

**Title: Teachers' negotiation of the "presence of the text": How might teachers' language choices influence the positioning of the textbook?**

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During my graduate studies, I was fortunate to spend almost three years in two grade eight mathematics teacher's classrooms where they were using the *Connected Mathematics Project (CMP)* (G. Lappan, J. Fey, W. Fitzgerald, S. Friel, & E. Phillips, 1998)<sup>1</sup>, one of the mathematics curricula funded by the National Science Foundation in the 1990's. During that time, I became intrigued by the ways in which these teachers used language in their classroom practices. As a person who was certified to teach secondary mathematics (and who had previously taught junior high school mathematics), my understanding of language use, especially as it related to my teaching, was very limited. When I began reading literature on language use and using it as a lens to make sense of what I was observing in the classrooms, I learned a lot about what language does and can do in the classroom. I came to understand that language choice is something that we, as mathematics teachers, mathematics teacher educators, and mathematics curriculum developers, need to pay more explicit attention to if we want to improve mathematics teaching and learning.

This chapter focuses on why language choice matters with respect to how we use curriculum materials<sup>2</sup> in the mathematics classroom. I begin the chapter with some classroom examples for the reader to consider. I then explain relevant literature related to

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<sup>1</sup> During my time in these classrooms, I spent a half a year looking at algebraic understandings (see, for example, Herbel-Eisenmann, Smith, & Star, 1999; Star, Herbel-Eisenmann, & Smith, 1999) as part of the Michigan Algebra Initiative (Smith, Phillips, & Lappan, 1997) and two and a half years studying classroom discourse patterns for my dissertation research (Herbel-Eisenmann, 2000). This dissertation research focused on describing patterns that were pervasive (i.e., that appeared most frequently across class periods and often multiple times within a class period) in the classroom discourse so that I could examine how the discourse patterns structured the norms in the classrooms. In this chapter, I only include some information about my research methods and refer readers to these cited sources for more details.

<sup>2</sup> Throughout the chapter, I use the word "textbook" and "curriculum materials" to refer to the published materials that the teacher and students use in the mathematics classroom. While most mathematics textbooks are published as a large, bound textbook, *CMP* has been published as a set of smaller soft-covered units, each of which focuses on a particular mathematical strand (e.g., algebra, number, geometry, data analysis). This allows for alternative sequencing as the units can be used in many different orders. The authors of the materials make suggestions about some possible orderings in *Getting to Know CMP*.

authority and to language use that I employ to theorize the examples. Next, I return to the examples and explain how the language choices in those examples “position” the teacher, students, and textbook in particular ways and thus enhance or mediate the textbook’s authority in the classroom. I argue that we need to be more conscious of our language choices when we use mathematics textbooks in classrooms because our choice of language can undermine or support goals that we have for students. I do not prescribe language patterns, rather I encourage readers to be more reflective about what they say and do when they use curriculum materials with students. Finally, I offer some questions for the reader to consider regarding textbook use and authority in mathematics classrooms.

### **Three Classroom Examples**

The three examples<sup>3</sup> below come from two different classrooms where the teachers, Josh and Karla, are both teaching a unit on mathematical modeling (*Thinking with Mathematical Models (TMM)* (G. Lappan, J. Fey, W. Fitzgerald, S. Friel, & E. Phillips, 1998)). At least two different kinds of modeling experiences are included in *TMM*: a) experiences where students are asked to collect the data themselves and then represent and analyze it; and b) experiences where students are given data, graphs, or equations from an existing modeling situation (e.g., they are asked to compare three different equations to make an argument about which they would use to raise the price of cookies

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<sup>3</sup> These examples come from the two focus class periods that were used for the fine-grained discourse analysis for each of the two classrooms. Since the research questions in my dissertation were broadly about pervasive discourse patterns and not specifically about the language choice in relationship to curriculum materials, there are more examples from one classroom (Josh’s) than the other because the curriculum materials played a much more visible and explicit role in that teacher’s classroom practices. In this chapter, the examples are used to illustrate different language choices because they are related to broader findings about the discourse patterns. That is, the examples I use here were brought to my attention as findings for related research questions but were not findings about how teachers drew from and referred to curriculum materials. Because of this, the examples are illustrative and not exhaustive. This raises implications for further research, which I discuss at the end of the chapter.

in a bakery). One recurring context in *TMM* has students measure the breaking weight of paper bridges by loading pennies into a cup until the bridge “crumples”. The first time this context appears (in Investigation 1.1) students vary the thickness of the bridges and the second time (in Investigation 2.1) they vary the length of the bridges. Students are also given information about a class in Maryland who has done this problem during the pilot phase of *CMP*. Students are asked to compare their own bridge-breaking experiences to what the class in Maryland did. Most of the situations in *TMM* can be modeled by a line and some (e.g., the problem where they vary the length of the bridge) can be modeled by a curve.

The first two examples I provide below come from the same class period in Josh’s classroom. The third example comes from Karla’s classroom. While all three are examples of teachers “using” curriculum materials, there are subtle differences in what is being done and said during this use. In the transcripts, I use “J” or “K” to indicate that Josh or Karla is speaking. Any other names that appear indicate specific students who were speaking and all names are pseudonyms<sup>4</sup>. I also used italicized text to indicate words that were read verbatim from the textbook. At this point, I mainly offer the examples to get the reader thinking about language choice as it relates to examples of teachers using and referring to curriculum materials. After I explain some applicable and important ideas from the literatures on authority and language use, I return to these examples to interpret them and discuss what I think they are examples of.

### **Example 1**

001 J: Let’s go ahead, read on

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<sup>4</sup> When it was difficult to tell who was speaking, I use “Ms” and “Fs” to recognize the gender of the student and “Ss” is used whenever a group of students was calling something out.

002 Cory: *The class then made a graph of the data. They thought the pattern*  
003 *looked somewhat linear, so they drew a line to show this trend. This line is*  
004 *a good model for the relationship because, for the thicknesses the class*  
005 *tested, the points on the line are close to points from the experiment.*

006 J: Okay, now, let's look at that line [in the book] again: *This line is a good model*  
007 *for the relationship because for the thicknesses the class tested, the points on*  
008 *the line are close to the points from the experiment.* Take a look at what they  
009 did. Now, their data was a little bit scattered, a little more scattered than ours  
010 was. But, they still were able to draw a line that seemed to fit the data pretty  
011 well. No point is really far away from the line. There's a couple of points  
012 below, you know, one or two slightly above. That is sometimes called a line  
013 of best fit. We're gonna use that term an awful lot. Cory read on.

014 Cory: *The line that the Maryland class drew is a graph model for their data.*  
015 *A graph model is a straight line or curve that shows a trend in a set of data.*  
016 *Once you fit a graph model to a set of data, you can use it to make*  
017 *predictions about values between and beyond the values in your data.*

018 J: Okay, I don't have a vocabulary chart yet, I forgot to put it up. I'll get it up  
019 later. But, there's a good definition for a graph model. It's one of your  
020 vocabulary words. It's *a straight line or curve that shows a trend in a set of*  
021 *data.* It models the data, it shows the path. ...

022 [three speaking turns later]

023 J: ... Remember what a graph model is—*it's a straight line or curve that shows*  
024 *a trend in a set of data,* it fits the data. So that all the points are pretty close [to

025 the line of best fit]. Um, I don't know. Why do we do this? What's the  
026 purpose of a graph model? [Abram's hand goes up right away] Abram, what's  
027 the purpose?

028 Abram: To show the linear relationship

029 J: Yeah. I could maybe see that it's linear just from looking at the table or if just  
030 looking at the way the plots are pointed. Why did I draw the line in? Just to  
031 show the pattern? Christy?

032 Christy: To get a better look at what the data is trying to tell you?

033 J: Well, maybe that's part of it. Look back at your definition for a graph model.  
034 Look at your definition of a graph model. What does it say? Read that last  
035 paragraph to yourself on page seven. Lance, what's the purpose here? Why  
036 do we even bother doing this?

## Example 2

037 J: If you go over the Mackinaw Bridge<sup>5</sup>, it has those center spans. We would all  
038 agree that this bridge right here is not going to be as strong as this bridge right  
039 here. Let's test to see what kind of relationship there is. If you look at the  
040 directions, it says we're, you're gonna need *eight 4-inch wide strips of paper*  
041 *with lengths 4 inches, 5 inches, 6, 7, 8, 9, 10, and 11 inches, two books of the*  
042 *same thickness, a small paper cup and about fifty pennies. Now this sounds very*  
043 familiar to the problem we did about a week and a half ago, right? This time  
044 every bridge you make is only going to be one layer thick, one sheet of paper.  
045 What we're going to vary are the lengths. One thing you're going to change on

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<sup>5</sup> This is a bridge in northern Michigan.

046 this right now. Instead of bridge thickness, you're going to have bridge length.  
047 You're still going to have breaking weight. The book says to start with a bridge  
048 four inches long, we're going to start with bridge that is five inches long  
049 because when you do the one inch overlaps, you only have two inches in the  
050 middle and I'm not positive your cups would even fit on that. So, start with a  
051 bridge five inches and then go 6, 7, 8, where do we stop?  
052 Ms: Eleven  
053 J: Eleven inches? Okay you're going to need to do some measuring, and a couple  
054 things to watch: make sure the only thing that differs from one test to the next is  
055 the length of the bridge, make sure you place your cups in the middle, make  
056 sure you place the pennies in, make sure you have one inch overlap on your  
057 books. Most people who screwed up last time, that's what you screwed up.  
058 Alright, any questions?

### **Example 3**

The example from Karla's classroom comes from the day after the students had a difficult time with the following question on a quiz:

To plant potatoes, a farmer cuts each potato into about 4 pieces, making sure each piece has an "eye." The eye contains buds that will become new plants. Each new plant will produce 5 potatoes. Thus, a single potato will yield 20 potatoes.

A. Make a table and a graph model that show how the number of potatoes grown depends on the number of potatoes cut and planted.

B. Write an equation that describes this situation.

(*Thinking with Mathematical Models*, Teacher's Edition, p. 64)

Subsequently, this discussion took place when Karla handed back the quiz:

059 K: The potato problem, they gave more information than we needed to know. I've  
060 heard this--to try to get you to sort through the information that was necessary.

061 All they wanted to know was that if I plant an old potato, about how many new  
062 potatoes are going to grow from it? All that stuff about cutting it up and  
063 dividing some from each piece and all that, that was just some background  
064 information about how if you wanted to go home and do this, you could do this.  
065 Ms: It was easy.  
066 Sammie: I was confused.  
067 K: I know [to Sammie].  
068 [Ss comment—overlapping speech]  
069 K: [inaudible] 20 potatoes. So then two potatoes and we could get forty and three,  
070 hopefully sixty. So, your table is going to increase that way. Why did they use  
071 the word “graph model” when the data seemed perfectly linear? ... [Comment  
072 regarding student behavior] They used the word graph model when it seemed to  
073 be a perfect fit. ...

### A Lens to Interpret the Examples

“**authority**” c.1230, *autorite* "book or quotation that settles an argument," from  
O.Fr. *auctorité*, from L. *auctoritatem* (nom. *auctoritas* ) "**invention, advice, opinion,  
influence, command,** from *auctor* "**author**" (see *author* ). Meaning "power to  
enforce obedience" is from 1393; meaning "people in authority" is from 1611.

-the *Online Etymology Dictionary* (bold added)

As the above excerpt indicates, there is a direct etymological link between the words  
“authority” and “author; one of the listed definitions of “authority” originates from the  
word “author.” In this section, I provide a lens to interpret the classroom examples,  
drawing on literature related to authority and language choice. I address teacher authority

and textbook authority and then describe how language choice can be related to authority through the idea of positioning.

### **Teacher Authority**

In much of the educational research related to issues of teacher authority, a distinction is made between being an authority because of one's content knowledge and being an authority because of one's position. This distinction has taken on many different names, for example, "rational authority" and "traditional authority" (Peters, 1966) or "sapiential (or 'knowledge') authority" and "structural (or 'positional') authority" (Skemp, 1979, following Paterson, 1966). Basically, teachers are described as being "*an authority in authority*" (Russell, 1983).

Some researchers in mathematics education have used ideas from linguistics to examine teacher authority. For example, Forman, McCormick, and Donato (1998) examine authority patterns in a classroom where the teacher is trying to enact the classroom practices described in the vision presented in the *Standards* (NCTM, 1989, 1991) documents. The authors found evidence that, although the teacher wanted to solicit, explore, and value multiple solution strategies, some of her discourse practices undermined this goal. More specifically, they found that the student-talk that was valued by the classroom teacher included mainly abstract talk that could be understood apart from the particular context in which it was taking place. The authors argue that the teacher asserted her authority through the use of overlapping speech, vocal stress, repetition and expansion. Despite the fact that three students in her class presented mathematically correct and different solution strategies, the teacher was shown to overlap a student's explanations *only* when s/he was *not* using the procedure the teacher recently

taught. The teacher also privileged the explanation of one student who used more “timeless, spaceless, impersonal, and algebraic” (Forman, McCormick, and Donato, 1998, p. 332) talk.

### **Textbook Authority**

Because textbooks “are taken as the authorized version of a society’s valued knowledge” (Olson, 1989, p. 192), it is difficult to ignore the fact that, generally, textbooks are viewed as an authority on mathematical content by the public. In current literature, there exist at least three (overlapping) perspectives on the source of a textbook’s authority<sup>6</sup>. While each of the three perspectives agree with the others that textbooks are an authoritative presence in the classroom, each highlights a different factor that they believe to be most important to the positioning of the textbook as an authority. First, Olson (1989) argues that the authority of the textbook is an intrinsic property of the structure of the text. The separation of the author from the text as well as the particular linguistic characteristics of a textbook, he contends, helps to instantiate the textbook as an authority:

Textbooks, thus, constitute a distinctive linguistic register involving a particular form of language (archival written prose), a particular social situation (schools) and social relations (author-reader) and a particular form of linguistic interaction (Olson, 1989, p. 241).

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<sup>6</sup> All three of these perspectives are included in one edited book related to literacy education. After searching multiple journals and data bases for articles and book chapters on textbook authority, I found that most research focuses on teacher authority and briefly mentions that the textbook played a role (see, for example, Amit & Fried, 2005; Haggarty & Pepin, 2002; Hamm & Perry, 2002). None of those authors, however, seriously consider the interactions amongst the teacher, textbook, and students in their inquiries.

In mathematics education, authors have referred to examining characteristics of textbooks in this way as examining the textbook as an “objective structure” (Otte, 1986) or as focusing on the “presence *in* the text” (Love & Pimm, 1996)<sup>7</sup>.

In fact, examining the textbook in this way can help to see how the textbook is in some ways *an* authority *in* authority. For example, the textbook<sup>8</sup> provides particular topics in a particular order and offers particular representations of mathematical concepts and skills<sup>9</sup>. A textbook is a codified version of what content is valued at a given point in time; it is a message from the mathematical community far removed from any particular school, teachers, and students about both what knowledge is necessary and the ways in which that knowledge should be organized and taught (Apple, 1986, 1992; Stray, 1994). In this way, it acts as *an* authority of mathematics. In the teacher’s edition, the textbook also provides suggestions about how to organize activities, what kind of lesson format to use (e.g., small group explorations vs. whole group summarizing), and how to teach particular mathematical ideas. In this way, it provides information to the teacher about how to organize the students’ social behaviors.

The second perspective (Luke, Cook, de Castell, & Luke, 1989) locates the reasons for the authority of the textbook within the “field of use and exchange” (p. 245), which includes the classroom context as well as the broader social institution of schooling. These authors point out that the kind of linguistic analysis proposed by Olson needs to

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<sup>7</sup> In Herbel-Eisenmann (2004; In Review), I use linguistic theory to analyze the presence *in* the unit (*TMM*) the teachers were using in their classrooms.

<sup>8</sup> I realize that in sentences like this one, I am giving agency to the mathematics textbook. I do this because I see the teacher-textbook relationship as a “participatory” (Remillard, 2005) one. Not only does the teacher shape the textbook when she uses it (based on her knowledge, beliefs, etc.), but the textbook also has the potential to influence the teacher’s knowledge, beliefs, skills, etc.

<sup>9</sup> In fact, some research on curriculum materials that preceded national standards in mathematics and science education suggested that textbooks can impact both what and how teachers teach, as well as what and how students learn (Alexander & Kulikowich, 1994; Begle, 1979; Tobin, 1987; Usiskin, 1985).

also include specific information about the context of schooling. Otherwise, they content, we are unable to see how the textual form and the institution of schooling together contribute to textbook authority. Because this work draws on New Criticism literary theory, it emphasizes the social institution of schooling as well as the background knowledge of the reader as playing an important role in the interrogation of the authority of the textbook in classrooms.

Finally, Baker and Freebody (1989) distinguish their perspective from the first two by arguing that the authority of the text does not exist in the textbook or in the institution of schooling, but rather are the results of pedagogy. They argue that most research on the authority of the textbook primarily stems from theoretical arguments. This third perspective, however, takes as central actual classroom interactions and the authors empirically investigate how “text-authorizing practices...may be observed in the course of classroom instruction” (Baker & Freebody, 1989, p. 264) as well as how these practices evolve in relation to the authority of the teachers. To illustrate these practices, they examine the kinds of questions teachers ask and the ways teachers respond to students’ answers to their questions. They seek to “describe the intimate connections between talk around text and the social organization of authority relations between teachers and students. Teachers may be shown to use various practices to assign authority to the text and simultaneously to themselves” (p. 266). In mathematics literature, empirical investigations of how textbooks are used have been referred to as examining the mathematics textbook as “subjective scheme” (Otte, 1986) or as examining the “presence *of the text*” (Love & Pimm, 1996) in the classroom. In this

chapter, I seek to understand the teacher's negotiation of the presence *of* the text by looking at the teacher's "talk around text".

### **Language Choice and Positioning**

Cazden (2001) begins her book on classroom discourse explaining why spoken language is an important aspect to study and consider in classrooms: a) spoken language is a central practice of teaching; b) spoken language is a primary way students demonstrate what they have learned; c) in contexts like schools and classrooms, "one person, the teacher, is responsible for controlling all the talk that occurs while class is officially in session—controlling not just negatively, as a traffic officer does to avoid collisions, but also positively, to enhance the purposes of education" (p. 2); and d) spoken language is intimately related to people's identities.

As Cazden alludes to above, some perspectives on language in classrooms make a distinction between language that is used to focus on the content understandings being developed (i.e., "to enhance the purposes of education") and language that is used to control social behaviors (i.e., "to avoid collisions").<sup>10</sup> Hence this parallels nicely the literature on teacher authority. Not only is a teacher *an* authority *in* authority, but they also have language that can be used for each of these purposes. For example, Christie (1995) more explicitly differentiates between an "instructional register" and a "regulative register" when she addresses pedagogical discourse. The instructional register is related to the content area or subject matter being taught (e.g., "The equation of a line is written

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<sup>10</sup> This has been true in research on literacy (e.g., Christie's work), science (e.g., Lemke, 1990), social studies (e.g., Schleppegrell, 2004) and mathematics classrooms (e.g., O'Halloran, 2000, 2004; Sfard & Kieran, 2001; Sierpiska, 1997). Much of this research draws on linguistic research stemming from the work of Michael Halliday and uses systemic functional linguistics to examine classroom practices. While this distinction is used for analytic purposes, most of these authors also acknowledge that these categories of language are intimately related to each other.

in the form  $y = mx + b$ .), whereas the regulative register relates to the overall goals of the activities and to the sequencing of the teaching-learning behaviors (e.g., “If you want to share your conjecture, you need to raise your hand first.”). Christie argues that these registers help us see:

those linguistic resources in which students are apprenticed into behaviors, skills, attitudes, procedures, and forms of knowledge which enable them to achieve particular pedagogic subject positions, and hence to acquire aspects of the ‘common knowledge’ that is an important part of schooling (pp. 222-223).

Like Christie, many authors who study language assume that language choice<sup>11</sup> is important because it indexes a particular set of values, dispositions, and ideologies (Halliday, 1979; Lemke, 1990; Morgan, 1996; Ochs, 1990). As Morgan (1996) points out:

Whenever an utterance is made, the speaker or writer makes choices (not necessarily consciously) between alternative structures and contents. Each choice affects the ways the functions are fulfilled and the meanings that listeners or readers may construct from the utterance. ... The [speaker or] writer has a set of resources which constrain the possibilities available, arising from her current positioning within the discourse in which the text is produced (p. 3).

Every time we speak, multiple phrases could be spoken that essentially carry the same meaning. However, the particular words that we choose carry messages about who we are and what we are doing. For example, in Karla’s classroom I heard students use the

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<sup>11</sup> As Morgan’s quote below indicates, the word “choice” does not mean that these choices are conscious choices for the speaker.

following two phrases: “that graphs shows a swoopy curve<sup>12</sup>” and “that graph shows an exponential relationship.”<sup>13</sup> Both of these phrases could indicate that a particular graph I am looking at is exponential. However, the first phrase only has meaning in Karla’s classroom, where “swoopy curves” was a meaningful way to talk about exponential relationships. Only the phrase using exponential relationships would be recognized by most people who are “in the know” about mathematics. If I were to use the phrase about swoopy curves outside of the context in which it was developed, I may not position myself as being ‘mathematically knowledgeable’.

As Morgan’s quote above highlights, the notion of “positioning” is important because it recognizes that authority and power are dynamic constructs. That is, if we consider that teachers, textbooks, and students all have agency within a classroom environment, at different moments in time, each of these participants might be privileged in different ways and may take on responsibilities for the teaching/learning process in different ways. All participants are involved in the constitution of positioning. As Davies and Harre (1990) state:

Positioning... is the discursive process whereby selves are located in conversations as observably and subjectively coherent participants in jointly produced story lines. There can be interactive positioning in which what one person says positions another. And there can be reflexive positioning in which one positions oneself. However, it

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<sup>12</sup> In my own work, I call this type of language “classroom generated language”. Other researchers have called it “quasi-mathematical language” (Pirie, 1998) and “idiosyncratic vocabulary” (Pimm, 1987).

<sup>13</sup> In Herbel-Eisenmann (2002), I describe many different ways students in these two classrooms talked about the concepts of slope and y-intercept. I argue that all of these ways of talking help to develop understanding of these concepts, but that it is important for students to learn to speak in the “mathematical register” (Halliday, 1979; Pimm, 1987) if we want them to be positioned as mathematically knowledgeable.

would be a mistake to assume that, in either case, positioning is necessarily intentional (p. 48).

As these authors point out, in some cases, people can be positioned by others (e.g., “If Carl’s smart and he got that answer, it must be right.”) or they may position themselves in different ways (e.g., “But your answer is the same as the one I gave a little bit ago.”). I elaborate further some of the potential ways the teacher, textbook, and students are positioned through language choices and hence how these positionings index authority at various points in time.

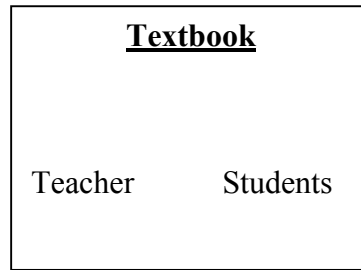
### **Returning to the Examples...**

In each of the three examples given at the beginning of this chapter, there are different ways in which the interactions unfold that illustrate some of the ways in which the teacher, textbooks, and students are positioned.

#### **Interpreting Example 1**

Example 1 highlights the positioning and repositioning of the textbook and the teacher, illustrating how authority and positioning really are fluid in classroom interactions. In lines 001 and 013, Josh calls on a student to read from the textbook. After Cory first reads a section of the textbook (lines 002-005), Josh re-reads a portion of what Cory read (lines 006-008). Reading directly from the text- especially with little or no interpretation (and then a re-reading) of it- can be seen to privilege the wording of the textbook (see Figure 1). The teacher is not authorizing the text, but rather from his position *in* authority, he defers to the text as authoritative, tacitly suggesting that his students also defer to the textbook’s authority. In this case, the textbook is authorized to introduce and to define particular mathematical terms.

**Figure 1: Textbook is Privileged**



When a teacher reads from a textbook or a student is called on to read from the textbook, the talk in the classroom is not unlike talk that occurs in church rituals. As Olson (1989) points out:

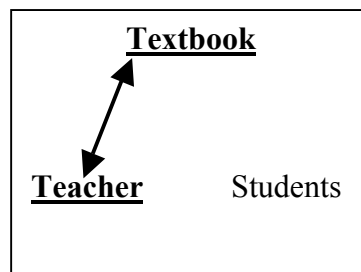
...ritual utterances radically restrict the linguistic options at the lexical, syntactic, and intonational levels... such restricted propositional content gain their illocutionary force through the limited options they provide for dissent. ... formalized language of ritual involves a different relation between the speaker and the message than does ordinary oral conversation... speaker... is not speaking his own words but the words of elders [or in this case, the words of textbook authors]; the orator does not simply express his personal view but rather acts as a spokesman or messenger... (p. 235).

These kinds of practices authorize the textbook as the authority because a ritualized form of reading requires a person to speak words that do not originate with him/herself, but rather with someone else.

Josh then steps back and comments on the textbook's words. He points out that the data that was given in the text was a little bit different from the data that they collected in class. That is, the data is a little more "scattered." "But," he continues, "they still were able to draw a line that seemed to fit the data pretty well," indicating that if this class in

the textbook was able to draw a line of best fit, then his class should be able to do so, also. In this segment of the classroom transcript, we see a shift from the positioning of the textbook as the privileged word to a positioning of the teacher and textbook as having a privileged subjectivity (see Figure 2). The teacher, in this case, is positioning himself as someone who can interpret the text and the images in the text for students. The term “graph model” is a word that the class is told they will use “an awful lot” (line 013) and Josh privileges the textbook’s definition of the term even further when he says that the book gives a “good definition” (line 019).

**Figure 2: Teacher-Textbook are Aligned**



Josh then provides a third reading of the graph model definition (lines 020-021). He asks students what the purpose of finding a graph model is. Both Abram and Christy attempt to answer his questions. When their answers seem to be not quite what Josh was looking for (see, for example “I could maybe see that...” (line 029) and “Well, maybe that’s part of it.” (line 033)), he directs students’ attention to the specific page number in the book and instructs students to “Read that last paragraph to yourself” so that they can answer his question appropriately. Josh’s questions and commands position the textbook as both something that determines the purpose of this classroom activity and as something in which students can find answers to his questions. This privileges the

textbook as an authority again (see Figure 1). Interestingly enough, there were instances in the classroom data<sup>14</sup> that indicated that students came to understand that the textbook was a place in which they were to find answers to Josh's questions. That is, in some instances Josh would ask students a question and when he asked "How do you know?" students would say, "It's in the book" as a form of explanation or justification.

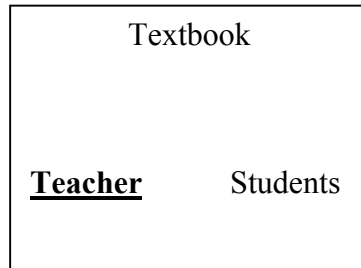
### **Interpreting Example 2**

Example 2 also has a combination of reading from the textbook followed by the teacher's interpretations of the textbook information. However, in this example, the reading of the textbook is only to inform the class what materials they need to use for the bridge experiment they are about to do. Josh's comments on the activity position him as someone who has been part of the classroom community but who also has the right to tell students what they will be doing next. He points out that this experiment is "familiar to the problem *we* did about a week and a half ago" (line 043) but that this time students (who he refers to as *you*) are going to vary the lengths of the bridges rather than the thickness. Josh then shifts his positioning again when he says, "The book says to... [*but*] we're going to..." (lines 047-048). In this case, he is positioning himself as an authority to change the activity the book suggests, thus he mediates the textbook's authority (see Figure 3) and highlights his own.

### **Figure 3: Teacher is Privileged**

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<sup>14</sup> Following the advice of Florio-Ruane (1987), I improved the trustworthiness of the findings in my dissertation research by searching for discrepant events, checking for consistency and prominence across all of the class sessions, and following up on any questions that arose in the analysis.



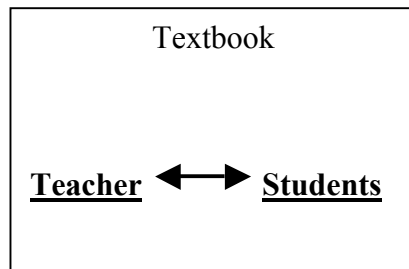
When Josh first used *TMM*, he found that the cups they placed on the bridges were too wide for a four-inch long bridge, so he tells his students to “start with a bridge five inches.” His last turn in this segment of transcript has a series of commands related to what he wants students to “make sure *you*” do (lines 054-057). All of these commands relate to mistakes students made when they did the first bridge experiment (or in past school years when Josh did this unit with other students). Pointing out that “most people screwed up” reinforces Josh’s authority to structure the classroom activity; he highlights the fact that, drawing on the way the problem is stated in the textbook, students made many mistakes. Therefore, he needs to clarify the process so that students can avoid the mistakes they made previously.

### **Interpreting Example 3**

Unlike Josh’s references to the textbook as “it” (lines 034 and 040) and “the book” (line 047), in Example 3 Karla uses the pronoun “they” to refer to the textbook. The background and context of the use of “they” is important. That is, it is important to note that Karla’s reference to the textbook as “they” comes after students did not do well with a particular quiz problem. The language of the quiz problem is absolute and precise (“will produce,” “will yield”) and may be confusing to students because when students collect their own data or when they are given data that is (supposedly) collected by someone

else, the increases are *not exact* increments to account for errors in the data collection process. In addition, students seem to have come to understand “graph models” as not being completely regular or precise because they referred to mathematical models as “kinda linear,” “almost linear” or “sorta linear.” In fact, both Karla and the students use the word “perfect” to distinguish data that was exactly linear from a modeling situation. Karla mediates this disjuncture by using language that is hypothetical (“if,” “could”) and vague (“about,” “seemed,” “hopefully”). To deal with this conflict of language use, Karla uses “they” to identify the authors of the textbook as a third party, positioning herself away from its external authority. This strategy allows her to act as an interpreter for her students, distancing herself from the authority of the textbook and the authors (see Figure 4) and aligning herself as part of the classroom community.

**Figure 4: Teacher-Students are Aligned**



Hamm and Perry (2002) acknowledge noticing that the teachers in their study “distanced themselves from the domain of mathematics by reference to the text with deference” (p. 135), saying things like “they want us to,” and “they tricked us.” I would contend, however, that the context in which these words are spoken needs to be considered before we can claim that these phrases are ones of deference. A phrase like “they want us to” could position the textbook as something that has agency to dictate

things that are done in the classroom, highlighting the textbook's authority to do so. A phrase like "they tricked us," however, seems to align the teacher and students and mediates the authority of the textbook. While I agree with the authors that "the incidental and routine comments that teachers make about their own place [and, I would argue, the place of the textbook]" (p. 135) might influence the classroom practices, I maintain that detailed analysis of the classroom discourse (which includes close attention to context) is needed to make such claims.

### **Permutations of Positioning**

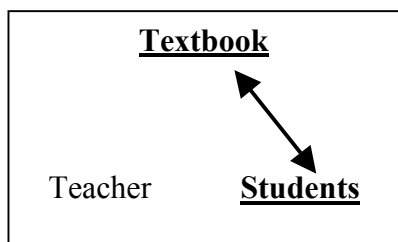
In summary, there are at least four positionings illustrated in these classroom examples: a) the Textbook is Privileged; b) the Teacher-Textbook are Aligned; c) the Teacher is Privileged; and d) the Teacher-Students are Aligned. Each of these positionings authorize or privilege particular ways of talking and doing things in these mathematics classrooms. When the textbook is read from, it is authorized to do and say things in particular ways. When the teacher adds interpretation and comments to the textbook reading, these words can be examined to see if the teacher and textbook are aligned or if the teacher is positioning herself as an authority who can change the textbook. Finally, the teacher and students can be aligned through particular references to the textbook as "they".

Each illustration of these positionings could be merely one point on a continuum of practices within each of the categories of positionings. For example, a more extreme illustration of the Teacher being Privileged could occur. In some cases, a teacher might enter the classroom, turn his or her back on the students and begin to speak to the board, virtually ignoring the students in the room. In the case of the Teacher-Student being

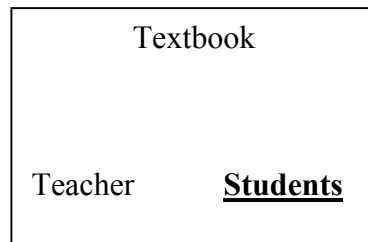
Aligned, it is possible that the authority could be completely shared so that true discussion is taking place. Or, the textbook may be completely absent from any of the classroom activity. Each of these four positionings requires additional investigation to be able to unpack them in more detailed ways and to further understand what the range of practices might be within each categorization.

Furthermore, there are at least two other potential positionings that did not appear in the examples: Textbook/Student is Aligned and Student(s) is Privileged (see Figure 5 below). These absent categories are important because they also highlight the fact that students are active agents in these positionings, too. It is possible that these two positionings could occur in the classroom, but they are probably less often captured in mathematics education research because the student(s) could be seen as acting in resistance to conventional classroom discourse practices. Student resistance is not a topic that has been examined in detail in mathematics education literature. (Houssart’s (2001) account of the “whisperers”, however, provides some interesting examples of an “unofficial culture” in the lower tracked classroom in which she worked.)

**Figure 5: Other Potential Positionings**



**Textbook-Student(s) Aligned**



**Student(s) Voice is Privileged**

The Alignment of Textbook-Student(s) may occur in situations where a teacher lacks knowledge in a particular content area. For example, a teacher may state that a square is

not a rectangle and a student in the class may refer to the textbook as evidence that the teacher was incorrect. A more extreme case could occur when a student disrespects a teacher and takes serious study only of the textbook, ignoring anything the teacher has to say in the classroom.

Instances where Student(s) is Privileged may be more prevalent in small group settings than in whole-class discussions because of the removal of the teacher in the interactions. For example, students have been shown to take on teacher-roles in small groups, positioning themselves as having a privileged voice (female students, in particular, have been shown to do this more often than male students) (Tholander & Aronsson, 2003). One form this type of positioning might take in whole-class discussions is that of student(s)-teacher debate. In his extensive research on science classrooms, however, Lemke (1990) reported that teacher-student debates occurred very infrequently. It is likely that in a domain like mathematics, student(s)-teacher debates would be even less frequent because there seems to be a more pervasive belief that mathematical knowledge is absolute and infallible.

### **Purposeful Positioning**

In mathematics education, researchers (e.g., Cobb, Wood, Yackel, & McNeal, 1992; Cobb, Yackel, & Wood, 1993; Wood, 1999) have shown that teachers can encourage students to justify and explain their reasoning, fostering an environment where the students see that they can be responsible for determining the reasonableness of their responses rather than the teacher or textbook needing to do so. In the work just cited, however, there was not a typical textbook present, rather the teacher and researchers developed lessons and activities to be used in that particular context based on what

happened in the class each day. Following one of the students from this environment into the next school year, McNeal (1995) found that the student “abandoned his self-generated computational algorithms in favor of less understood conventional procedures” (p. 205). She argued that the teacher’s use of the textbook was partly responsible, but did not examine the ways the teacher positioned the textbook more closely. An examination of language choice can help us see more clearly how we position ourselves, our students, and our textbooks with respect to authority. It may have been that the teacher required mainly reading from the textbook or that she rarely required students to say the mathematical ideas in their own words. The more ways students can talk about content, the better they understand it (Halliday, 1978).

Often when I write about language choice, I am asked what I recommend people *do*. I am not saying that any of these positionings is exclusively “good” or “bad” because each could have different consequences on the classroom practices, depending on what the teacher’s goals are. I began this chapter by saying that I was not going to prescribe language patterns, rather I encourage people to consider what their goals are and then look closely at their classroom discourse patterns to see if their language choice supports or undermines those goals. While a few mathematics teachers have used teacher research<sup>15</sup> and have been involved in disseminating their work (see, for example, the work of Vicki Zack or Lynne Godfrey), this is an area that deserves more attention in mathematics education because it provides a powerful way for teachers to examine their language choices. Teacher research has been used by teachers in other content areas and

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<sup>15</sup> Here I use the more general term “practitioner research” because in some cases teachers did teacher research and in other cases, they did action research. For more about these distinctions, see Zeichner and Noffke (2001).

has allowed teachers to significantly understand and improve their classroom discourse practices (e.g., Ballenger, 1999; Gallas, 1995; Wells, 2001).

### **Coda**

The *Professional Teaching Standards* (NCTM, 1991) took a strong stance about the need for a shift in authority in mathematics classrooms--away from the teacher and textbook as an authority for determining correct answers and toward mathematical reasoning (see p. 34). However, to what extent this shift might occur through various ways of using textbooks in mathematics classrooms has not been examined in depth by the mathematics education community. I argue that, for authentic learning to take place, we need to pay attention to language choice when referring to and using<sup>16</sup> textbook materials. In making this argument, I realize that I have made a shift from suggesting that teachers should be more conscious of their language choices to saying that students may become more aware of their language choices, impacting in some ways their learning experience in mathematics. Other researchers (e.g., Love & Pimm, 1996; Morgan, 1998) have made a similar shift in their writings about language choice in mathematics education. Ultimately, our goal as mathematics educators is to help our student learn mathematics in ways that is meaningful to them. Part of this learning should include ways of seeing the nature of authority in the discipline and, as the *Standards* suggest, in helping students see themselves as able to use mathematical reasoning to justify their mathematical thinking. However, as Wagner (this session) has pointed out, these kinds of practices are not straightforward. There is much we still need

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<sup>16</sup> I distinguish between “referring to” and “using” because in some cases the textbook is being talked about but may not be physically present (therefore it is being referred to, for example, a teacher might say, “Let’s take out your textbook and see how it does this problem.”) and in other cases the textbook is a physical presence in the ways it is being used (e.g., when it is read directly from).

to learn about what language practices might be most helpful and then how to incorporate them in ways that provide powerful experiences for students. These are issues that should be taken up if we are going to continue improving mathematics classroom practices.

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