Talking Past One Another: Looking for Signs of Conversational Mismatch in One 6th grade Science Classroom

Mon-Lin Monica Ko, Learning Sciences Res. Institute, U. of Illinois–Chicago, mlko@uic.edu
Andrew Elby, College of Education, University of Maryland, elby@umd.edu

Abstract: This study analyzes two days of middle school science sensemaking conversations to argue for the existence and explanatory power of *conversational mismatch*, an interactional achievement in which students and their teacher seem to be "on the same page" about the nature of their classroom discourse, but the students' framing and teacher's framing of the classroom activity differ in subtle ways—a misalignment they don't notice until later. Conversational mismatches, we contend, arise in part from tensions between instructional goals of fostering students' engagement in authentic scientific sensemaking and guiding them toward particular understandings of pre-determined concepts and models.

Introduction: Shared vs. discordant framing in classroom discussions

Recent U.S. science education reforms emphasize the importance of classroom talk for developing and refining scientific knowledge (e.g. NGSS Lead States, 2013). Productive classroom discourse relies on participants "being on the same page" about the nature of the classroom activity (van Zee & Minstrell, 1997), which relies on the development of shared norms and routines. Researchers have used conversation and framing analysis to analyze where and how classroom participants get and stay on the same page, and what that page *is* (Berland & Hammer, 2012; Hutchison & Hammer, 2010). In this study, we use the same analytic tools to examine talk that preceded a moment of discord similar to the one documented by Berland and Hammer (2012), where students resist the teacher's bid to shift the classroom activity— a charged exchange we'll call the *explosion*. While our initial analysis of the pre-explosion frame negotiations revealed smoothness in the conversation, we also found evidence of unrealized mismatches in expectations that only became apparent upon the explosion. We conclude by posing methodological and theoretical questions emerging from our analysis, and by discussing implications of *conversational mismatch* for teachers and teacher educators.

Curriculum, classroom context, and focal lesson

Our data come from a 6th grade classroom in the United States using *IQWST*, a curriculum which emphasizes sense-making discussions (Krajcik et al., 2011). During a larger study of teachers' enactment of the same IQWST lessons, we observed an explosive event at the end of a lesson that was designed to help students explain the 'disappearance' of certain components of white light when passing through filters. Prior to the explosion, students discussed patterns in their observations and tried to make sense of *what happened* to those missing colors.

Retrospective analysis

We developed two alternative hypotheses about what led to the Explosion. One is that Ms. J and her students were "on the same page" throughout the discussion, but Ms. J's attempts to steer the class toward consensus led to the disagreement—just like the "explosion" in Berland & Hammer (2012). A second hypothesis is that tacit discord existed throughout the lesson; Ms. J and the students were never fully on the same page. By this account, Ms. J and her students interpreted one another's utterances in ways that convinced them they were "in sync," whereas they were actually framing the discussion in subtly different ways. The explosion occurred when the subtle framing misalignment came fully into view; what counted as explanatory (and hence conversational) closure for Ms. J different from what the students sought in an explanation.

Drawing on both frame and conversational analysis (Goffman, 1986; Pomerantz &Fehr, 1997), we engaged in two rounds of retrospective analysis to identify evidence for both hypotheses. For hypothesis 1, we looked for evidence of "smooth" conversation—bids taken up, conversational repairs quickly offered and taken up, shared expectations about what kinds of responses are appropriate, and so on. For hypothesis 2, we knew from the explosion to look for subtle differences in the epistemological component of framing (Hammer et al., 2005). We engaged in several rounds of review of one another's identified evidence and vetted them looking for confirming and disconfirming evidence. We returned to the classroom video to re-examine tone, inflection, and body language by the teachers and students at particular moments.

Findings

We found evidence to support both hypotheses, with neither set of evidence outweighing the other. Throughout the lessons, the students and teachers appeared to maintain a shared framing of the classroom activity as a discussion of students' ideas, as evidenced by smooth turn-taking (or crosstalk reflecting excitement), taken-up bids for changes in expectations about students' responses (towards more explanation), but with student ideas always valued and foregrounded. Given this evidence, we would have concluded that Ms. J and the students were "on the same page"—if the explosion hadn't prodded us to revisit. However, by focusing on epistemological aspects of how Ms. J and the students were framing the classroom activity, we found evidence for two related misalignments. One was different expectations about which pockets of knowledge the students' explanations should privilege. The students recruited diverse intellectual resources, such as their understanding of color and color mixing. Other students drew on analogies, drawing parallels between the demonstration and a *filter system*, while others relied on the consensus model they constructed earlier in the unit, using words like *absorb*, *transmit* and *reflect* to describe what happened. Ms. J, however, privileged the consensus model. For instance, when one student said the missing colors became invisible and disappeared, Ms. J countered *light cannot disappear*: according to their previous model, light could only reflect, transmit through, or get absorbed. Ms. J repeated her bid for students to use (only) the model, in both day 1 and day 2, indicating that students weren't stably taking up this bid; they continued using pockets of knowledge including but not limited to the consensus model.

Implications for teaching and teacher education

In classrooms where teachers foster students' engagement in authentic science practices while also "covering" pre-determined concepts, —teachers will likely face tensions between (i) facilitating scientific sense-making, which can lead to incorrect explanations, and (ii) guiding students toward the targeted concepts/models (Hammer, 1997). If the teacher's guidance is gentle, a conversational mismatch like the one in Ms. J's classroom can occur; students may frame the activity as *brainstorming/debating mechanistic explanations* while the teacher may frame it as something more like *using science practices to figure out the concepts/model*, especially when time pressure builds. The mismatch could go unrecognized for a while, as in Ms. J's class, because the students and teacher share a broader shared framing of the activity as a *sense-making discussion*.

Ms. J's classroom illustrates, conversational mismatches, once discovered, can lead to negative affect. So, when teachers need to start guiding students toward "correct" ideas, they might consider announcing this shift, explicitly distinguishing *using science practices to figure out the concepts/model* from a more free-form *brainstorming and/or debating mechanistic explanations*. Of course, this move could shut students down. We think it is worth studying whether and how teachers can help students sustain their sense-making even when the students know they are being guided. We also urge studies of ways in which examples such as Ms. J's class could therefore be used in professional development to introduce teachers to *conversational mismatch*, with the goal of helping teachers make more conscious decisions about when and how to shift classroom discussions.

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