider

During many introductory discussions that occurred in the initial stages of the project, many of the students’ shared personal experiences that related to the overall topic of the problem (e.g. batteries; braking distances and automobile safety but not to the specifics of data to compare the two makes of cars). The following comment is an example of the personal comments that students would make during that time:

K: They have a commercial where it’s like a big long line and they have the tires and says this is what happens when the tire like stops. And showing how fast it takes to go from 60 to 0.

Teacher: Yeah as opposed to 0 to 60. Usually, yeah, usually the cars that, you know, the sports cars say from 0 to 60 in you know so many seconds. They don’t talk a whole lot about from 60 to 0 which is pretty important when you have to stop.

As the discussion continued, students made similar comments:

Gary: When my sister was taking her driving test, I used to watch her videos along with her. And they said on an icy road it could take a car 275 feet to stop.

Teacher: To stop. That’s exactly correct. Because it just starts sliding. There’s just nothing for the wheels to grab hold of.

In the early stages of the project, the teacher revoiced (O’Conner & Michaels, 1996) students’ personal comments and included them as a part of the ongoing discussion. In revoicing, the teacher drew attention to different aspects of the problem situation and the issue the students would be asked to investigate. Her intent in including students’ comments and supporting their participation was to cultivate their interest in the issue that the problem presented. In doing so, she supported a space in which students could share ideas as part of the teacher’s goals of clarifying the problem context. We conjecture that this practice of building on students’ comments may have contributed to students’ interest in investigating the issue through data analysis. Additionally, we speculate that this practice placed students on a path in experiencing more expansive fields of negotiability within the context of the class. We note that this illustration offers only a glimpse of a lengthy process that occurred during the project.

As the project continued, the teacher became less accepting of such comments and she and the students together coined a term, “random comments,” to label comments that did not
relate to the problem at hand. These personal comments became increasingly rare, and students who made these comments were typically challenged by the teacher and in some cases, other students. This explicit attention to talking about classroom discourse emphasizes the idea of students as decision makers and resources for their own learning. From the perspective of access, the practice of building on students’ comments toward the instructional agenda, provided opportunities to share their ideas and possibly view their ideas as part of the sanctioned and legitimate space of the class. This shift required that the students have a sense of what the relevant aspects of the problem task included. Additionally, this treatment of random comments created opportunities for students to reflect on their own participation and more generally on the nature of conversations.

STUDENTS’ CONTRIBUTIONS AS RESOURCES

Students’ contributions in introductory discussions can be viewed as reflecting student engagement and participation, and potentially more positive orientations, in the long term, about mathematical learning. At the same time, we would emphasize, students’ contributions served to advance the agenda of introductory discussions. They were used as resources by the teacher to create involve the students in co-constructing the problem context, and thereby providing many students with access to the task and their purpose in analyzing related datasets. As an illustration of the role of student contributions in constructing the problem context, consider a task that occurred in the latter half of the first year of the project in which students were to assess the effectiveness of installing airbags in cars. The teacher initiated this discussion by asking the students if they had seen television commercials that show crash test dummies being used to test the safety of cars. In opening the discussion with a non-mathematical question, she offered students a way “in” to the conversation. From there, she then presented a brief introduction of the overall issue of car safety testing. Drawing on a student’s question, she then focused the discussion specifically on the effectiveness of airbags, the issue that the students were to investigate. She was able to create a space for students’ contributions to be legitimate and for important topics, relevant to the task, to become topics of conversation.

Dan: What are we trying to find out?
Teacher: How do you think people made this decision about it, to put airbags in cars?
Rob?
Rob: A lot of people were getting in wrecks.
Teacher: How do you make a decision about whether or not to have an airbag in the car or not? How would you make that decision? Tyler?
Tyler: You’d find out the safety of the car. You put a crash dummy in there and you see if he hits his head on the dashboard or the steering wheel or whatever.

The previous excerpt offers a glimpse of how students’ comments were used to support care safety to become an explicit topic of conversation and, more generally, the role of students’ contributions in introductory discussions. As illustrated in this brief exchange, the teacher, through discourse, was able to provide opportunities for students to share their ideas, but at the same time drew on these comments to bring out relevant pieces of the
problem. In such discussions, the students were then encouraged to anticipate information that would be necessary to investigate the question at hand. This provided students with situations in which they would have to assess the appropriateness of their own comments and that of others. In this case, this information included the nature of the data to be collected that would be necessary to convince people to install airbags in cars.

Later in the discussion, the teacher introduced data from crash tests conducted on all models of new cars available in the United States in 1993, some of which were not fitted with airbags.

Teacher: These are the cars that were manufactured in 1993. These are the cars that had airbags (points to one of the data sets) and these are the ones that did not have airbags in them (points to the second data sets). And those are the results of the crash test, just looking at head injuries and trying to make a decision about airbags. Wes?

Wes: What about the rest of the bodies?

Teacher: No, they were just, the primary function of an airbag is to prevent head injuries so that’s what they were focusing on that. Good question. Rob?

Rob: How could they know how severe the head injury was if they were dummies?

Teacher: They put sensors in the dummies that could register the impact of what’s happening to them in there and slow motion cameras that watch it.

In the previous exchange, students’ contributions (in this case their clarifying questions) were included to construct more fully the problem context. The students’ and teacher’s comments about measuring injuries suffered in car accidents together made the overall context and issue more accessible to the class. More importantly, by introducing the data that the students were to analyze as generated through a systematic process, the teacher and students co-constructed the meaning of the numbers in data sets with regard to the phenomenon to be investigated. As a consequence, the mathematical aspects of following whole-class discussions about the students’ analyses of the data were made more accessible to students. The introductory discussions can then be viewed as serving the dual purposes of both making the problem context come to life and constructing meaning for the numbers presented in data sets. Therefore, students’ contributions were drawn upon as resources in making the phenomenon and the mathematical ideas of problem tasks accessible to the classroom community.

DISCUSSION

In this paper, we have described classroom discourse as an instructional resource for supporting students’ access to important ideas and to more positive views toward mathematics learning. We have described a central challenge to teaching, that of advancing the instructional agenda and including students’ ideas as aspects of the legitimate and sanctioned space of mathematics class and how this challenge played out in one instance in a middle grades class. In navigating this tension, we have illustrated a shift in responsibility to include students in making decisions about relevancy and appropriateness in whole-class discussion. The classroom discourse we have described is significant in that it stresses the importance of creating opportunities
for students to share their ideas and experience their ideas as valued. However, it is also important to create situations for students to understand what constitutes relevancy and the purpose for engaging in specific activities in mathematics class.

References


