A DISCURSIVE FRAMEWORK FOR EXAMINING THE POSITIONING OF A LEARNER IN A MATHEMATICS TEXTBOOK

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Personal Positioning in Relation to Mathematics

In *TMM*, first person pronouns[1] are entirely absent. Such an absence obscures the presence of human beings in a text. The second person pronoun ***you*** appears 263 times in *TMM*. Two forms are especially relevant: 1) ***you*** **+ a verb** (165 times); and 2) **an inanimate object + an animate verb +** ***you*** **(as direct object)** (37 times). The most pervasive form, ***you*** **+ a verb**, includes such phrases as *you find, you know,* and *you think*. In these statements, the authors tell the readers about themselves, defining and controlling the 'common knowledge' (Edwards & Mercer, 1987), and thus use such control to point out the mathematics they hope (or assume) the students are constructing. In *TMM*, the other common *you*-construction (**an inanimate object + an animate verb +** ***you*** **(as direct object)**) provides a striking example of obscured personal agency*:* inanimate objects perform activities that are typically associated with people – e.g., "The graph shows you…". In reality graphs cannot "show" you anything.

The modality of a text also points to the text's construction of the role of humans in relation to mathematics. The modality of the text includes "indications of the degree of likelihood, probability, weight or authority the speaker attaches to an utterance" (Hodge & Kress, 1993, p. 9). One set of modal forms, hedges*,* describe words that point at uncertainty. The most common hedge in *TMM* is *about* (12 instances), followed by *might* (7 instances) and *may* (5 instances). Modality also appears in the authors' verb choice: *would* (55 times), *can* and *will* (40 times each), *could* (13 times), and *should* (11 times). The frequency of these different modal verbs indicate an amplified voice of certainty because the verbs that express stronger conviction (*would, can*, and *will*) are much more common than those that communicate weaker conviction (*could* and *should*). The strong modal verbs, coupled with the lack of hedging, suggest that mathematical knowledge ought to be expressed with certainty, which could suggest that the knowledge is not contingent upon human relations.

Student Positioning in Relation to Peers and the Teacher

Pictures alongside verbal text can impact the reader's experience of the text. In *TMM*, for example, there are 24 pictorial images. Of these, only 7 are photographs. The textbook's preference for drawings, which are more generic than photographs, mirrors its linguistic obfuscation of particular people. Furthermore, only a quarter of the images show people, and among these we find only one image of a person doing mathematics – a drawing of a hand conducting a mathematical investigation. The disembodied, generic hand parallels the lost face of the mathematician in agency-masking sentences such as the ones discussed above.

Morgan (1996) asserts that imperatives (or commands) tacitly mark the reader as a capable member of the mathematics community. However, we suggest that such positioning is not clear

[1] Tools and concepts from discourse analysis are underlined here.

Lloyd, G. M., Wilson, M., Wilkins, J. L. M., & Behm, S. L. (Eds.). (2005). *Proceedings of the 27th annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education.*

from the mere presence of imperatives. Rotman (1988) distinguishes between what he calls inclusive imperatives (e.g. *describe, explain, prove*), which ask the reader to be a thinker, and what he calls exclusive imperatives (e.g. *write, calculate, copy*), which ask the reader to be a scribbler. The thinker imperatives construct a reader whose actions are included in a community of people doing mathematics, whereas the scribbler imperatives construct one whose actions can be excluded from such a community. The student who 'scribbles' can work independent from other people (including her teacher and peers).

Student Positioning in Relation to the World

Most of the prompts in the analyzed textbook are referred to as 'real life', 'applications', and 'connections' (connections between mathematics and real life). Though the textbook consistently places its mathematics in 'real' <u>contexts</u> (with few exceptions), linguistic and other clues point to an inconsequential relationship between the student and her world. When we compare the instances of <u>low modality</u> (expressing low levels of certainty) with those of <u>high modality</u>, we begin to see what experiences the text foregrounds. The text refers with uncertainty to the student's experiences outside the classroom using hedging words like *probably* or *might*. However, the text expresses certainty about the student's abstract mathematical experiences, as in "In your earlier work, you saw that …" (p. 9). Because the authors know what the curriculum offers, they work under the assumption that the student has learned particular mathematical ideas. Yet, the authors cannot really know what their readers have seen. Students might be led to think that their everyday experiences matter less than their mathematical experiences?

Revisioning Mathematics Text

We were surprised by the results of our analysis of this textbook that we both appreciate for its constructivist approach to mathematics. The language forms and images suggest a different view of mathematics, one in which the student works independently from a pre-existent mathematics. How then does such a text become a tool for constructivist-informed education?

We see room for mathematics textbook writers to change the *form* of their writing to recognize the connections between readers and their world, which includes the people around them. Until such textbooks appear, we note that any textbook is mediated through a person (the teacher) in a conversation amongst many persons (students). In such a community, there is room to draw awareness to relationships between particular persons (historical or modern, professional or novice mathematicians) and the apparently abstract, static discipline of mathematics.

References

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