Communications

The one and the many: transcripts and the art of interpretation

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A classroom transcript is a fiction, something that is made. It is usually a written text constructed from an audio recording or the sound track of a video-recording of the actual classroom event, which has vanished forever. Both of these latter records are themselves intentional traces. Transcripts are thus, in the words of the UK playwright Tom Stoppard (1972), "twice removed from the centre of events" (p. 36). Nonetheless, they are useful fictions, ones which can reward close attention.

In this collection of communications [1], seven authors make brief interpretative remarks concerning aspects of the same short classroom transcript [2]. Depending on which phenomena we attend to, the means and manner of that attention, the theoretical resources we overlay and the resulting possibilities that ensue from each fleeting analysis, we seek to illustrate some of the potential for attending closely to classroom transcripts, transcripts that carry with them a certain, albeit low-level, veracity (the event from which they have been fabricated actually happened; see Barthes, 1984). This collection also underlines the importance of reading *into* a piece in order to be able to read *out* from it. Part of this process involves an identification of theorized features, as well as aspects of their functioning. This move is one that goes from global to local, and additionally permits looking out to and for other "instances" of the same phenomenon.

More pertinently, we jointly try both to instantiate and to engage with a challenging discussion around questions of method and technique with regard to classroom analysis (see also Pimm, 2009), bearing in mind that almost every piece of mathematics education research is based on language data to some greater or lesser extent. Whether these data consist of oral interviews, transcripts of classroom video recordings, textbooks (ancient or modern), student's written responses to tasks, mathematicians' writings or teacher study group recordings, being able to work with and analyze language data at length and at depth is a significant skill, one that we feel is underrepresented in the research literature.

The class setting and focal transcript

The excerpt comes from a grade 8 classroom (ages 13-14 years) in the USA, in which the teacher, Josh, was working on a unit on mathematical modeling from *Thinking with Mathematical Models* [TMM] (Lappan *et al.*, 1998; italics show where the textbook is being read aloud). At least two different kinds of modeling are included in TMM: (a) instances in which students are asked to collect the data themselves and then represent and analyze it; (b) those in which students are provided with data, graphs or equations from a (purported) pre-existing situation. Both kinds were employed in this excerpt (J refers to the teacher, Josh; S stands for un-named students). Figure 1 shows the relevant textbook extract.

Notes

[1] The contributors all attended a discussion group at a small conference on Discourse and Equity in Mathematics Education held in Rochester, NY, in 2008. This conference was supported by an NSF grant (#0711138). Any opinions, findings, and conclusions or recommendations expressed are those of the authors and do not necessarily reflect the views of NSF.

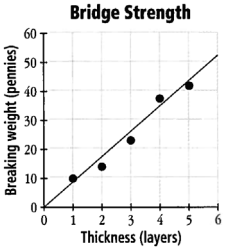
[2] The transcript was originally from Beth Herbel-Eisenmann's doctoral research. The section that has line numbers was the original part of the transcript shared with the larger group who attended the discussion group at the Rochester conference and appears in Herbel-Eisenmann (2009, p. 141). The section of transcript that precedes the numbered part was provided to the group of authors later when they agreed to contribute to this writing.

Drawing Graph Models

A class in Maryland did the bridge-thickness experiment. They combined the results from all the groups and found the average breaking weight for each bridge. They organized their data in a table.

Thickness (layers)	1	2	3	4	5
Breaking weight (pennies)	10	14	23	37	42

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



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

Problem 1.2

A. Draw a straight line that seems to fit the pattern in the (thickness, breaking weight) data you graphed in Problem 1.1.

B. Based on your graph model, what breaking weights would you predict for bridges 6 layers thick and 7 layers thick?

C. Suppose you could use half-layers of paper to build the bridges. What breaking weights would you predict for bridges 2.5 layers thick and 3.5 layers thick?

Figure 1. "Drawing Graph Models" from Connected Math Project: Thinking With Mathematical Models.

J: Let's go ahead and take a look and read problem 1.2 where it says, "Drawing graph models." Cory, would you read that please, on p. 7.

[Cory reads the first part about the class from Maryland.]

J: Okay, first of all look at their class average and then look at our class average. How do they compare?

Cory: Theirs is like heavier or something.

J: Okay. Looks like, on every single layer, there's noticeably more pennies than ours.

S: [inaudible]

J: Maybe. Maybe it was thicker.

S: Maybe their paper was thicker [inaudible].

J: I don't know, maybe they used construction paper or something, I don't know.

S: Looks like [inaudible].

J: Let's go ahead, read on.

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

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

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

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

[a little while later]

J: … Remember what a graph model is – it's *a straight line or a curve that shows a trend in a set of data,* it fits the data. So that all the points are pretty close [to the line of best fit]. Um, I don't know. Why do we do this? What is the purpose of a graph model? [Abram's hand goes up right away] Abram, what's the purpose?

Abram: To show the linear relationship.

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

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

J: Well, maybe that's part of it. Look back at your definition for a graph model. Look at your definition of a graph model. What does it say? Read that last paragraph to yourself on page 7. Lance, what's the purpose here? Why do we even bother doing this?

References

Barthes, R. (1984) *Camera Lucida: Reflections on Photography.* London, UK: Fontana.

Herbel-Eisenmann, B. (2009) Negotiation of the "presence *of* the text": how might teachers' language choices influence the positioning of the textbook? In Remillard, J., Herbel-Eisenmann, B. & Lloyd, G. (Eds.) *Mathematics Teachers at Work: Connecting Curriculum Materials and Classroom Instruction*, pp. 134-151. New York, NY: Routledge.

Herbel-Eisenmann, B., Choppin, J., Wagner, D. & Pimm, D. (Eds.) (2012) *Equity in Discourse for Mathematics Education: Theories, Practices and Policies.* New York, NY: Springer.

Lappan, G., Fey, J., Fitzgerald, W., Friel, S. & Phillips, E. (1998) *Thinking with Mathematical Models (Teacher's edition).* Menlo Park, CA: Dale Seymour Publications.

Pimm, D. (2009) Method, certainty and trust across disciplinary boundaries. *ZDM* **41**(1-2), 155-159.

Stoppard, T. (1972) *Jumpers.* London, UK: Faber and Faber.

Work address

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I start with the observation that the voice of the transcriber occasionally appears (between square brackets), much as director's notes might, commenting for instance that it is now "a little while later" (line 22) or that "Abram's hand goes up right away" (line 26). Next, the transcript has line numbers, which is one way of allowing close pointing, an asset that is insufficiently used in most articles to warrant them, as opposed to speaker turn numbers. Line numbers are a complete artifact of the transcription rather than of the speech data itself [1]. In a piece in this journal, Staats (2008), drawing on the emergent field of ethnopoetics (within linguistic anthropology), has queried whether prose (with its artificial right as well as left margin) is the most appropriate form for mathematics classroom transcription. So one possibility would be to consider re-lining the transcript to bring out some structure I might hear or see.

The things that I notice here come from a long time of looking at and reading about classroom language. My general orientation is one informed by a broad linguistics-based discourse analysis (as opposed to conversation analysis), particularised through the specific emphases and pressures that mathematics as the focus of discussion brings about. Virtually the first thing that catches my eye is the practice of students reading aloud from the text. This allows the textbook to have an actual voice in the speech environment. I ring the opening "Let's" with a pen and expect to find first-person pronouns at work, singular and plural, although I expect their movement through the transcript may be simple, regular and stable or sometimes turbulent. "Let's" is a veiled imperative. I also circle the opening explicit imperative "read on" (addressed, I assume, to Cory, though addressivity is one of the really hard things to garner from a transcript alone; see Pimm, Beatty & Moss, 2007, for more on addressivity). In line 13, "Cory, read on" is a more overtly addressed imperative, but in lines 26, 30 and 34 we cannot tell if the teacher's cued elicitation of these individuals is in response to raised hands or other indicators. But imperatives, whether in a textbook or in a teacher's words, often signal what the students are actually to do: "remember", "read" and "look" feature highly here.

Italicising words in the transcript is a transcriber device to try to help the reader be aware of the intertextuality of the textbook in the spoken classroom discourse (for more on mathematics textbook intertext, see Dowling, 1991). The two extensive passages when Cory is reading aloud are pretty straightforward in their attribution, but what about in lines 20-21 and 23-24? I find myself wondering how the teacher, Josh, prosodically handled this revoicing intertext. Do the students hear the voice (and authority) of the textbook here, or the voice (and authority) of the teacher, to declare things as definitions?

For instance, there is language being brought in from the mathematics text and emphasised (most particularly the framing of "a straight line or a curve that shows a trend in a set of data" as a definition of "graph model"), but there is also local vocabulary being used (*e.g.*, line 12). And the use of the word "that" which begins "That is sometimes called a line of best fit" could be *anaphoric* (referring back within the transcript) or *deictic* (pointing to the immediate context of the utterance, possibly as with the somewhat confusing "there's" in line 19). And what are the students to make of "sometimes"?

There are also common words between text-language and classroom-language, words like "show": the text (line 3) talks of drawing a line "to show this trend" (which I take to be a partially set phrase here, that of *showing a trend*), while Abram (line 27) offers "to show the linear relationship" and the teacher says "shows the path" (line 21) and "show the pattern" (lines 29-30). And this specific verbal choice raises an important mathematical question as to whether this thing (called "the trend") pre-exists the use of the graph model or whether it is actually created (called into being) as a result of the model being applied. "Show" suggests the former, more passive interpretation.

The question of pronoun reference is interesting: there are teacher "I"s (*e.g.*, line 25, but also 29) as well as "we"s (*e.g.*, line 12) and teacher "you"s (*e.g.*, lines 11, 32 and 34). I have lots of questions about these pronouns. To talk of "your vocabulary words" (line 20), when there is also a certain amount of "we"-speak is arguably contrastive, explicitly excluding the teacher. However, when and why in line 33 does it suddenly become "your definition" that the teacher is directing them to in the funnel of imperative and interrogative cues in lines 32-35? Is it because the teacher cannot claim it as "ours" when it has evidently come from the book, peopled by "them"? Yet to call it "their definition" might be too distancing. How does this relate to Christy's use of "you" in her response (line 31)?

A sophisticated reader can pick up the intent of the text sentence at line 15 beginning "Once you fit …", but the ambiguous use of "you" (for "one") might conceal that this use is general and that what you can use it for is its purpose. Here, the teacher repeats his question three times and hedges his way out of having to accept either Abram's or Christy's responses. (In passing, note the infinitive form of these responses in lines 27 and 31, the presumed head of the sentence being "The purpose of a graph model is …".) Also notice the explicit use of elements from the mathematics register in Abram's response, compared with the more colloquial response of Christy, who also substituted the lexical item "tell" for "show". And the teacher uses the word "just" in each case to identify the insufficiency, a trigger word for some students (see Wagner & Herbel-Eisenmann, 2008). There is much of interest here.