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## THEORY, ETHICS, AND EQUITY IN INTRA-ACTION IN MATHEMATICS EDUCATION: LOOKING BACK, LOOKING FORWARD

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*This paper considers the intra-actions between poststructural theories and mathematics education over the last 40 years and considers how these theories have resulted in different ways to think students, teachers, and knowledge production. I argue that thinking in intra-action with various and different theories can allow us to ask different questions and radically rethink school mathematics.*

Keywords: Research Methods, Equity and Diversity

At the opening plenary of PME-NA Rochelle Gutiérrez (2017) proposed to the mathematics education research community that “interaction between different knowledges, different ways of knowing and different knowers” (p. 2) could serve to respond to and perhaps address the precarious state of our planet and our relationship with it. Gutiérrez is not the first leader in the field of mathematics education research to call on the community to consider not only the what of mathematics education but also the how. William Tate (1995) called on the community to consider policy in relation to equity in mathematics education. He commented that he found the “paradigmatic boundaries of mathematics education somewhat narrow,” and he intentionally modeled his work after scholars who “crossed the epistemological boundaries of their fields to provide a more cogent analysis of important issues facing African Americans” (pp. 425-426). In this paper, I will consider research in mathematics education that has already crossed epistemological boundaries to open up spaces for mathematics educators, teachers, and students to think themselves, mathematics, and schools differently. I will then explore Barad’s (2007) construct of intra-action and the potential possibilities it offers for qualitative methodology, specifically in mathematics education. Finally, I will come back to calls by Gutiérrez (2017), de Freitas and Sinclair (2014), and Martin (2015) to consider how possibilities for ethical action are structured by the ways we do and think research.

### **Theory and Qualitative Research in Mathematics Education**

de Freitas and Walshaw (2016) describe their approach to theory as impacting their thinking and meaning-making, explaining that “the act of defining or creating new concepts is precisely what theory has the potential to do. Thus, theory is a creative tool, an inventive approach to making meaning, as well as being an intervention into current cultural practices” (p. 4). In this frame, theory becomes not just something that you think about prior to research or something that you apply to research, but something that inevitably impacts the meaning that is made through research.

Stinson and Walshaw’s (2017) chapter on theoretical frontiers in mathematics education research explains that theory has not always been considered a foundational aspect of mathematics education research. As theory gains space and attention in the field of mathematics education, the question of which theory to use will continue to surface. Rather than thinking about which theory is best, perhaps mathematics educators can consider how theories have functioned to allow us to “move toward the unthought” (St. Pierre, 1997, p. 185) and ask, what other important thoughts have we yet to think or unthink that matter in mathematics education?

Poststructuralism has intersected with mathematics education for decades, and mathematics educators use of poststructural theories have made it possible to consider how meaning and knowledge get made and whose “interests are privileged, marginalized, or silenced” (Stinson & Walshaw, 2017, p. 139). Poststructural theories have also been taken up to allow a different view of teachers and students as subjects that are constituted through interactions with the powerful discourses of school mathematics, education, and gender.

Walkerdine (1994) drew on poststructural theory to consider the production of the “appropriate” mathematical subject, arguing that “theories of the development of reasoning when incorporated into education become ‘truths’ which actually serve to produce the desired kinds of subjects as normal and pathologizes differences” (p. 65). Walkerdine was particularly interested in the effects of gender and class on subject formation in mathematics classrooms. She pointed to the ways in which girls were positioned as compared to boys. Her work pointed to the need to recognize the meaning in the practices that mathematics educators carry out and the limitations they, sometimes inadvertently, put forward in how students can live. Similarly, Mendick (2005) questioned why and how particular girls seemed to freely choose paths that reified their oppression. She found that girls were less likely to enroll in accelerated mathematics classes despite equal or higher achievement on math assessments. She used poststructuralism to question the assumptions that math is legitimately powerful and that gender is a natural binary. Margret Walshaw (2004) describes the “postmodern analytical edge ... invites a less certain space for research, pedagogy and practice” (p. 4) that has allowed mathematics educators to recognize and disrupt taken for granted assumptions.

Though poststructuralism has taken on the humanistic stable subject and the power of discursive formations, it has been critiqued for its focus on the linguistic and lack of attention to the material. In the materialistic turn, where the question of what matter matters has been raised, new understandings and theorizations of quantum mechanics and environmental concerns have come together to produce theories that undo the nature culture divide and decenter the human as privileged caretaker or dominator of the earth. van der Tuin and Dolphijn (2010) explain that new materialism is fascinated by affect, force and movement as it travels in all directions. It searches not for the objectivity of things in themselves but for an objectivity of actualisation and realisation... It is interested in speeds and slownesses, in how the event unfolds according to the in-between. (p. 169)

Like poststructuralism, the key tenants of these new materialisms function to trouble binaries and distinctive boundaries. In addition, new materialist theories take seriously what matter matters and how it comes to matter.

Barad—a feminist, philosopher and quantum physicist—introduced many useful and important figurations in the last two decades as she imagined her agential materialism into being. Through her concept of intra-action, Barad (2007) denies the existence of individual separate beings and objects through the exploration and study of Niels Bohr’s “philosophy-physics” (p. 24). Intra-action is born out of the recognition that things are not discrete but are always already entangled. Interaction implies separate entities that take individual action towards or away from each other. Instead, Barad considers intra-action that is always taking place between “two mutually entailed folds of the same realm” (de Freitas and Sinclair, 2014, p. 46).

In Barad’s view, matter and meaning are co-constituted and inseparable. Just as matter and meaning cannot be separated, so too epistemology, ontology, and ethics cannot be thought apart. We are “part of that nature that we wish to understand” (Barad, 2007, p. 26). Since, things are not thought of as separate and discrete, neither can they have individual agency, “rather what is

understood as ‘agency’ in the relational materialist approach is a quality that emerges in-between different bodies involved in mutual engagements and relations” (Hultman & Lenz Taguchi, 2010, p. 530). In a research setting then, we can no longer think the researcher as an objective separate observer, who studies from afar to know a subject. Instead, researcher, students, teachers, materials are mutually entangled and constituted and come to know “from a direct material engagement with the world” (Barad, 2007, p. 49).

New materialisms and in particular Barad’s agential realism are beginning to be taken up by mathematics educators and are effecting/affecting the types of knowledge that are being produced through research. de Freitas and Sinclair (2014) bridge the fields of philosophy, mathematics and feminism, pulling the threads of various (and differing) theories 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. Inclusive materialism functions in their work to allow them to conceive of school mathematics as reconfigurable into what they imagine as a minor mathematics that is “not the state-sanctioned discourse of school mathematics but that might be full of surprises, non-sense and paradox” (de Freitas & Sinclair, 2014, p. 226). This is an ethical move for them, though they recognize that this mathematics will 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” (de Freitas & Sinclair, 2014, p. 226). As in the review of poststructural theories, in thinking with Barad and inclusive materialism a new conception of methodology was necessary. de Freitas and Sinclair (2014) show how inclusive materialism might alter the way we think about embodiment of mathematical concepts, offering alternate ways of studying how students learn concepts and of how we might choose and order concepts as part of a curriculum sequence. When concepts are animated differently, learning is similarly altered. Inventive acts in classrooms become part of a growing material assemblage, a process of embodiment in which the potentiality of the body is emphasized.

### **Implications for Enactment of Qualitative Methodology in Mathematics Education**

Though Barad’s conception of onto-epistemology and the collapsing of knowing and being are important and productive in how we think mathematics education, given Gutiérrez’s (2017) and Martin’s (2015) demands, it is Barad’s inclusion of ethics and her view on responsibility that could really matter for students and researchers in mathematics education. Her concept of intra-action demands a relational ethics, as being and knowing are entangled, so, too, is living well and in respons-ability to all others. Barad (2007) proposes, ethico-onto-epistem-ology—an appreciation of the intertwining of ethics, knowing, and being— since each intra-action matters, since the possibilities for what the world may call out in the pause that precedes each breath before a moment comes into being and the world is remade again, because the becoming of the world is a deeply ethical matter. (p. 185)

Our ontologies, epistemologies, and ethics cannot be separated out. They are entangled in the production of our worlds and our lives. As we make choices in how we live and research we are, according to Barad’s (2007) agential realism, making cuts. We are engaged in 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). These cuts have material effects. For example, in Gutiérrez’s (2008) work around the achievement gap, she points to cuts that are made around black and brown bodies that produce them as deficient and lacking. Cathy O’Neil (2016) argues convincingly that mathematics has material effects on people’s lives and discriminatively negative effects on the poor. Far from being an abstract and static discipline that

it is sometimes assumed to be, mathematics is intimately entangled in our lives as it continues to serve as a proxy for truth and privilege. The way that we do and use mathematics and the way that we do qualitative research matters. The models that we set up, in Barad's (2007) terms—the apparatus within which we are entangled—determine reality (O'Neil, 2016). In each intra-action, we determine reality and reconfigure our worlds. These determinations cannot be made ahead of time and cannot be rule-bound or universalized. This brings us again to calls by Gutiérrez (2017), Martin (2015), and de Freitas and Sinclair (2014), especially as educational researchers. How do we work to continually pose questions to ourselves/each other that take into consideration how we might all live differently? I propose that we as mathematics educators be open and uncertain about what possibilities thinking/being differently in ethical relation with mathematics education might open up. Research over the last forty years has shown that reconfiguration is possible, and we may have to unlearn some of what we know to achieve the needed radical reconfigurations in the next forty.

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### References

- Barad, K. (2007). *Meeting the universe halfway: Quantum physics and the entanglement of meaning and matter*. Durham, NC: Duke University Press.
- de Freitas, E., & Sinclair, N. (2014). *Mathematics and the body: Material entanglements in the classroom*. New York, NY: Cambridge University Press.
- de Freitas, E., & Walshaw, M. (2016). *Alternative theoretical frameworks for mathematics education research: Theory meets data*. Switzerland: Springer.
- Gutiérrez, R. (2008). A “gap-gazing” fetish in mathematics education? Problematizing research on the achievement gap. *Journal for Research in Mathematics Education*, 39(4), 357–364.
- Gutiérrez, R. (2017). Living mathematx: Towards a vision for the future. *Philosophy of Mathematics Education*, 32(1).
- Hultman & Lenz Taguchi, H. (2010). Challenging anthropocentric analysis of visual data: a relational materialist methodological approach to educational research. *International Journal of Qualitative Studies in Education*, 23(5), 525-542.
- Martin, D. B. (2015). The collective Black and *Principles to Actions*. *Journal of Urban Mathematics Education*, 8(1), 17–23.
- Mendick, H. (2005). Choosing maths/doing gender: A look at why there are more boys than girls in advanced mathematics classes in England. In L. Burton (Ed.), *Which Way Social Justice in Mathematics Education* (pp. 105–132). Westport, CT: Information Age Publishing, Inc.
- O'Neil, C. (2016). *Weapons of math destruction: How big data increases inequalities and threatens democracy*. New York, NY: Crown.
- St. Pierre, E. A. (1997). Methodology in the fold and the irruption of transgressive data. *International Journal of Qualitative Studies in Education*, 10(2), 175–189.
- Stinson, D. W., & Walshaw, M. (2017). Exploring different theoretical frontiers for different (and uncertain) possibilities in mathematics education research. In J. Cai (Ed.). *Compendium for Research in Mathematics Education* (pp. 128-155). Washington, DC: National Council of Teachers of Mathematics.
- Tate, W. F. (1995). School mathematics and African American students: Thinking seriously about opportunity-to-learn standards. *Educational Administration Quarterly*, 31, 424-448.
- van der Tuin, I., & Dolphijn, R. (2010). The transversality of new materialism. *Women: A Cultural Review*, 21(2), 153-171. DOI: 10.1080/09574042.2010.488377
- Walshaw, M. (Ed.) (2004). *Mathematics education within the postmodern*. Greenwich, CT: Information Age Publishing.