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Re-mythologizing mathematics through attention to classroom positioning

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With our conceptualization of Harré and van Langenhove's (1999) positioning theory, we draw attention to immanent experience and read transcendent discursive practices through the moment of interaction. We use a series of spatial images as metaphors to analyze the way positioning is conceptualized in current mathematics education literature, and the way it may be alternatively conceptualized. This leads us to claim that changing the way mathematics is talked about and changing the stories (or myths) told about mathematics is necessary for efforts to change the way mathematics is done and the way it is taught.

With growing awareness of the significance of social interaction in the development of mathematical understanding, researchers in mathematics education are attending increasingly to the nature of interpersonal positioning within classroom relationships. In addition to explicit attention to positioning, the word 'position' sneaks into conversations about dispositions, impositions, juxtapositions, oppositions, propositions, and transpositions.

These position words are similar to each other because they are all nouns, but dispositions seem more stable than propositions, juxtapositions, transpositions and oppositions because people talk about *having* dispositions. By contrast, an imposition, proposition, juxtaposition or opposition is *made* – made in relation to other people or to other people's arguments. This difference raises questions for us about how these words emphasize different aspects of mathematics learning. Should mathematics teaching be oriented around equipping students for action, or building a particular identity?

The difference between stability and action is central to Harré and van Langenhove's (1999) conceptualization of positioning, which we work from to articulate a theoretical lens for evaluating accounts of classroom positioning in mathematics education research. We consider how interpretations of positioning can draw attention to space for action. To illustrate this, we draw on recent work that pays significant attention to positioning.

We adopt a relatively radical positioning theory that focuses on moments of action rather than on apparently stable characteristics of individuals and the discipline. We will 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. We emphasize the need for change to combat the sense of repression often associated with mathematics and argue that scholars should lead the way in being careful about how positioning is talked about and theorized. The way a researcher theorizes positioning (the way she sees and thinks about it) affects the way she interprets actions, including her own.

1.0 Positioning Theory – Locating the subject in mathematics learning

The positioning theory described in an edited book by Rom Harré and Luk van Langenhove called *Positioning Theory: Moral Contexts of Intentional Action* is the primary focus of this section as it underpins our current conceptualization of positioning. Their theorization, which is introduced in the first chapter of the book (van Langenhove and Harré, 1999), is elaborated in the other chapters by various author teams, which mostly include Harré or van Langenhove as co-authors. Their positioning theory draws attention to 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" (p. 10). In this section, we say more about these core ideas and connect them to relevant mathematics education and education literatures.

1.1 Introducing positioning theory

Van Langenhove and Harré (1999) described positioning as the ways in which people use action and speech to arrange social structures. This view does not conflict with other scholars' use of the word. 'Positioning' can refer to physical arrangements, as in Goodwin's (2007) study of how parents and children position themselves while the children do mathematics homework, but more often, as with van Langenhove and Harré, 'positioning' is used metaphorically to represent relationships.

Harré and van Langenhove's (1999) understanding of positioning emerges from Erving Goffman's analytic conception of discourse practices as unfolding dramas, but relates more closely to Goffman's (e.g. 1981) later metaphors of 'footing' and 'frame,' which have been used to interpret practices in mathematics classrooms (e.g., O'Connor and Michaels, 1993). This interpretive concept recognizes that there can be multiple kinds of conversation happening in any mathematics classroom, each of which assigns fluid roles to the participants. There are passive roles and active roles, just as there are stars and bit parts in dramas. Interactive positioning occurs when one person positions another; reflexive positioning occurs when one positions oneself in the conversation. Positioning is not necessarily intentional.

Positioning theory refers to 'storylines' in a sense similar to Goffman's metaphors. As outlined by van Langenhove and Harré (1999), 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. The student may continue the interaction complicit with this positioning or resistant to it.

We notice that van Langenhove and Harré's conceptualization of storylines bears resemblance to *scripts* in Edwards's (1997) cognition-based description of how people draw on known scripts as resources, and to Holland, Lachicotte, Skinner, and Cain's (1998) description of *figured worlds* in their investigation of human identity and its connections to agency. Holland et al. credited Harré, in particular, as leading the way in considering the nature of self in relation to others, and noted connections between figured worlds and storylines. In all three of these approaches, fluidity is emphasized: people can choose how to act and develop their identities.

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 a person reading from their mathematics textbook.

001 Teacher: Let's go ahead, read on
002 Cory: *The class then made a graph of the data. They thought the*
003 *pattern looked somewhat linear, so they drew a line to show this*
004 *trend. This line is a good model for the relationship because, for the*
005 *thicknesses the class tested, the points on the line are close to points from the experiment.*
006 Teacher: Okay, now, let's look at that line again: *This line is a good*
007 *model for the relationship because for the thicknesses the class*
008 *tested, the points on the line are close to the points from the*
009 *experiment.* Take a look at what they did. Now, their data was a little
010 bit scattered, a little more scattered than ours was. But, they still were
011 able to draw a line that seemed to fit the data pretty well. … That's sometimes called a line of best fit. We're gonna use that term an awful lot. Cory read on.

In this episode, there are multiple storylines because there are multiple relationships, including 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 (for the time being). 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 008-010). 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 006-008).[1]

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 have to remember that the authors don't know about our classroom as well as we do," it would have been an example of third order positioning. Attention to metadiscursive language moves as they relate to mathematics classrooms can be found in Rittenhouse's (1998) idea of *stepping out*, Cobb, Yackel, and Wood's (1993) description of "talking about talking mathematics," and Adler's (2001) notion of "transparency." The first two of these constructs focus on meta-language about mathematical processes, and the third focuses more on the discursive construction of mathematics. Going beyond these constructs, which focus on the *teacher's* power to invoke third order positioning, in Wagner (2007) mathematics *students* were also invited to think metadiscursively.

Positioning theory differs from Goffman's approaches by concentrating 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 in line with the common use of the word 'immanent' to describe something inherent to one's local experience. Davies and Harré juxtaposed a focus on the immanent with interpretations that privilege the *transcendent*, and which attend to factors outside of the current interaction. This too is in line with the common use of the word 'transcendent' to refer to something beyond the boundaries of the local. With their favouring of immanence over transcendence, Davies and Harré (1999) used 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). As Walkerdine (1988) claimed, "what is claimed as real is the biggest fiction of all" (p. 202).

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 (Holland et al, 1998). For example, by positioning oneself as a teacher in a teacher-student relationship, one positions others as students. Cabral and Baldino (2002), in their Lacanian analysis of a mathematical interaction, claimed, "[T]eacher and student are not labels attached to people, but positions of speech" (p. 174). Tholander and Aronsson (2003) showed that this teacher-student storyline is especially prevalent amongst female students.

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 (1999), "two people can be living quite different narratives without realizing they are doing so" (pp. 47-8).

1.2 Questions about positioning theory

We acknowledge that there are aspects of our description of storylines that warrant further theorization. We note that Davies and Harré (1999), who developed the concept the most in the edited book, leave questions unanswered. It appears that they used 'narrative', 'narratology', and 'storyline' synonymously. We are not convinced that people who do narrative inquiry or research on stories would agree. For example, in a forthcoming book (*Narrative Analysis for Teacher Education: Making the Professional Ethical Turn*), Rex and Juzwik will note issues relating to the conflation of these two key terms in the literature, and Juzwik (2006) has already distinguished between 'narrative' and 'story' in educational research.

Harré and van Langenhove (1999) pointed out that some people are more likely than others to introduce new storylines to any given situation. Our experiences in classrooms raise questions about their claim: we agree that power differentials should not be underestimated but we wonder what Harré and van Langenhove mean when they refer to people's different capacities to initiate storylines. Unproblematised attributions of capacity could allow for a deficit view of people's capabilities. Cohen and Ball's (1999) elaboration of capacity with respect to school improvement recognized multiple contextual agents in classrooms, and significant differences between students' apparent capacity in various contexts and interactions. Capacity is never a fixed entity. This way of looking at students' instructional capacity melds well with Harré

[1] For elaborated analysis of the positioning in the given transcript and its context, see Herbel-Eisenmann (2009).

and van Langenhove's positioning theory because capacity is seen as contingent and dynamic. Capacity too is immanent as it is only meaningful in a particular time and place, in connection with interlocutors' experiences.

We agree that students in a particular classroom, for example, would differ in capacity to initiate storylines that work (i.e., that are taken up by others) because the various students will have learned different ways of positioning themselves effectively in different contexts outside of school. Some of these contexts and their associated effective positioning approaches are more privileged than others in school settings. This phenomenon was shown, albeit with different theoretical underpinnings, by Zevenbergen (2001) and by O'Halloran (2004). Harré and van Langenhove also claimed that people differ in willingness to initiate storylines. We believe that these differences may relate strongly to cultural factors.

Context has a powerful influence on both capacity and intention. The cultural capital that serves a student well in her communities outside of school may not allow her to resist teacher-enacted storylines in a classroom. Furthermore, a teacher may enact a storyline that invites or discourages student initiative, and thus influence the willingness of a student to risk initiating a new storyline. In Wagner and Herbel-Eisenmann (2008), we have demonstrated some subtle language choices that invite and repress student dialogue, but the language choices that do so can also be more explicit ones. For example, if a teacher employs a typical mathematics classroom storyline, with a recurring initiation-response-evaluation sequence, the repetitive evaluation reinforces an authority structure that strips initiative from students. This differs from silencing students because even though complicit they respond to the teacher, but not with initiative.

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 slightly different nuances) is a myth. Their approach would suggest, for example, that there is no such thing as 'mathematics' as a discipline. Rather 'mathematics' is unique in any interaction. When Harré and van Langenhove described the presence of discourses, they focused on particular practices (i.e. *la parole*). However, their treatment of 'narratologies' (stories) recognizes the systemic power of some practices. We suggest that attention to the differences between narrative and storylines may illuminate the tension between local interaction and the exterior disciplines that impact on them.

Whether *la langue* is real or not is not a question for us. 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. Holland et al (1998), made a similar point relating to identity: "the key to human existence was the ability of humans to escape enslavement to whatever stimuli they happened to encounter. And the way they did this was (broadly) linguistic" (p. 35).

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', 'mathematics is independent from values', and 'mathematics is the queen of the sciences'. 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.

2.0 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 will use a series of spatial images as metaphors. This choice feels quite natural to us because the language of positioning theory itself invokes spatial images metaphorically to refer to non-spatial interpersonal relationships. Our images draw attention to issues related to immanence, reciprocity, contingency, and contestability in the defining and applying of positioning. Although these images have helped us sharpen our view of these aspects of positioning, we note that they do not represent some aspects of our sense of positioning. Most importantly, the images seem crisp and static and we think of positioning as fuzzy. Fuzzy images, however, would make it difficult to illustrate other aspects of positioning. Within each juxtaposition represented by our images, we will also consider recent mathematics education literature in which positioning is central to the work.

2.1 Immanence

We have developed our own interpretation of Harré and van Langenhove's (1999) radical focus on the immanent, as opposed to the transcendent: 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 the point *A* without a coordinate system by describing its location in terms of other points to which it relates – the point *A* may be seen to 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.

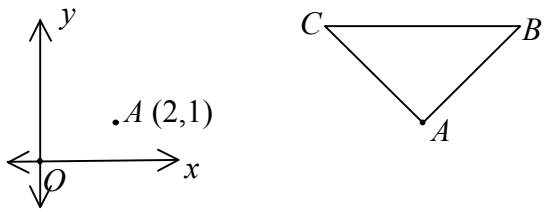

Figure 1: Illustrating transcendent and immanent theorizations of positioning

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. One might locate a student along continua (or axes) that describe the student's pleasure or sense of power, for example. 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 one or more unrecognized people are central to the discipline.[2]

Both ways of referring to the positioning of point *A* are valid, but the way we look at this positioning is significant in determining our visualization of the point and its location. Similarly, it can be reasonable to focus on the immanent or the transcendent when considering the positioning of a mathematics student. The way one chooses to focus significantly impacts the portrayal of the student. For example, our interpretation of the transcript in section 1 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', as opposed to human intentions within the classroom or within the modelled problem.

We can see such distinctions in the literature too. In the ground-breaking work on affect by Evans (2000), positioning was central to his interpretive lens as he interviewed adults to consider the impact of school mathematics on their lives. He proposed "a notion of the context of mathematical thinking that can be captured by the idea of *positioning in practices*" (p. 8), which referred to the way an individual identifies him/herself in relation to mathematics and other discourses. In his analysis, he described students' connection to the discipline of mathematics and the relationship of this link to other discourses, including ones that relate to gender and social standing. Most often Evans focused on positioning in relation to social discourses and connected these to the person's identity within mathematics. Each of the discourses (or practices) he considered is transcendent, referring to relationships and stereotypes outside the given situations.

We argue that each of the discourses Evans considered also has an immanent presence, as it is mediated through relationships with people. Though Evans explicitly focused on transcendent discourses, his use of the word 'positioning' can often be read with an immanent lens, as in "This involves a repression by the man of his feelings through projection and a consequent position as powerful, rational, supportive." (p. 126) – Evans did

[2] In our earlier work, we have drawn attention to linguistic structure that obscures the significant people within the mathematics register (Herbel-Eisenmann and Wagner, 2007; Wagner and Herbel-Eisenmann, 2008; Herbel-Eisenmann, 2007; Wagner 2007).

not indicate whether he saw the man as powerful in general (within the transcendent discourse) or as powerful in relation to the people in his immanent interaction.

Significantly, we notice in the grammar associated with Evans's approach that the discipline is in the subject position of many sentences and thus the discipline acts upon the individual. For example, Lerman (2001) highlighted the repressive aspects of the practice (the discipline) : "As a person steps into a new practice, in social situations, in schooling, in the workplace, or other practices, the regulating effects of that practice begin, positioning the person in that practice" (p. 98). As with Evans, it is not clear whether the word 'practice' is being used to refer to social interactions in the moment or is being used to mean something like the practice of the discipline of mathematics. Lerman, at one point, described how teachers can position students in relation to each other – "the teacher positions one student of a collaborative pair as more able than the other" (p. 104). Just as transcendent-focused analyses can be explained through an immanent lens, Lerman's attention to the immanent interpersonal dynamic may be read through the lens of a transcendent focus. Positioning in this case relates to identity again, and the students are positioned by the discourse as able and unable, but the presence of the other may be ignored.

2.2 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 in section 1, the teacher, enacting a leader–follower storyline by telling Cory what to do, typecasts Cory as a follower. Cory seems to comply.

Sfard's (2001) thinking-as-communicationg metaphor is the closest thing we can find in mathematics education literature to reciprocity in positioning. She viewed learning as initiation to a well-defined discourse, but noted that the rules of interaction in the discipline regulate the interlocutors' "mutual positioning" and shape their identities (p. 31). She used the word 'positioning' a few times but did not explicate her sense of it. Her focus on discursive moves, however, is similar to our view of positioning as action taken in particular situations. In an analysis of oral discourse in middle school mathematics classrooms we have been more explicit about positioning and its reciprocal nature (Herbel-Eisenmann, Wagner, and Cortes, 2008), though not explicit enough to satisfy ourselves now. By analyzing frequently occurring sets of words we showed how positioning is encoded in language practice, and we noted how enacted storylines ascribe roles for individuals in relation to each other, thus representing reciprocity.

The reciprocal nature of positioning may be more obvious when focusing on the immanent with interpersonal positioning, but it also appears in transcendent-focused interpretations of discursive positioning. In Evans's (2000) work the discipline often took the subject position, but at times, with reversals of sentence structure, he highlighted the agency of the individual who chooses which discourse he or she sees himself or herself in relation with (e.g., on page 192).

Often, however, subjectivity is obscured. Authors achieve this obfuscation by using the words 'position' and 'positioning' as nouns, and thus as attributes that a person *has*, rather than as verbs, which describe a person or discipline *acting on* or *with* another person or community. A person's position may become reified more strongly by referring to it as a 'disposition'. This is a word that cannot be used as a verb. It is always a noun. In this way, dispositions are more strongly connected to apparently stable identities than positions and necessarily focus on the transcendent discipline because dispositions are attributes one carries from one situation to the next. Gresalfi and Cobb (2006) made this clear: "Dispositions thus draw our attention to both the discipline as it is realised in a particular classroom and the extent to which students come to identify with the discipline" (p. 50).

2.3 Contingency

We now draw attention to two issues that relate to the contingent nature of positioning. First, one can interpret any situation with different storylines. Second, there is no way of establishing the correct storylines or positionings in a situation because perspectives differ.

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, not considering the perspectives of their students for whom the same point may appear significantly different. There are more dimensions – even more than three. It is valuable for teachers to attend to many possible points of view in mathematics classrooms. Even students can benefit from this kind of

awareness, though, we believe, they are naturally more aware of the significance of point of view because they experience difference from the voice of their teacher daily. In our transcript in section 1, 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 – to garner the teacher's approval, because he sees the teacher's guidance as helpful in his pursuit of understanding, or as a way of ignoring the teacher's desire for him to think independently.

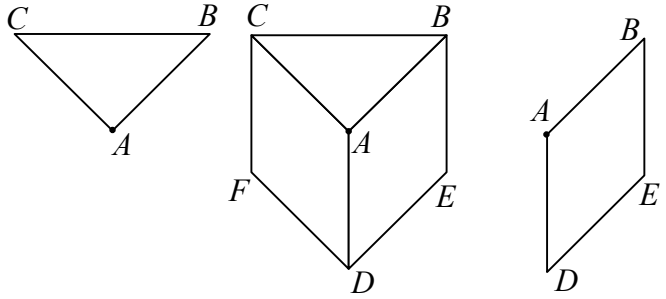

Figure 2: Illustrating the contingency of positioning

Evans (2000) recognized aspects of contingency, as he noted that there are different discourses with which one can associate: "the subject's positioning at any moment in the setting depends on the discourse(s) s/he 'calls up'" (p. 151). This repertoire of available discourses to be drawn upon for interpreting a particular social interaction has also been theorized in terms of funds of knowledge. As demonstrated by Nasir and Saxe (2003), there are different sources of cultural capital that students may draw upon when considering their 'place' in a classroom interaction. Moll, Amanti, Neff, and Gonzalez (1992) argued that recognition of the various funds of knowledge (or available discourses) highlights the fact that the privileging and marginalization of discourses are social constructions, and thus contestable. As noted in section 1, the different funds of knowledge have implications on participants' senses of each other's capacity.

Both with Evans's theorization and with the funds of knowledge approach, the focus is on discourses. Despite this departure from the immanent, we note that storylines are associated with particular discourses, so a student's or teacher's repertoire of storylines to draw upon for conceptualizing their interaction in a particular classroom setting will depend on the discourses with which s/he has had exposure and experience. Here we recognize the difficulty in completely avoiding external, discourse-related influences even when attending to immanent experience.

Examples of different mathematics classroom participants having different interpretations of a situation can be found in Ainley's (1988) investigation of students' perceptions of the questions teachers asked. She found that the students' interpretations of the questions were quite different from the teacher's. Similarly, Wagner (2008) showed how students and their teachers had significantly different impressions of the word 'just'. This prompted our further analysis of the word's use in a sampling of mathematics classrooms (Wagner and Herbel-Eisenmann, 2008), demonstrating the complexity of diverse interpretations that may be invoked all at once. We noted that students have choices about how to interpret a word (or an utterance), but the reality of the moment somehow allows all interpretations to be active at once. The same is true for storylines: there can be various ways of positioning within a storyline, and it is even possible for these 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. Abbott's (1884) *Flatland* provides wonderful imagery that can help us think about the contingency of perspective in relation to the perception that we see the world as it is. 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 in section 1, 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. As demonstrated by Wagner (2008) in his discussion of the word 'just', even when immersed as a researcher and participant in a mathematics classroom, differences of interpretation of meaning are both inevitable and illuminating.

In Evans's (2000) work, he wrote about positioning as if it is not contingent on perspective. Even where he recognized that multiple positionings were available, the person still needed to choose. He did not seem to recognize that two or more positions were possible simultaneously,

and that the way this positioning looked was contingent on the perspective of the interpreter. Nor did he want to recognize that one person in an interaction may foreground a different storyline from another person in the interaction. Rather, he argued that "it is possible to describe the subject's positioning in particular episodes of [an] interview" (p. 177). It has been interesting to us that his analysis of positioning recognized multiple possibilities more when he analyzed his own positioning in his interviews, in which he was a participant, than when he described the interviewee's positioning in other contexts. This is an example of how the perspective of an outsider doing research makes it relatively difficult to notice the contingent nature of positioning.

2.4 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. 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 section 1, 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 or use a different system, such as polar coordinates. 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. Furthermore, a person's image of mathematics inevitably shifts as they engage in mathematics.

When the words 'positioning' and 'positions' are used as verbs, it is easier to see that positions change because the act of positioning implies a move to change the positioning. To exemplify this difference, we draw on Sensevy, Schubauer-Leoni, Mercier, Ligozat, and Perrot (2005), who used the word 'positions' in two distinct ways in their analysis of mathematics teachers' actions leading an activity. When 'positions' is a noun – as in "The teacher thus secures a possible didactic tool for moving forward the lesson by differentiating the students' positions" (p. 176) – the impression is that each student is stuck with a particular position. By contrast, when 'positions' is a verb – as in, "Therefore, at this moment, he positions himself within the same didactical space as the students" (p. 178) – it is clear that the teacher made a choice (probably not consciously). This time the choice was to align with the students. 'Positioning' can appear as a noun or verb, just like 'positions.' These grammatical distinctions and their embedded assumptions are rarely recognized or treated as problematic in the literature. Yet, we argue that they are important distinctions to attend to, with implications for the reader's awareness of the space for action available to the people being described.

When the word 'disposition' is used to describe the kind of positioning a person typically takes up, we argue that the impression is that this quality is even more stable because the word 'disposition' is always a noun. Exemplifying this, Gates (2006) showed the power of dispositions in mathematics teacher development: "We are all prisoners of our past and act according to various social norms and consequently develop enduring dispositions" (p. 352). Ironically, his focus on the enduring nature of dispositions and their resistance to teacher development is probably intended to fight the power of these dispositions. Alternatively, one can be explicit about the *development* of dispositions or the development of identities, and thus show that they need not be as stable as they appear. Gresalfi and Cobb (2006) traced the development of student dispositions.

We return attention to Evans's (2000) recognition of multiple possibilities in positioning to illustrate that positional change is possible. He described an interviewee playing with the positioning in the interview: " She […] shows herself as able to play with multiple positionings: she moves from being positioned as student, or as interviewee, to 'being flirtatious' […]. She then takes up a position momentarily in the interview, by offering 'mock-resistance' – as a joke" (p. 194). This kind of play is also available to students and teachers in mathematics classrooms. We juxtapose this with Lerman (2001), who pointed to the extreme examples of resistance that especially appear in coercive settings, identifying schooling as such a setting. The resistance described by Lerman and the play described by Evans, are perhaps different levels of the same phenomenon (second or third order positioning). However, we note that they could just as well be different interpretations of the same phenomenon. Who is to say that the resistance to coercion described

by Lerman was not seen as play by the students in the situation? It could be their game. And who is to say that the interviewee's shifts in positioning with Evans were not a crafty form of resistance – a declaration of power? However we read these situations, it is clear that positioning is ephemeral. Shifts happen.

3.0 Discussion

We have considered some variances in how positioning is conceptualized but we know there are other variances. 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. Any way of theorizing foregrounds particular aspects of teacher's and student's experiences. We see benefits in theorizing differently for particular purposes.

In research reporting, one can be explicit about how positioning is theorized in one's interpretation, but it is common practice that the metaphor of positioning to refer to relationships is simply used without definition – without clarification. We encourage the use of the positioning metaphor, with or without clear explication of the theoretical approach to it, though point out that clear explication is of utmost importance if positioning is central to the analysis. Whether positioning is briefly mentioned or central to a work, however, thoughtfulness about the effects of one's way of thinking and writing about the nature of positioning is important. More attention to positioning in immanent relationships can offer alternative understandings of positioning that a transcendent focus cannot.

We argue that the significance and complexity of positioning may be lost if one is not careful about how the words and ideas are used. Simply borrowing terminology – calling common classroom experiences storylines, for example – may spark new ways of thinking because 'storyline' is a fresh word, but such nominal use of positioning theory without the depth of Harré and van Langenhove's (1999) theorizing that explains the word, leaves significant relational realities obscured.

Considering the different approaches to positioning, we see value in discursive positioning because, as we have said, the discipline is taken as real in classroom interaction. The stories, or myths, told about mathematics powerfully format the way students approach mathematical problems and the way they use mathematics to address problems that are not necessarily mathematical. To focus attention on students' dispositions draws attention to the significance of mathematics and mathematics education to society. Dispositions have a powerful effect on the way individuals position each other in moments of interaction, but we wonder whether a focus on interpersonal positioning and its reciprocal nature in discussions with teachers and pre-service teachers would have a mitigating effect on the power of the discipline. Perhaps the recognition of more familiar realities present in the classroom – connections to more familiar storylines – can help educators find a way through the repression or offer a way to build tools for developing more open dispositions.

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 often 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 appropriate, 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.

School is a multicultural encounter with both teachers and students belonging to diverse groups differentiated by variables such as age, social class, gender, race, and ethnicity (Banks and Banks, 1995). This multicultural context makes it especially clear that there is work to be done in promoting classroom practices that invite multiple storylines in mathematics classrooms. Although we recognize that this ought to be done out of respect for diversity and concern for equity, we argue that it also has potential for supporting the development of mathematical understanding. There are multiple sources of stories.

We are recommending a relatively radical approach to positioning in mathematics education – only relatively radical because it is 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. First, it is appropriate to simply invite educators to use whatever resources they have at hand to do this. We invite educators to exercise their creativity to recognize and authorize a larger diversity of human

stories. Second, it can be helpful to suggest resources for bringing meaning into mathematics by inviting narrative into the classroom. Drawing on Morgan's (2006) list of questions in her development of social semiotics for mathematics education, we suggest the following questions as potent for research and for use by mathematics teachers. The first two questions are Morgan's (p. 229) and the others are adapted and generalized to extend outside of written texts, which was Morgan's focus:

- Who does mathematics? (Is a human agent present?)
- What processes are human agents engaged in?
- Who are these human agents doing these things for and why?
- Who is looked at as an authority?
- What roles are available to the primary human agent and the other human agents in the interaction?
- How does the interaction connect with human relationships outside the classroom context?

Morgan showed that the field of linguistics offers useful tools for identifying answers to these questions.[3] 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 (e.g., D'Ambrosio, 2006) and so claims that any mathematics is set in human story. Thus ethnomathematical research and the history of mathematics can add to students' repertoires 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. For example, Mendick (2005) draws attention to the 'good' and 'not-so-good' polarization that is often connected to gender in mathematics. There is a need for this and other kinds of polarizations in reflection on and analysis of mathematics learning situations.

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 – having them make propositions and transpositions, identify juxtapositions, and engage in oppositions. 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.

[3] We have corroborated Morgan's (2006) claim having used various linguistics tools to address these questions in our earlier work (Herbel-Eisenmann and Wagner, 2007; Wagner and Herbel-Eisenmann, 2008)

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