SITUATING REVOICING WITHIN BROADER TASK AND SOCIAL STRUCTURES

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This article explores how situating the linguistic move of revoicing within broader structures helps to explain why researchers and practitioners attribute a variety of forms and functions to revoicing, and shows how revoicing may be described as consisting of and situated within a broader set of discourse structures that represent a continuum with respect to positioning students in epistemic roles. We present analysis from classrooms of three teachers enacting the same task in both small group and whole class activity structures. The results show how revoicing took on a variety of functions within longer exchange sequences, which themselves functioned to position students as active contributors and as participants in mathematical discourse practices. The implications are that broader exchange sequences can provide the functionality that O'Connor and Michaels attributed to revoicing.

Keywords: Classroom Discourse; Teacher Practices; Positioning

Revoicing has become part of the lexicon in mathematics education since O'Connor and Michaels (1993, 1996) introduced the idea. They contended that teachers' use of revoicing created *participant structures* in which students took on serious intellectual roles with respect to mathematical argumentation (Foreman, 2003). Subsequently there has been considerable research that has focused on the various forms and functions of revoicing (Enyedy et al., 2008; Foreman et al., 2008; Moschkovich, 1999) and on the ways practitioners perceive the form and function in their classroom practice (Herbel-Eisenmann, Drake, & Cirillo, 2009). Notably, revoicing is not simply seen as creating opportunities to engage students in argumentation (Foreman, 2003) but also to create opportunities for typically marginalized students to participate in complex and valued mathematical discourse practices (Enyedy et al., 2008; Moschkovich, 1999).

A theme that has emerged from the research on revoicing is the multiplicity of forms and functions evident in practice, with Enyedy et al. (2008) identifying at least seven functions and the teachers in the Herbel-Eisenmann et al. (2009) study identifying 25 potential intended and unintended functions. These findings point to potential pitfalls of looking at a single instructional move in isolation of broader task, activity, and discourse structures: characterizing any instructional practice may portray a sense of clarity that rarely exists in practice, with consequences for how such practices are presented to and taken up by practitioners. Consequently, it is necessary to situate any discussion of revoicing (or any other instructional move) within broader chronological, instructional, and discursive structures, particularly those that contribute to the development of participant structures in which students take on serious epistemic roles (i.e., student contributions drive the development of mathematical content).

In this paper, we present analyses from classrooms of three teachers in order to show how situating revoicing within broader structures helps to portray why researchers and practitioners attribute a variety of forms or functions to revoicing, and to show how revoicing may be described as situated within a broader set of discourse structures that represent a continuum with respect to positioning students in epistemic roles. For example, moves characterized as revoicing may: serve as an extension of teacher-controlled forms of discourse (e.g., IRE-dominated exchanges) in which the teacher 'hijacks' a students' explanation to launch into a related explanation; or resemble *animation* in which the teacher narrates students' actions and explanations, squarely attributing the explanation to the students; or constitute a brief clarifying move to get students to elaborate and refine their explanations. These moves focus the discussion on students' contributions, but differ according to how the primary responsibility for explaining the mathematics shifts among the participants. These examples differ with respect to both form and to their location in longer exchanges.

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We explore what we see as the primary function of revoicing relative to more constrained forms of discourse (IRE), which is to help students see themselves as knowers and doers of mathematics by creating spaces for students' contributions to serve as the focus of classroom discourse and as the primary mechanisms by which mathematical content is developed. We explore how the various shades of revoicing affect this primary functionality. We also explore moves that, in conjunction with revoicing, place the responsibility for mathematical explanations (i.e., the *work* of mathematics classrooms) almost fully on students.

In this study, we address the following research questions:

1. How do exchange sequences—broader than revoicing—influence the social task structure (i.e., position students as active contributors and participants in mathematical discourse)?
2. How do exchange sequences—broader than revoicing—develop the mathematical goals of the lesson (i.e., the academic task structure)?

Defining Revoicing

Revoicing involves a dual function of creating a social task structure (positioning students as active contributors to the development of mathematical ideas) and an academic task structure (positioning students' contributions with respect to academic content) (O'Connor & Michaels, 1993). When describing a teachers' revoicing move, O'Connor and Michaels stated:

> What [the teacher] is doing here is creating a participant framework in which (a) she herself has taken the opportunity to draw a further inference from [Student A's] utterance; and (b) [Student A] has the right to validate [the teacher's] inference and, thus, take on a position himself with respect to an aspect of the current academic task …; and (c) [Student A] has been positioned in opposition to [Student B] in an activity that involves discussion of the relative merits of two proposals. (p. 322)

Typically revoicing involves (1) rephrasing or rebroadcasting a student explanation, (2) attributing intellectual contributions to the student, and (3) checking back with the student to see if the teacher described the explanation accurately. Performing these actions puts the teacher "on relatively equal footing" with the student (p. 324) and allows the student to "challenge or affirm" any claim attributed to him. In terms of the social task structure, this allows the teacher to "induct students into a discourse community, by getting them to adopt roles in the ongoing thinking practices that she wishes them to develop" (p. 325). In effect, revoicing coordinates the academic and social task structures.

Methods

We employed discourse analysis techniques to study three teachers enacting the same task in both small group and whole class activity structures. The three teachers were selected because they displayed distinct patterns in their discursive routines and because we had data of their enactments of the same instructional sequence, providing a common mathematical and curricular context. We characterized the teachers' discourse practices in terms of the extent to which they engaged in *accountable talk* (Michaels, O'Connor, & Resnick, 2008) as operationalized in the Instructional Quality Assessment Toolkit (Boston & Wolf, 2006). Accountable talk involves discourse practices that facilitate the development of participant structures that position students in substantive epistemic roles, and includes revoicing as one of a broader set of discourse moves. Other accountable talk moves include pressing for accuracy or pressing for reasoning. We also documented occurrences of the IRE discourse pattern and similarly monologic practices (Lemke, 1990; Nystrand, 1997)—such as extensive teacher explanation and direction—that were evident. We then situated the revoicing moves for how they functioned within the broader academic and task structures by considering their functionality in the immediate turns surrounding the move and within longer interactional patterns.

The teachers were observed enacting *Comparing and Scaling* from CMP, which focuses on helping students develop methods for comparing quantities using multiple strategies, including fractions, ratios, and percents. The task that is the focus of this analysis is the *Orange Juice* task, in which students were

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given four water/concentrate mixtures (e.g., 2 cups concentrate to 3 cups water, 5 cups concentrate to 9 cups water, 1 cup concentrate to 2 cups water, and 3 cups concentrate to 5 cups water) and asked to determine which were the most and least "orangey" mixes. This task offered opportunities for students to choose from a range of strategies to make their comparison and to make connections between fractions, ratios, and percents as forms of comparisons.

Results

Revoicing functioned within the longer exchanges most prominently to establish *common ground* (Staples, 2008) at a given point in time, with two primary patterns in terms of what followed. The two teachers who most frequently and productively used revoicing to establish common ground either subsequently: (a) pressed the student or group of students to refine, revise, or elaborate their explanation; or (b) elicited comments from other students about the explanation. A second use of revoicing, particularly within the group activity structures, was to conclude a set of exchanges (which are analytically akin to Mehan's [1979] *Topically Related Set*), to establish common ground for one strategy before students moved to recording that strategy or developing a second strategy.

The longer sets of exchanges in which the revoicing moves were located had distinct functions in terms of the social and academic task structures. In terms of the social structure (e.g., the participant frameworks), the longer exchanges helped to make public students' explanations in ways that clearly attributed the origins of the explanations to particular students or groups of students, and marked the mathematical qualities of the explanations. At least implicitly, this positioned students as competent problem solvers and active contributors to the collective development of the core mathematical concepts. In terms of the academic task structure, the longer sets of exchanges served as the primary vehicles by which the teachers explored the mathematical ideas they identified as the primary goals for the unit.

Although we provide more detail shortly, Table 1 summarizes the exchange patterns across the three classrooms and indicates the location of revoicing within those patterns. The table shows differences in group and whole class exchange patterns. A common occurrence in the group exchanges was the use of revoice and press routines, in which the teacher revoiced the student contribution as a means to continue pressing students to clarify or revise their explanations. Granville used revoicing more sparingly, engaging instead in extended press sequences that often resulted in a fairly complete student explanation. Pless, by contrast, used revoicing to inject some explanatory features before continuing to press the students. In her class, the students' contributions were less evident, though she often explicitly attributed the content of her revoiced explanation to a student or group of students. In the classes of both Granville and Pless, the exchange sequences typically resulted in an articulation of a coherent strategy, though, as noted, the responsibility for articulating that strategy was distributed differently in those two classes. Sadosky's group exchange sequences were not as productive in terms of producing a coherent strategy, though she too employed the revoice and press routines. Below, we present examples of the *revoice and press* (Example 1) and *revoice to conclude* (Example 2) patterns.

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Table 1: Occurrences of Revoicing in Exchange Sequences

Teacher	Small Group		Whole Class	
	Exchange patterns	**Location of revoicing**	**Exchange patterns**	**Location of revoicing**
Granville	Press and extended presses followed by student explanations; Exchanges conclude by revoice or teacher explanation (in 4 of 10 exchanges)	The revoicing move concluded an exchange (3 of 10 exchanges)	Student explanation, teacher press for others to interpret, with press and explanation, and revoice and press sequences (with short revoicing turns); interspersed IRE sequences	Short instances inside of longer press, revoice, and student explanation sequences (4 of 6 lengthy exchanges)
Pless	Press and extended presses followed by student explanations; Press, revoice, and more press (in 4 of 8); Press, teacher explanation, and more press (in 2 of 8)	In the midst of longer revoice and press sequences (4 of 8); The revoicing move concluded an exchange (3 of 8)	Press and student explanations; revoice and press exchanges (with long revoicing turns); interspersed IRE sequences	In the midst of longer exchanges as catalyst for press and explanation sequences (4 of 5 lengthy exchanges)
Sadosky	Press, revoice, and press (in 2 of 5); Extended known-answer press (in 1 of 5); Press followed by student explanation (1 of 5); Teacher explanation (1 of 5)	In the midst of longer revoice and press sequences (2 of 5)	Primarily IRE sequences, with some student explanation and teacher explanation	Concludes exchange (2 of 8 mostly brief exchanges)

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Example 1: Revoice and Press Routine

Pless: Guys can you listen to him while we do this? So look at what he did? He wrote two over three and said it is 66.6 repeating percent but as he looked at this now he realizes, he originally thought this meant 66.6 percent was concentrate right? (She looks at Adam for confirmation. Adam nods.) [**Revoice**]

Pless: But as he looked at this he is thinking that is not really the case anymore. Do you agree with him ... that is not the case? [**Pressing for agreement**]

...

Pless: Because what do I have to do if I want to find out what percent the concentrate is that of the juice? [**Pressing for accuracy**]

Adam: You have to add them together and then do the concentrate out of the total amount.

In Example 1, Pless revoiced the student's strategy as a precursor to a further press for him to explain the strategy. In Example 2, below, Granville revoiced the student's explanation to provide the strategic context for the procedural description provided by Tim. Her revoicing marked the end of the discussion on one strategy before proceeding to discuss a second strategy.

Example 2: Revoicing to Conclude

Tim: You multiply that to get your base-90 and top of it you multiply by the same amount to get the top of it ... to get ... to get the numerator. [**Student explanation**]

Granville: So what you are saying is that since these are all different, might as well try to get all out of the same amount. [**Revoice**]

The whole class exchange sequences were oriented toward explaining and collectively reflecting on strategies developed in the small group activity structure, as opposed to developing a strategy; consequently, the exchanges reflected that difference. In Granville's class, for example, the exchanges typically began with a student explanation, followed by a press for other groups to interpret the strategy or a press back to the initiating group (sometimes in the form of multiple IRE sequences) if clarification was required. When Granville employed revoicing, it was typically a brief move serving to clarify a key feature of the explanation before a further press to the group or to other groups to interpret the strategy. Pless, by contrast, used longer revoicing moves that involved narration of the group's processes and thinking before continuing with the press back to the group or class as a whole about the strategy. In both classes, revoicing helped to focus students on a particular strategy in which there were clear attributions back to the groups that developed the strategies. In Sadosky's class, the summary discussion was poorly organized and there was little opportunity to extensively discuss a particular strategy. Furthermore, she took on a greater role in explaining strategies, using revoicing to conclude exchanges rather than as a clarification before a subsequent press. Below, we present examples of the use of revoicing in the summary discussions.

Example 3: Granville's Use of Revoicing as Short Turn Followed by Press

*Granvill*e: So first they wrote the ratio of OJ to water, and then what was the second part they did? Why wouldn't I say they got a common denominator? … So what did you get a common—what? [**Pressing for Accuracy]**

Student: Uh, we got a common uh amount of cold water. [**Student explanation**]

Granville: Common amount of cold water. Ok. So you got them all out of—or compared to 90 cups of cold water. [**Revoicing**]

...

Granville: So here's the next question. How is this strategy related to our first strategy**?** Talk in your group. How is this strategy two related to strategy one [students start to talk]? [**Asking students to interpret peer's strategies]**

In Example 3, the revoicing move by Granville was brief and primarily functioned to establish a common description for a strategy before pressing the students to compare two strategies. In Example 4 below, Pless's revoicing turn was lengthy and explained both the strategic and technical aspects of the strategy before she pressed the students on further aspects of the strategy.

Example 4: Pless' Use of Revoicing as Longer Turn with Explanatory Qualities

Pless: So you started with a fraction and what type of comparison is your fraction? [**Pressing for Accuracy]**
Student: Part to whole.
Pless: Part to whole. And what part and what whole are you talking about? [**Pressing for Accuracy]**
Student: Concentrate to juice.
Pless: Concentrate to juice okay ... So I asked [the group] to keep going because I wanted you guys to see this. Now this might not be the easiest one to do common denominators with, however, they wanted, they were having trouble finding what they thought might be the smallest common denominator so they found a common denominator, they knew it would work by multiplying all of the denominators together and they came up with a denominator of 1,680. [**Revoicing**]
Pless: Do you think that's the lowest common denominator? [**Pressing for Accuracy]**

A key feature of revoicing (O'Connor, 2009) that was not as evident in these classrooms was the move where the teacher checks back with the student to ensure that any interpretation reflects the student's intentions. O'Connor and Michaels (1993) noted that this move allowed the student "to validate [the teacher's] inference and, thus, take on a position himself with respect to an aspect of the current academic task" (p. 322). One question that our data leads us to ask is the role of such a move with respect to the norms established in the respective classes. Given the way that Granville pressed her students to fully articulate their strategies, for example, it is possible that students felt freer to disagree with the teacher's interpretation of their strategy than in the classes of the other two teachers, who more strongly controlled the discourse with respect to the academic task structure. In those classes, however, it is important to ask whether attempts to rephrase or interpret students' explanations, even with attribution, constitute revoicing as envisioned by O'Connor and Michaels. This leads us to the bigger question of how the longer exchange sequences, in which revoicing served an important but limited role, potentially developed the participant structures that could ostensibly be created through revoicing.

Discussion

We reflect on how focusing on longer exchange sequences helps us to consider how revoicing and its proto-forms (i.e., those moves with some but not all of the features of revoicing described by O'Connor and Michaels) contribute to the development of social and academic task structures, especially structures in which students take on serious epistemic roles.

How Exchange Sequences Influenced Social Task Structure

Even though the range of accountable talk moves at times constituted a constrained form of positioning in that the teacher controlled how explanations were articulated and attributed, the moves still contributed to the portrayal of students as competent actors and thinkers. However, it should be noted, the lack of the third move limited student agency in terms of how their claims were taken up, with decreased roles especially in Pless's and Sadosky's classrooms.

Instances in which at least two of the three features were evident involved a continuum of control over responsibility for mathematical explanations. On the one end, teachers used the proto revoicing forms in ways that functioned as teacher explanation. In these cases, the teacher used an interpretation of a student's strategy as a beginning point to expand the mathematical claim but did not attempt to press the student or class to specifically focus on how the student to whom the claim was attributed may have interpreted the claim. That is, the teachers' interpretation became the focus of discussion as a tool to advance the academic task structure. This function of revoicing, as well as other functions that allow the teacher to

control the content and flow of discussion, is seen by teachers as 'muddying' the ostensibly clear description of what revoicing is intended to accomplish (Herbel-Eisenmann, Drake, & Cirillo, 2009). In practice, revoicing, as seen by teachers, potentially describes a continuum of practices, which in part argues for looking at the characteristics and functionality of longer exchange sequences to see patterns in how the teacher positions students.

On the other end, the teachers, particularly Granville, used revoicing as a brief clarifying move to keep the discussion focused on the students' explanation, including helping the student to elaborate her explanation more fully and helping other students to interpret that explanation for themselves. Granville seemed particularly skilled at using revoicing to coordinate the social and academic task structures. However, she did not explicitly scaffold the participant structure in the same way as the teacher in O'Connor and Michaels (1993) study; instead, her use of the extensive press for explanation made student thinking explicit features of classroom discourse and students took on the responsibility of aligning themselves in relation to the claims.

The regular presence of consecutive revoice and press moves in the exchange sequences was an interesting development. In these cases, the teacher used the revoice move not simply to attribute or to draw students into the discussion, but to establish common ground before continuing to press for explanation or for other students to interpret explanations.

How Exchange Sequences Influenced Academic Task Structure

Although it could be argued that the more teacher-focused forms exhibited by Pless and Sadosky allowed them to control the academic task structure and thus advance their didactical goals for the lesson, Granville's skillful and persistent press for explanation and peer interpretation of strategies provided arguably the same or greater opportunities for students to make sense of the key mathematical ideas. That is, her use of accountable talk moves resulted in strongly coordinated social and academic task structures. She pressed students until the procedural and strategic features of the explanations were clear, which Granville supported by recording these features concisely on the same sheet as other strategies. This strategy allowed her not only to collectively press the class to interpret each strategy but also to compare strategies according to the primary concepts of the unit (e.g., the nature of comparison and nature of quantities being compared).

Revoicing as Situated Within Broader Structures

The revoicing moves used by the three teachers served a variety of purposes, not all of which were consistent with O'Connor and Michaels (1993) description of the move. In part, this was due to our interpretation of the move, which included proto forms that did not include all of the features listed by O'Connor and Michaels. However, our interpretations are consistent with those of other researchers and practitioners who have attempted to identify instances of revoicing in a wide range of classrooms. In part, the ambiguity stems from trying to isolate revoicing from broader discursive and activity structures and in part from trying to map messy data onto theoretically driven descriptions of discourse moves.

The broader exchange sequences, particularly those used by Granville, served many of the same functions as the revoicing moves described by O'Connor and Michaels (1993), suggesting that the broader set of accountable talk moves can create participant structures that position students as active contributors in ways that provide agency to the students. Much of the work in the longer exchange sequences was more implicit than in a more singular instance of revoicing, in terms of attributions and students' opportunities to verify the interpretations of their claims. That is, there were extended opportunities for students to revise and clarify their explanations, notably during the revoice and press sequences.

It should be noted, however, that in many cases, especially in Sadosky's class and occasionally in Pless's class, that the proto forms of revoicing placed much of the work of interpreting and explaining on the teacher, with presses for verification and clarification often in the form of a known-answer questions. A question that arises from this research is how to help teachers develop awareness of the potential for transforming these proto forms into exchange patterns that provide greater opportunities for students to do the intellectual work in mathematics classrooms.

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