are to read them in relation to the information in the textbook. The mathematical knowledge that counts for them in this moment lies within this interface between what they read as mathematical knowledge in the book and how the teacher has them engage with it.

In previous classroom research (Rex & McEachen, 1999), I explored how teachers signaled and students read expectations for displaying subject-matter knowledge so it could be recognized and validated by the teacher. Those displays that are recognized and validated by the teacher in this episode involve reading verbatim, comparing average weights and guessing what the teacher is thinking. Students' knowledge displays that are recognized and not validated include a conjecture about reasons for consistent differences in average weights, a conjecture about the mathematical purpose of a graph model and a conjecture about the mathematical purpose of drawing a line on a graph model. The single instance of a student's unrecognized knowledge display occurs when S attempts to elaborate her conjecture about the thickness of the bridge in the Maryland experiment. Josh's decision not to recognize this elaborated thinking could be read as a signal to S and the other students that this is not how to display knowledge about mathematical thinking.

My aim, by describing what occurred in the ways that I have, is to see ordinarily invisible dimensions and relations that could inform practice, by pointing out for teachers their discursive choices and their interactional trajectories. With only one short transcript, I cannot know whether this knowledge-building social condition is a normative practice in this classroom. Nevertheless, this episode illuminates the interrelated social and epistemic practices in action on this particular day.

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Textbook positioning

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Textbooks have a pervasive presence in mathematics classrooms and can impact what and how teachers teach and students learn. I am interested in the teacher–student–textbook relationship, because the teacher, students and textbook are all potential sources of knowledge in relation to learning. The ways in which the teacher and students draw on, use and refer to the textbook influence its position and privilege as a source of knowledge. And, through this "positioning" (see Wagner & Herbel-Eisenmann, 2009), language choice also allows the teacher and students to position themselves and one another. Although there are many interesting aspects related to the positioning and repositioning of the textbook and the teacher in this transcript, here I narrow the scope of my focus by concentrating on one aspect raised earlier in this composite piece: direct reading from the text.

When the textbook is read from, it is authorized to do things and say things in particular ways and thus amplifies the authority of the textbook as a source of knowing. Most research on authority in classrooms focuses on teacher authority and briefly mentions that the textbook may play a role in authority relationships in classrooms (Amit & Fried, 2005; Haggarty & Pepin, 2002; Hamm & Perry, 2002). None of this research, however, has seriously considered the interactions among the teacher, textbook and students in their inquiries, perhaps because, as Olson (1989) has claimed, textbooks "are taken as the authorized version of a society's valid knowledge" (p. 238).

Josh began the interaction by calling on a student to read from the textbook. After Cory read a section of the textbook (lines 2-5), Josh re-read a portion of what Cory had just read (lines 6-8). Reading directly from the text, especially with little or no interpretation (and then a re-reading) of it, privileges the wording of the textbook. The teacher did not authorize the text, but rather from his position *in* authority, he deferred to the text as authoritative, tacitly suggesting that his students should also defer to the textbook's authority. In this case, the textbook was authorized to introduce and define particular mathematical terms.

When a teacher reads from a textbook or a student is called on to read from the textbook, the talk in the classroom is similar to talk that occurs in church rituals when the congregation is asked to read from or repeat a text. As Olson (1989) has pointed out:

> ritual utterances radically restrict the linguistic options at the lexical, syntactic, and intonational levels [...] [providing] limited options [...] for dissent. [...] [a] speaker [...] is not speaking his own words but the words of elders as a spokesman or messenger. (p. 235)

These 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- or herself, but rather with someone else. It is one of the most controlling ways in which students are restricted from speaking the form of the words they might choose.

Josh called on Cory to read from the book a second time (line 13). Josh further privileged the textbook's definition of graph model when he said that the book gave a "good definition" and provided a *third* reading of the graph model definition (lines 20-21). Both Abram and Christy attempted to answer Josh's questions about the purpose for finding a graph model. When their answers seemed to be not quite what Josh was looking for (*e.g.*, "I could maybe see that…", line 28, and "Well, maybe that's part of it", line 32), he directed students' attention to the specific page number in the book and instructed students to "Read that last paragraph to yourself" so that they could answer his question appropriately.

Josh's questions and imperatives (or commands) positioned the textbook both as something that determined the purpose of classroom activity and as something in which students could find answers to his questions. Interestingly enough, there were instances in the larger set of classroom data that indicated that students came to understand that the textbook was a place in which they were to find answers to Josh's questions. In some instances, when Josh asked students a question and then asked "How do you know?", students said, "It's in the book", as a form of explanation or justification.

I contend that the words spoken in relation to the textbook matter when supporting students' learning. When teachers, textbooks and students come into contact with one another, there is the potential for each of these "participants" in the classroom to take on responsibility for the introduction and development of mathematical knowledge. A teacher's language choice when using and referring to textbooks encodes how teachers, textbooks and students are positioned as being responsible for learning mathematical terms, definitions and concepts.

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Science or mathematics?

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The kind of inquiry reflected in the transcript could easily have been part of a science class: collecting, representing, analyzing and comparing data with other data sets is a frequent occurrence in science classrooms. Modeling is also an important activity in science education (Stewart *et al.*, 2005). However, the instructional approach to modeling in science is different from the approach used by this teacher.

In the transcript, the sequence of activities seemed to be:

- collect data;
- represent the data;
- examine the data pattern on the graph;
- predict.

In addition, the students were asked to *compare* the represented data patterns from their class with those from a (presumably) fictional class to evaluate the goodness of fit of the graph model for the two different data sets. Some of these activities (*e.g.,* comparing the graph models and predictions) occurred during public discussions among the teacher and members of the class.

Stewart and his colleagues have outlined how science classrooms should sequence inquiry activities when they ask students to evaluate models. First, students need to collect or review someone else's data to look for patterns using a variety of data representations (tables, graphs, physical objects, *etc.*). Second, they must use these data representations to derive causal models. Third, they are to use the representations and models to make predictions. Fourth, they should present representations and models in a public forum to evaluate their validity in light of critiques by peers. Many of the activities described by Stewart and his colleagues seem very similar to those employed in the transcript from Josh's mathematics class. What differs is the range of data representations employed and their use in deriving causal models.

One important difference between mathematics and science is the nature of the models. In science, models often provide a metaphorical explanation for the properties of matter and/or energy. Scientific models are always evaluated in terms of what they can tell us about objects of scientific inquiry. In contrast, mathematical models need to be evaluated on their own terms: internal consistency, precision, logical coherence. A mathematical model (*e.g.*, the graph of a linear function) can help us to predict what is likely to happen when the values of the variables in the model increase or decrease. If a linear model fails to predict the phenomena it was supposed to predict, then a different model is proposed (curvilinear). The first model is replaced but not rejected as a valid model for a different phenomenon (*e.g.*, density). Mathematical models are not solely evaluated in terms of what they can tell us about objects in the world: they can also be valued for their ability to tell us about the nature of mathematical objects that may or may not have real-world applications.

Turning now to the transcript, there are several instances when the data representations could have been interpreted in either a scientific or a mathematical fashion. Nevertheless, teacher–student transactions co-construct this lesson as occurring within the "mathematics world" and not within the "science world" [1]. The first example occurs before the line numbering begins, when the teacher asks the class to compare the two data tables and Cory responds that the fictional classroom in Maryland may have used heavier paper, because their bridges held more pennies. The teacher responds by expanding on Cory's statement ("Theirs is like heavier or something"): "Looks like on every single layer, there's noticeably more pennies than ours." This exchange continues with another student and then the teacher proposing that the paper may have been thicker in Maryland. It ends with the teacher admitting that he did not know whether they had used construction paper and asks Cory to continue reading the problem.

Thus, the students and teacher could have pursued this idea: that differences in the paper used were causally related to the outcomes observed. This point could have led to a dis-