RE-MYTHOLOGIZING MATHEMATICS BY POSITIONING

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Using spatial metaphors, we analyse the way positioning is conceptualized in current mathematics education literature, and the way it may be alternatively conceptualized. Our theorization favours immanent experience over transcendent discourses. We claim that changing the way mathematics is talked about and changing the stories (or myths) told about mathematics is necessary for changing practices.

INTRODUCTION

With growing awareness of the significance of social interaction in the development of mathematical understanding, and the related attention to interpersonal positioning, we ask whether mathematics teaching should be oriented around equipping students for action, or building a particular identity. The difference between action and stability is central to Harré and van Langenhove's (1999) conceptualization of positioning, from which we, in this paper, articulate a theoretical lens for evaluating accounts of classroom positioning in mathematics education research. In developing a relatively radical positioning theory that focuses on moments of action rather than on apparently stable characteristics of individuals and the discipline, we claim that changing the way mathematics is talked about and changing the stories (or myths) told about mathematics is necessary for changing the way mathematics is done and the way it is taught.

POSITIONING THEORY – LOCATING THE SUBJECT

Rom Harré and Luk van Langenhove's positioning theory, which is articulated in their edited book, describes the "dynamic stability between actors' positions, the social force of what they say and do, and the storylines that are instantiated in the sayings and doings of each episode" (van Langenhove & Harré, 1999, p. 10). 'Positioning' refers to the ways in which people use action and speech to arrange social structures. As outlined in their introduction to the book, in any utterance clues in word choice or associated actions evoke images of known storylines and positions within that story. The storylines can stem from culturally shared repertoires or can be invented. For example, a teacher may say something that positions herself as a coach and the student as a motivated athlete. Neither require experience as a coach or an athlete but they would have to know stories about coaches and athletes.

In any conversation, an initial utterance would be called first order positioning as it introduces the positioning within a certain storyline. In a subsequent utterance, if someone moves to change the positioning within the storyline or to change the storyline, it is called second order positioning. We use the following conversation

from a middle school mathematics class to illustrate these different types of positioning. Italicization, in this case, represents reading from the textbook.

01   **Teacher**: Let's go ahead, read on.

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

06   **Teacher**: Okay, now, let's look at that line again: *This line is a good model for*
07   *the relationship because for the thicknesses the class tested, the points on the*
08   *line are close to the points from the experiment.* Take a look at what they did.
09   Now, their data was a little bit scattered, a little more scattered than ours was.
10   But, they still were able to draw a line that seemed to fit the data pretty well.
11   …   That's sometimes called a line of best fit. We're gonna use that term an
12   awful lot. Cory read on.

In this episode, there are multiple storylines because there are multiple relationships, involving the teacher, Cory, other students in the immediate classroom as well as the mythical class mentioned in the textbook, the textbook, its authors, and others. The teacher initiates a typical teacher-student storyline, telling Cory to read from the textbook. This is first order positioning. Cory is complicit, which is either a low-impact form of second order positioning, or is a substantiation of the teacher's first order positioning – together, in agreement, they establish a storyline.

In another storyline, the textbook authors take the initiative with first order positioning. By writing about a particular mathematical situation and giving instructions for action, they tacitly suggested that they have provided all the necessary information. The teacher resists somewhat by interpreting the graph of the data in the textbook and comparing it to the data that his class has collected (lines 08-10). When the teacher makes it clear that he is aware of the local situation, and that the textbook authors are not, he takes some authority away from them. At the same time, the teacher positions them with the authority to tell how to draw a line that is a "good model for the relationship" (lines 06-08). Third order positioning is explicitly metadiscursive: it is reflective with explicit conversation about positioning. If, for example, the teacher in the excerpted situation would have told the students, "When we read a textbook, we should remember that the authors don't know about our classroom as well as we do," it would have been third order positioning.

Positioning theory concentrates on the moment of interaction and thus recognizes that multiple storylines can be enacted simultaneously. This focus on what Davies and Harré (1999) referred to as the immanent includes attention to the moment in time and to the people present in this moment. This is juxtaposed with interpretations that privilege the transcendent, and which attend to factors outside of the current interaction. Davies and Harré (1999) use Saussure's distinction between discourse practice and the discursive systems in which they are situated: "La langue is an

intellectualizing myth—only la parole is psychologically and socially real" (p. 32).

With their attention to relationships in the moment, van Langenhove and Harré (1999) argued that all positioning is reciprocal. Thus, in every act or utterance, a person simultaneously positions him- or herself, and the other people with whom he or she is relating. As a result, expressions of identity are contextual and enact polarizations of character within the storylines at play in the context. Also relating to immanence, positioning is dynamic. We characterize this dynamism by saying that storylines are contestable and contingent in the enactment of any particular conversation. First, as described above, storylines are contestable because whenever one person enacts a certain storyline the others in the interaction may choose to be complicit with that storyline and the way they are positioned in it or they may resist and enact a competing storyline. Second, storylines are contingent in that different people may see different storylines being enacted in any given situation. As stated by Davies and Harré, "two people can be living quite different narratives without realizing they are doing so" (pp. 47-8).

For us, the most radical aspect of Harré and van Langenhove's (1999) positioning theory is their claim that la langue (sometimes called 'the discourse,' 'the discipline,' 'the Discourse,' or 'the discursive system', albeit with different nuances) is a myth. This would suggest, for example, that there is no such thing as 'mathematics' as a discipline. Rather 'mathematics' is unique in any interaction. Whether la langue is real or not is not a question for us. Instead, we are interested in the interpretive value of considering classroom practices with the assumption that there is no exterior structure that forces particular interactions. This view illuminates discourse participants' freedom to conceive alternative practices. No one can enforce a particular storyline or positioning in a conversation. Any participant is free to make moves (with speech or action) to establish a particular positioning.

We recognize that myths are powerful: they often feel more real than anything. For instance, though race distinctions are a myth (constructed, not inherent), these distinctions are often the most powerful reality in the lives of people suffering the effects of racism. The word 'myth' refers to stories that are well known in a culture. With this sense of the word, calling a story a myth makes no claim about its veracity. Rather, it makes a claim that the story is very well known and formative in the way people think. Myths are stories people live by, so we claim it is possible for people to position themselves in relation to a discipline whether 'the discipline' is something real or not. Positioning in relation to the discipline is commonplace because there are powerful mythologies relating to mathematics in academic cultures – for example, 'mathematics is useful', and 'mathematics is independent from values'. Thus we argue that even attention to a transcendent discipline can have its place in consideration of immanent experience. People take their storylines from their myths.

POSITIONING STUDENTS IN MATHEMATICS EDUCATION RESEARCH

To illustrate some of the characteristics of our view of positioning in juxtaposition

with alternative views on positioning, we use a series of spatial images as metaphors. Our images draw attention to issues related to immanence, reciprocity, contingency, and contestability in the defining and applying of positioning. In the conference presentation, we will illustrate the significance of each feature of positioning using mathematics education literature in which positioning is central.

Immanence

We have developed our own interpretation of Harré and van Langenhove's (1999) radical focus on the immanent: we share their view that focusing on the immanent is preferable but we understand how one could use an immanent lens to reconcile scholarship that focuses on the transcendent. To illustrate the difference between positioning that foregrounds the transcendent and positioning that foregrounds the immanent, we visualize a mathematics student as a point, A. One could locate the position of the point with Cartesian coordinates – point A might be at (2,1). However,

we could avoid analytic geometry and locate point A without a coordinate system by describing its location in terms of other points to which it relates – the point A may form a triangle with B and C. Figure 1 illustrates these two ways of seeing point A. We emphasize how different the same point A looks in each way of seeing the point's position.

Figure 1
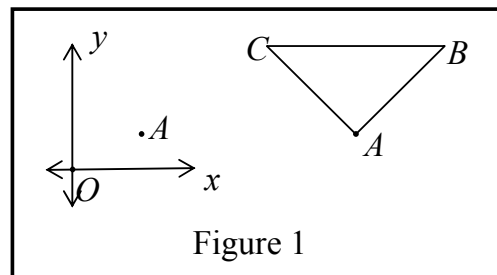
Locating points in relation to other points is like locating students in relation to other people in their mathematics learning. Student A relates to student B and teacher C, for example. By contrast, locating analytically is like theorizing that positions students in relation to mathematics. In analytic geometry the representation of the point's position mentions no other points, just as some scholarship considers the positioning of students in relation to mathematics without mentioning how this positioning relates to other individuals. Instead, they are positioned within a system.

We might argue that the origin is a significant point in the Cartesian system, but it is a point that is taken differently than other points in the system. Similarly, when interpreting scholarship that characterizes student positioning in relation to mathematics (the system), we can recognize that the discipline may be taken as an entity but it is mediated through a person (e.g., a mathematics teacher), or multiple persons (e.g., students perceived as "good" at mathematics). Thus there are one or more unrecognized person**s** central to the discipline.

The way one chooses to focus significantly impacts the portrayal of the student. For example, our interpretation of the transcript above took an immanent focus, with attention to interpersonal dynamics. With a transcendent focus one might foreground the attention to the apparent technical necessities of modeling and establishing 'good fit'. In the presentation, we will use Evans's (2000) work in which he proposed "a notion of the context of mathematical thinking that can be captured by the idea of

positioning in practices" (p. 8) and Lerman's (2001) illumination of repressive aspects of the practice of mathematics teaching to illustrate the significant complexities of immanent versus transcendent foci.

Reciprocity

The reciprocity of positioning relates closely to immanence in positioning theory, because immanence requires referring to a person in relation to others and the relationship goes both ways. In the illustration in Figure 1, locating point A in terms of points B and C implies, even requires, that B and C are also in relation to A. Together they form a triangle. For example, from our transcript, the teacher, enacting a leader–follower storyline by telling Cory what to do, typecasts Cory as a follower. Cory seems to comply. In the presentation, we will point out the paucity of attention to such reciprocity in the mathematics education literature, and we will use Evans (2000) to show how reciprocity can be obscured by using the words 'position' and 'positioning' as nouns instead of verbs.

Contingency

We now draw attention to two issues that relate to the contingent nature of positioning. Firstly, to illustrate that one can interpret the same situation using different storylines, we show in Figure 2 that while person A can be in relation to student B and teacher C there are other co-incidental possibilities for the positioning of A in relation to B. One could focus instead on the relation to D and E, with which A and B form a square in a different plane. Teachers may interpret situations thinking only of their own perspective. There are more dimensions – even more than three. It is valuable for teachers and even students to attend to the various possible points of view in mathematics classrooms. In our transcript, though Cory seems to be complicit with the teacher, we do not know why he is. Significantly different storylines would have him complying for different reasons – for example, to garner teacher approval, or because he sees the teacher's guidance as helpful in his pursuit of understanding.

Figure 2
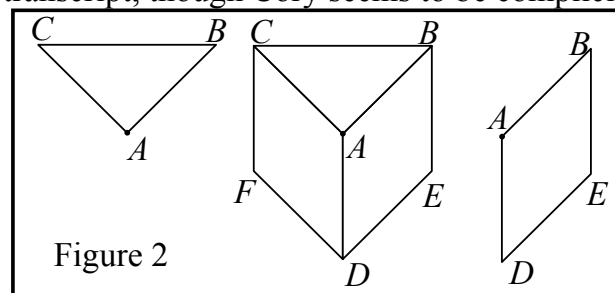
In the presentation, we will draw attention to Nasir and Saxe's (2003) identification of different sources of cultural capital that students can draw upon when considering their 'place' in a classroom interaction. Their different funds of knowledge have implications on participants' senses of each other's capacity. We will also use Ainley's (1988) investigation of students' perceptions of the questions teachers asked to show an example of students and teachers having different interpetations of the same situation. We will argue that it is even possible for different positionings to co-exist in a complex weave.

Secondly, we said above that A, B, E, and D together form a square in our illustration. Looking at the shape without added context, however, we see a rhombus,

not a square. The perspective of the person visualizing the positioning is significant. Thus, it may be true in a way to say "positioning is [a certain way]" in research reporting, but it would also be true to recognize that this is only one perspective on the positioning. Analyzing positioning from a vantage point that feels exterior to a situation is different from analyzing it from the perspective of a participant. A significant question is: who decides what the positioning is? In the context of interaction, the participants' decisions on this are most significant, but such a participatory position is relatively unavailable for researchers. Thus, with our transcript, we offered accounts of positioning but we want to make clear that there are other viable interpretations. Attending to more of these by drawing on various participants' perspectives would be helpful. In the presentation, we will consider Evans's (2000) recognition of the multiplicity of available positionings.

Contestability

Relating to the complexity due to the multiple possibilities for visualizing positioning in any given moment, there is further complexity due to the ephemeral and dynamic nature of positioning. All the illustrative images we used above are static images. It is difficult in a print medium to show them moving and changing shape or to make them as fuzzy as they should be to capture our view of positioning. Second and third order positioning, described earlier, remind us that even when one vision of positioning is initiated, it is contestable. The participants in the relationship can make moves to change that positioning, with either tacit moves (second order positioning) or explicit moves (third order). For example in the transcript, we could see the teacher first establishing the textbook and its authors as authoritative (by using it to structure the lesson), and then undermining this authority (by saying that 'they' do not know the situation in the real classroom).

Not only are the relationships between participants contestable, but their relationships to 'the' external power (the mythological discipline) are also. To illustrate, keeping point A in the same position, we could move the other points with which A associates to form different triangles and other shapes, not necessarily polygons. And in the analytic system, we could freeze A and move the coordinate system's origin. When visualizing a student's positioning in relation to mathematics, it is important to remember that different people (including students) may have very different senses of what (or where) mathematics is, and of how a person can relate to it. In the presentation, we will use examples from Sensevy et al. (2005) to show how using 'positioning' or 'positions' as verbs instead of nouns gives a different sense of the available options for classroom participants. We will also use Gates (2006) to demonstrate the rigidity of the discipline suggested with a focus on dispositions (this word has 'position' as its root).

DISCUSSION

Our take on Harré and van Langenhove's (1999) positioning theory favours a focus on immanent practice, instead of attention to transcendent discourses, and highlights

the reciprocal, contingent and contestable nature of positioning. We see benefits in theorizing for particular purposes and we suggest that more attention to immanence and its related features is warranted in the analysis of mathematics learning.

We described above how myths are stories people live by. No matter how real one thinks mathematics as a discipline is, it is possible to recognize that students position themselves in relation to the 'mythological' discipline, and it is misleading to write about the discipline as if it is uniformly experienced by all people. Students experience the discipline through their teachers as mediums of the discipline, but they also may experience the discipline as a presence. The repression associated with mathematics expresses itself in interpersonal utterances, which are experienced in unique contexts. In the presence of such a powerful myth as 'mathematics' it is worth considering how educators could demythologize the discipline and thus render it powerless, or perhaps less powerful. More appropriately, we suggest, is the possibility to re-mythologize such a powerful discipline by reconceptualising it with human stories that invite identification with storylines that are not traditionally a part of mathematics classroom discourse.

We are recommending a relatively radical approach to positioning in mathematics education, less radical than Harré's and van Langenhove's (1999). Instead of de-mythologizing mathematics and rendering it impotent as a discipline, we advocate re-mythologizing it by drawing attention to the narratives at play in classrooms and outside classrooms. We suggest the following questions as potent for research and for use by mathematics teachers to invite narrative into the classroom. The first two questions are Morgan's (2006, p. 229) and the others are adapted from her work and generalized to extend outside of written texts, which was her focus: 1) Who does mathematics (Is a human agent present)? 2) What processes are human agents engaged in? 3) Who are these human agents doing these things for and why? 4) Who is looked at as an authority? 5) What roles are available to the primary human agent and the other human agents in the interaction? 6) How does the interaction connect with human relationships outside the classroom context?

Morgan showed (and we would corroborate) that the field of linguistics offers useful tools for identifying answers to these questions. We would also point at two other fields of mathematics education research to help identify possible storylines and positioning within them. Ethnomathematics takes the view that all mathematics is cultural, and so claims that any mathematics is set in human story. It can add to one's repertoire of ways to participate in mathematics. Identity work also has potential for this end as it draws attention to various ways students might see themselves.

Perhaps the best way to deal with the power of a weighty discipline like mathematics is not to fight it, but rather to ignore its weight by simply engaging students in the doing of mathematics. Let students position themselves in various ways and help them recognize that positioning themselves within various storylines in various ways can only strengthen their mathematics.

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