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the Classroom*

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BOOK REVIEW

Radical Reconfiguring(s) for Equity in Urban Mathematics Classrooms: Lines of Flight in *Mathematics and the Body: Material Entanglements in the Classroom*¹

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In *Mathematics and the Body: Material Entanglements in the Classroom* by Elizabeth de Freitas and Nathalie Sinclair (2014), the authors call for a “radical reconfiguring” (p. 225) of mathematics education. Similarly, Barad (2012) argues that “theories are living and breathing reconfigurings of the world” (p. 207) and that putting new materialist and posthumanist theories to work in mathematics education could open up a space for this radical reconfiguring. This book review is based on our developing thinking about the use of theory and its possibilities within urban mathematics education. We situate ourselves in what de Freitas and Sinclair call a “stretchy space of continuous transformation” (pp. 90–91)—continuing to think and re-think issues like equity with this text, letting the words wash over us (St. Pierre, 2003), opening up and questioning urban mathematics education research. As two White women mathematics educators and emerging scholars in the field, we do not assert that theory alone or theory removed from practice can address the complex, prevalent, and long-lasting inequities present in mathematics education; however, we view theory in concert with practice as having potential to advance the field. de Freitas and Sinclair’s theories, which they use to question school mathematics in general, could be built upon and deployed to expose the problematic presence of White rationality (Martin, 2015) in urban classrooms. We encourage the reader to join us in this stretchy space and embrace the potentialities of the book as an as-

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semblage, a process of making and unmaking, arranging and fitting together of theories (Jackson & Mazzei, 2012), as it allows us (i.e., researchers and educators) to disrupt and perturb taken-for-granted assumptions about urban mathematics education.

Putting Theory to Work: Inclusive Materialism and Equity

To think potentialities of equity with *Mathematics and the Body*, like de Freitas and Sinclair (2014), we pay attention to particular parts of the text, recognizing that they are in assemblage with other parts of this text, other texts, and us. We highlight what we consider to be the main concepts within each chapter, and we consider these concepts as points of departure for potential flights that mathematics educators could embark on with and through their area(s) of interest. Although equity is not addressed explicitly by de Freitas and Sinclair in all of the chapters, one of the flights that we take involves thinking this text and equity together as “knots and meshworks...less an image of different bits and pieces glued to each other than an image of a tangled set of paths, each with its own mobility and degree of freedom” (p. 225) that might “push the field into new uncharted terrain and allow for new conjectures about teaching and learning” (p. 5).

de Freitas and Sinclair (2014) pull the threads of various (and differing) theories, drawing on Barad, Deleuze, Rotmann, Ranciere, and, most heavily, on Châtelet to put forward a new form of materialism that they term *inclusive materialism*, which troubles traditional humanist and rationalist notions and takes up the aesthetic, affective, and material as *mattering*. de Freitas and Sinclair put this theory, and others, to work to rethink school mathematics, proposing that inclusive materialism might “alter the way we think about embodiment of mathematical concepts, offering alternate ways of studying how students learn concepts and how we might choose and order concepts as part of a curriculum sequence” (p. 12).

In addition, de Freitas and Sinclair (2014) address inequity in education through the entanglement of the political and the material and by proposing the reconfiguring of school mathematics, inviting readers to conceive of a *minor* mathematics that is “not the state-sanctioned discourse of school mathematics but that might be full of surprises, non-sense and paradox” (p. 226). They recognize that this mathematics might be “at odds with current institutional demands. However, a minor mathematics is likely to engage students and teachers in more expansive ways, and our hope is that it would engage *more* students in mathematics” (p. 226). de Freitas and Sinclair are not interested in theory separate from the material and political reality of schools. Their minor mathematics would entail shifts in the way we theorize and practice mathematics education.

Theoretical Flights

Mathematics and the Body is divided into eight chapters, each of which uses theory to push the bounds of what has become sensible in mathematics education. All the chapters are densely packed and take some time to “chew and digest” (Jett, 2015, p. 14). Thinking with even one chapter at a time could (and should) take the reader on endless “lines of flight” (Deleuze & Guattari, 1980/1987). A line of flight is a place of possibility and change, an opportunity to shift. It implies the type of movement and flow across paradigms that would be necessary to move toward a minor mathematics.

Flight(s) 1: When does a body become a body?

bell hooks (1994) notes that the legacy of the Cartesian cogito in educational practice has meant the erasure of the body that we may “give ourselves over more fully to the mind” such that the normalized governing assumption is “that passion has no place in the classroom (p. 192)”. (as cited in Taylor, 2016, p. 202)

de Freitas and Sinclair (2014) begin by asking—when does a body become a body? We ask—when do students’ bodies become mathematical bodies? Which bodies are assumed to be mathematical and which are resisted in their mathematical becoming? de Freitas and Sinclair acknowledge materiality of bodies as an intra-activity, an inexhaustible dynamism that (re)configures relations of space and time and matter (Barad, 2007), across and between bodies and materials. In (re)visioning the body and its boundaries, they also destabilize traditional views of knowing and consider knowing that “extends beyond the boundary of the skin” (p. 16). They question the individual learner and knower as a separate and self-contained entity that has (or does not have) mathematical knowledge. If the body is not the singular fixed container of knowledge with known abilities, and instead the body is in process of becoming in engagement with materials and others, how might our classroom and pedagogical processes change?

de Freitas and Sinclair (2014) consider the assemblage of child-materials-concept as a body that emerges through the intra-action, a view that might allow us to consider learning in new ways. In this view, the materials matter, and the concept is invented through the intra-action rather than being viewed as preexistent and waiting to be “discovered” by the child. The body is assembled in relation to non-human components and is “always in a process of becoming that belies any centralizing control” (p. 24). If students “bodies” are in the process of becoming, our views of them as particularly abled (tracked, sorted, low, high, gifted, (dis)abled...) do not work anymore. What happens to mathematics education when we begin to think classroom with assemblage? How might research fall apart, so that we can create new ways to understand urban mathematics education? What opportunities

might there be in this view to think mathematics education differently in ways that acknowledge students and teachers as in process as becoming?

Barad (2007) takes up the concept of cuts, boundary-making practices that categorize and classify: “Cuts are enacted not by willful individuals but by the larger material arrangements of which ‘we’ are a ‘part’” (p. 178). Once a cut gets made what are all the mechanisms that get produced that reify and solidify that cut so it becomes the only way that we can think? In mathematics education, cuts are being made around black and brown bodies with the production of the achievement gap (Gutiérrez, 2008). How might a different conception of bodies undermine these cuts? If there is no discrete knower, then it becomes unthinkable that a single number derived from a test score could (or should) represent knowledge of mathematics.

Flight(s) 2: The “ontological turn” of inclusive materialism

As de Freitas and Sinclair (2014) draw the reader through the works of Niels Bohr and Karen Barad, they build a case for the consideration of mathematical concepts as material and inventive, not as Larson (2016) states as something to be *given*. With Barad, the authors question the apparent immobility of matter and the construction and fixed bodies of knowledge. de Freitas and Sinclair animate matter and concept in material intra-action; the traditional view that—

learning is assumed to have a teleological trajectory towards fixed and immovable mathematical concepts. Concepts are said to emerge through activity, but there is no troubling of the specificity of the concepts—in other words, the mathematical concepts (multiplication, cube, zero) are taken for granted, while students collaboratively move towards them. (p. 40)

This traditional view is upturned in favor of sensational (not just sensible) learning that is inventive and intra-active.

In this chapter, de Freitas and Sinclair (2014) outline their framework, *inclusive materialism*, noting four crucial aspects:

1. It is not reductive, seeing all matter as the same; instead it privileges “difference and multiplicity” (p. 42).
2. The socio-political and the material are seen as “inextricably entangled” (p. 42) and in this viewing inequity issues in education can be addressed within a broader framework.
3. Affect and aesthetics and nonsense are central and rationality is not privileged.
4. Humanist notions and human agency are decentered (not as anti-human) but to distribute agency across the assemblage.

In laying out this theory, de Freitas and Sinclair (2014) move through theories of language, considerations of discourse as material with Barad, and views of boundary making practices that led them to question the taken-for-granted curriculum in school mathematics. When we begin to understand the curriculum that we have taken up as constructed and having effects on mathematical learners, we might be willing to “rethink learning as an indeterminate act of assembling various kinds of agencies rather than a trajectory that ends in the acquiring of fixed objects of knowledge” (p. 52). If we can begin to think mathematical concepts as quivering spaces of potential rather than “tool[s] that we give students” (Larson, 2016, ¶7), *more* students might be invited into mathematical thinking.

Flight(s) 3/4: Diagrams, gesture, movement, and inventiveness in the mathematics classroom

de Freitas and Sinclair (2014) use Châtelet’s (2000) ideas to connect materiality, gestures, diagrams, and inventiveness in mathematics. Châtelet views gestures and diagrams as interrelated, inseparable, and inventive. In *Figuring Space*, he traces mathematical invention (through gestures and diagrams) and argues that mathematical concepts are material. This argument is counter to the prevailing belief that mathematical concepts are abstract and static. For Châtelet, mathematical concepts are mobile and have multiple latent virtualities that can be actualized. In one classroom example, de Freitas and Sinclair read multiple student diagrams not as to whether the diagrams approach a definitive answer, but as to how the diagrams and gestures were put to use to think and how they mobilized potential readings of a shared experience in the classroom. Here, students became in material intra-action with mathematics. de Freitas and Sinclair view this type of student gesturing and diagramming as a “disruptive and innovative practice” (p. 84), a minor mathematics.

Assemblage, gesture/diagram, the virtual, and inventiveness are intertwined by de Freitas and Sinclair (2014) in Chapter 4 as they consider several additional classroom episodes that reassemble and reconfigure the world. The authors begin a conversation about the interplay between the actual and virtual. They build on this conversation to consider how the “new,” mathematical inventiveness or creative acts, come into being in the mathematics classroom. They argue that a creative act:

1. introduces or catalyzes the new,
2. is unusual,
3. is unexpected or unscripted (not directly caused by the software the teacher or any individual student), and
4. is without given (or predetermined) content.

These characteristics are not held within individuals as creative (or not creative) people. Creativity in this framework “flows across the learning assemblage in a somewhat impersonal way” (p. 86). These impersonal creative acts are seen as ontological reassembling, radical reconfigurings of the world. de Freitas and Sinclair are careful to draw a line between gesture/diagram and representation. The diagram and gesture are powerful in that they do not represent but interfere, link, pleat, and crease matter, keeping matter and concepts mobile. They do not try to fix or make mathematics static. Rather, they mobilize mathematics.

Flight(s) 5/6/7: Materialist approaches to mathematics classroom discourse, the sensory politics of the body mathematical, mapping the cultural formation

Of particular interest to us, in this section, is de Freitas and Sinclair’s (2014) use and conception of *data*. Given their new materialist theoretical frame, the question of how to *do* research takes on new meaning, forcing the researcher into a position of negotiation with the limits of methodology. If we consider the classroom as assemblage, then we cannot isolate variables or pin down particular aspects to be studied independently. de Freitas and Sinclair conceive of a momentary stabilization of the data in order to think with it, yet they acknowledge that doing so is impossible and imperfect.

In Chapter 5, de Freitas and Sinclair (2014) attend to and decenter language in new materialist terms, “exploring how classroom discourse, in particular speech, is coupled to other materialities and affective forces” (p. 111). Moving away from the focus on classroom discourse as being what is written or spoken, this chapter highlights the integration of the body, diagrams, and gestures into the assemblage of materialist approaches. They note, “Our aim here is not to fetishize speech as the immediate expression of embodied presence, but in fact to recombine speech and thinking in new, material ways and to show how this recombinatorial logic operates in classrooms” (p. 138). For de Freitas and Sinclair, speech is not the disconnected representation of thought. Thought is embodied and intra-acting with speech production through the body. The field’s privileging of student production of linear and sequential explanations of mathematical thinking is problematic if seen in relation to this theory as it excludes expressions of thinking that are not sensible within the normative frame of school mathematics.

Building on this thinking, in Chapter 6, de Freitas and Sinclair (2014) decenter privileged forms of knowing/sensing in their thinking about (dis)ability: “Learning disabilities in mathematics...are constructed using narrow definitions of what counts as acceptable mathematics and what counts as evidence of proficiency in mathematics” (p. 160). By taking a posthumanist approach, de Freitas and Sinclair make a move to reconceptualize the body as collective. And in Chapter 7, de Freitas and Sinclair discuss acts of dissensus: “the subject comes into being through both consensus (alignment with common sense) and through dissensus (divergent

individuation)” (p. 175). They actively question what we conceive of as making sense and put forward dissensus as a way to radically reconfigure the world. de Freitas and Sinclair claim: “dissensus eventually produces new consensus. The question thus becomes: How might dissensus-producing ideas be kept lithe and fleeting, so that they escape becoming part of the common sense while remaining meaningful for a community of practice?” (p. 199). This question is of particular importance in rethinking school mathematics: “The aim is to perturb, if even only temporarily, what is taken to be common sense and who is assumed to possess it” (p. 199). How do we continue to perturb school mathematics and “equitable” practices that have become normalized but are not working?

Flight(s) 8: The virtuality of mathematical concepts

In the final chapter of *Mathematics and the Body*, de Freitas and Sinclair (2014) dive deeply into Châtelet and his use of the virtual and the actual in thinking mathematical invention particularly with respect to mathematics curriculum. They move through examples of linking mathematical concepts with the virtual deploying Châtelet’s conception of the “virtual as the necessary link that binds the mathematical and the physical together in mutual entailment” (p. 201). This mutual entailment allows concepts to “sustain a certain vibrancy and vitality. In other words, a concept of this kind must be a *multi-purpose device* that resists reification while carving out new mathematical entities” (p. 217). If the concept remains vibrant and multi-purpose, then it cannot become static and fixed. It remains mobile, which is crucial for Châtelet. de Freitas and Sinclair point out that keeping mathematical concepts vibrant and mobile is difficult, as mathematicians tend to focus on the real and the possible rather than the virtual. The tendency is to nail down and know, so they ask, “can we find the latent virtualizes in the mathematics curriculum and also reanimate the bodies of ossified mathematical concepts?” (p. 213). What are the effects of a bodiless mathematics on students and teachers that engage with it?

Critique

If we are going to pursue the goal of equity in mathematics classrooms and consider how minor mathematics might function in the field in ways that *matter*, how might the thought experiments that de Freitas and Sinclair (2014) share be “technologies we create not only to remember but to think” (p. 91)? Similarly, how might theories like poststructuralism, posthumanism, and new materialism as diagrams, or material actions work “as prosthetic devices that become vehicles of intuition and thought” (Knoespel, 2000, p. xiii)? The centering of movement, potentialities, and creativity that de Freitas and Sinclair put forward in *Mathematics and the Body* could be taken up to work toward more equitable thinking and practices in

mathematics education, and we propose that thinking with the decentering of language, the body, and the linear curriculum sequence has significant implications for urban mathematics education. Changing what makes *sense* to us about mathematics education by building a minor mathematics could make for more equitable conceptions of learning and research for students, practitioners, and researchers.

While we see this potential in the text, we note that de Freitas and Sinclair (2014) spend little time and space on issues of race and gender, as they acknowledge in their own conclusion and implications. Given the attention devoted to race and gender in urban mathematics education scholarship, we wonder what it might have looked like for these researchers to take up race and gender in this text. Could examples have foreclosed or opened up lines of flight? What gets ignored or silenced by not attending to such issues? Can we tend to race and gender as well as other oppressive structures sufficiently? Paying so little attention to race and gender feels irresponsible, but to what degree is the researcher the authority in terms of responsibility? Do they feel authority to raise these issues in more specific and straightforward ways? Race and gender certainly deserve attention in mathematics education, but who has the authority to take these up?

Perhaps, by not including those explicit labels as boundaries, de Freitas and Sinclair (2014) opened a space for their readers to bring their agendas, views, and experiences in assemblage with this text and to think those (and other) topics alongside the provocative theories they present. de Freitas and Sinclair's resistance to boundary-making practices (Barad, 2007) allows readers to take up critical issues, like equity, in their own lines of flight. However, by not addressing them explicitly, what (and who) gets silenced? What cuts are de Freitas and Sinclair making and what effects might they have on their readers' thinking? How might readers of this text assemble its concepts and enact new potentialities? Echoing Stinson and Bullock (2012), "we challenge mathematics education researchers to claim (and articulate) their own theoretical space—pure or hybrid—that might activate a praxis of uncertainty within their research passions as well as inspire those passions not yet known" (p. 52). *Mathematics and the Body* provides fertile ground for the development of theoretical space and concepts with potential to decolonize (urban) mathematics education.

Conclusion

We came into assemblage with this text, entangled with our computers, our other readings, and bodies whose boundaries had recently become strange to us. Susan had just broken her leg, and it was rebuilt with a plate and screws. Therefore, she was bedridden, wondering what had become of her body. Kayla was nine months pregnant with her first child and wondered about the now blurry borders of *her* body. Reading the first chapter in this state made us think about theories and

ourselves differently. Our bodies *mattered* to us in new ways. We were both reading elsewhere, together and separately, in poststructuralism and posthumanism and new materialism. We waded into *Mathematics and the Body*, spent hours and hours marveling at the beauty of the language, wrestling with what de Freitas and Sinclair (2014) “meant,” wondering how it would be possible to take up all these ideas at once and knowing that we could not, and asking countless questions of each other and the text. One thing became clear very quickly, though this text specifically questions school mathematics, the theories cross boundaries and make boundaries between fields porous. Additionally, the gestures that de Freitas and Sinclair were making were productive to our thinking. There were so many questions to be rethought, so much work to be done out of this text. How does mathematics look when it is thought alongside the body, mind, materials, teacher, students, concept, gesture, and/or diagram? How do labels like standardized test scores fail students and teachers when mathematics is (re)considered as distributed and in assemblage, especially within urban contexts? How might our conceptions of sense and ability enact violent cuts between students and mathematics? And how might our research practices reify those cuts?

Mathematics and the Body opened us up to think taken-for-granted concepts differently and iteratively. In our discussions about the later chapters and in the margins of our books, equity came up again and again. Concepts in this text had the potential to challenge assumptions, beliefs, biases, and practices that could open up a space for us to consider mathematics in a way that could allow access for more students. Yet, de Freitas and Sinclair (2014) resisted telling and closure; instead, they questioned and invited readers on lines of flight. Perhaps they harken back to Archimedes and “intentionally chose an obscure and ‘jumpy’ presentation so as to ‘inspire a reader with the shocking delight of discovery, in proposition 24, how things fit together, so as to have them stumble, with a gasp, into the final, very rich results of proposition 27” (p. 189). In this text, readers are inventors and creators of new thinking.

With that said, we bring this review to *JUME* in an attempt to invite urban mathematics educators and researchers to join together in this “stretchy space” with permeable boundaries and to find places for creation, innovation, and practicality within (various) theoretical texts. Although de Freitas and Sinclair (2014) point to this book as a move to challenge inequities in mathematics education, they do not speak directly to the kinds of inequities that it might function to undermine. This ambiguity has been criticized, yet it leaves a wide-open space for the “radical reconfiguring” (p. 225) necessary to improve mathematics education for underserved students. We wonder what possibilities exist if readers couple radical reconfiguring together with Martin’s (2015) critique of *Principles to Actions: Ensuring Mathematical Success for All* (NCTM, 2014), which calls for a revolution of values, a new way of thinking, and a decolonizing education for the

collective Black. Whatever the case, *Mathematics and the Body* presents possibilities, and the ideas expressed in it should be taken up in a critical manner by urban mathematics educators to produce a more equitable mathematics body.

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