A QUEER TURN IN MATHEMATICS EDUCATION RESEARCH: CENTERING THE EXPERIENCE OF MARGINALIZED QUEER STUDENTS

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Evidenced by the lack of research considering queer students, mathematics education researchers are continuing to marginalize the experiences of queer youth and the only resolution is to center the queer student experience in the mathematics context. To accomplish this, I choose to dwell in the borderlands between queer theory and mathematics not only to challenge the border between them, but also to push on the borders of mathematics education research. In order to do so, I offer ways in which mathematics education researchers can take a queer turn in mathematics education research by generating queer curriculum, engaging in queer pedagogy, and queering mathematics content.

Keywords: Equity and Diversity

> The knower and the known are intertwined, for realizing that a science without humanity - without values, purposes, beliefs - is a false science, the false science of the spectator who always stays outside the arena of action, removed from the existential happenings of life - the 'pure' scientist as the phrase goes. This spectator view of science, of knowledge and of teaching is a thing of the past. (Doll, 1989, p. 248)

Introduction

William Doll foreshadowed the sociopolitical turn in education, that would not take root in mathematics education until more than a decade later (Gutiérrez, 2013). Another turn, a queer turn, began in education more than a decade ago (e.g., geography (Elder, 1999); biology (Snyder & Broadway, 2004); English (Greene, 1996)) and is invigorated with attention today (e.g., Gowlett & Rasmussen, 2014). This call to include queer theory in mathematics education research is not independent of the call for the inclusion of gender and sexuality topics in pre-service and in-service teacher education (Hansen, 2015; Martin, 2014; Robinson & Ferfolja, 2008; Vavrus, 2009). Nevertheless, the mathematics education research community has yet to engage with queer theory in earnest. In this theoretical exploration, I argue that mathematics education researchers continue to marginalize the experiences of queer youth by not focusing on queer students in their research, and the only resolution is to center the queer student experience in the mathematics context. At the expense of oversimplifying, queer as an identity will be used as a non-exclusive umbrella term for lesbian, gay, bisexual, and transgender (*à la* LGBT). *Queer* is discussed at length in the following section. Research centering queer students is necessary if we hope for equitable opportunities to learn mathematics for all students (Esmonde, 2007).

Mathematics education has a *significant* role in students' development of learner identities (Gates & Jorgensen, 2009) and student positioning has a lasting effect on children's perceptions of their available social roles (Cannela, 2008). In light of this research, hegemonic discourses within mathematics, such as *mathematics as masculine* (Mendick, 2006) and the *white male math myth* (Stinson, 2013), are particularly damaging. Despite this concern, the mathematics education research community cannot begin to identify equivalent discourses which oppress queer students if it continues to marginalize the queer student experience. This tension is evidence of the borderlands created between sexuality and mathematics, queer theory and mathematics education. The mathematics classroom is held to be culture-free or unbiased, despite literature indicating the oppressive nature of content and pedagogy (e.g., Kumashiro, 2004; Ladson-Billings, 1997). The ability to consider sexuality irrelevant in the mathematics context is a heteronormatively privileged

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position; for queer students, their queerness, indeed *other*ness, is intersectional across social contexts. As Anzaldúa (1987/2012) does, I choose to dwell in these borderlands, for me the borderlands between queer and mathematics, to leverage my "outsider within" status as a queer individual in the mathematics education context not only to challenge the border between mathematics and queer, but also to push on the borders of mathematics education research. In order to do so, I offer ways in which mathematics education researchers can take a queer turn in mathematics education research by generating queer curriculum, engaging in queer pedagogy, and queering mathematics content.

Queer(ing) Identity

Queer does not have a fixed definition; it is "relational, in reference to the normative" (Letts, 2002, p. 123). Historically, queer was linked with insult and shame. Today, queer has become the "rallying point" not only for young gays and lesbians concerned with the homonormative images of gay men and lesbian women, but also for those whom wish to identify themselves with the anti-homophobic movement (Butler, 1993). By combining the works of Butler and Anzaldúa (1991), queer is understood as a false unifying umbrella, useful for solidarity with the necessary error of homogenizing and erasing differences to yield a temporarily totalized identity, which then necessarily fails to represent the person. Queer as an identity, henceforth, will be used as an umbrella term for lesbian, gay, bisexual, transgender, and other gender and sexual minorities.

Queer students can and do have academic and emotional success; Robinson and Espelage (2011), however, highlighted the higher incidence of suicidal thoughts, suicide attempts, victimization by peers, and unexcused absences for queer students compared with their non-queer peers. Additionally, Toynton (2007) documented the alienation of queer science students while Yoder and Mattheis (2015) followed this phenomenon of marginalization into STEM workplaces. I contend that mathematics education researchers are in a key position to work against the alienation of queer students and their underrepresentation in STEM careers by challenging discourses and structures which position queer students as *other*.

Beyond the classical components of identity (e.g., gender, sexuality, racialized group, etc.), Bishop (2012) offered mathematics identity as the collection of ideas one has about who they are, and the way they should act, in the mathematics context. Bishop offers identities as multiple, flexible, and fluid, and "ways of acting" (p. 39) suggests compatibility with identity as performative (Butler, 1993), but Bishop does not offer an operationalization of performative identity. To that end, Darragh (2015) operationalized the notion of a performative mathematics identity as the repeated performances that shape student recognition of themselves as certain types of learners of mathematics and, in particular, focused her research on whether students could see themselves in the descriptions of performances of good at mathematics that they identified. The notion of intersectional identities, introduced next, yields that studying mathematics students' identities, in particular their mathematics identity, without consideration of queerness, will be necessarily incomplete.

Intersectional Identities

> *Envez de dejar cada parte en su región y mantener entre ellos la distancia de un silencio, mejor mantener la tensión entre nuestras quatro [sic] o seis partes/personas* [Instead of keeping each part [of our identities] separate and maintaining a "distance of silence" between them, it would be better to hold in constant tension our four or six identities/*personas*]… There is no way that I can put myselves through this sieve, and say okay, I'm only going to let the "lesbian" part out, and everything else will stay in the sieve. All the multiple aspects of identities (as well as the sieve) are part of the "lesbian." (Anzaldúa, 1991, p. 252-3)

In the first half of this quotation, Anzaldúa not only highlights the multiplicity of our identities by mentioning a rhetorical four or six parts of identity but also advocates against maintaining a

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"distance of silence" between them. Furthermore, Anzaldúa's assertion that each part of her identity is also a part of her lesbian identity, highlights the intersectionality of identity and, in turn, the necessity to consider student queerness in mathematics education research. I connect the second half of Anzaldúa's quotation, the analogy of the sieve, to the notion of researcher positionality (e.g., Foote & Bartell, 2013). Just as Anzaldúa highlights the impossibility of realizing some idealized form of a lesbian writer by leaving her Chicana identity unacknowledged, so too it is impossible for the mathematics education research community to leave all aspects of our identity when we perform mathematics education research. In particular, Milner (2007) provided seen, unseen, and unforeseen dangers that might emerge if researchers *detach* themselves from their research. In a sense then, through this article I "come-out" as a queer theorist with queer intentions as a mathematics education researcher. I offer my abbreviated positionality as a white, queer, assigned-male-at-birth individual that is able to *leer y escribir en español* and instead of maintaining a distance between these facets of identity, I keep them in tension, bringing my queer identity to bear on my mathematics education research.

A Queer Turn in Mathematics Education Research

Thus far, I have motivated the necessity to consider the needs of queer students in the mathematics education context. In this section, I introduce queer theory and investigate the intersection of queer theory and mathematics education research. Like Letts (2002), who held queer theory "still long enough to get a good look at it," I do not claim to present queer theory as a defined package. Instead, I first provide a theoretical overview of queer theory followed by *instantiations* of queer theory. These instantiations are like a photograph that freezes-in-time one instance of queer theory in practice and necessarily reports it back in an incomplete way. I introduce queer theory here for three key reasons. First, existing research fails to address the experience of the queer student in the mathematics context, which queer theory enables. Second, the notion of intersectional identities yields that each facet of identity is part of each other facet and, as a result, studying mathematics students' identities (e.g., racialized or gendered) without consideration of queerness will be necessarily incomplete. Finally, I introduce queer theory to offer an illustration of the types of work that queer theory can enable in mathematics education.

Queer Theory

Queer theory: is an epistemological stance (Letts, 2002); appropriates the forms of curriculum and pedagogy to investigate how sexuality is organized, how sexuality is identified, how knowledge is unfixed, unstable, and how knowledge "unfolds…subject to individual insights and cultural contingencies" (Davis & Sumara, 2000, p. 832; Sumara & Davis, 1999); is deviant and critiques normativity (Jourian, 2015); signifies action and is unstable and multiplicitous (Britzman, 1995); and is about making normal queer, revealing the socially constructed nature of truths and selves, and ultimately asks "what can be, rather than what is" (Gunckel, 2009, p. 63; Snyder & Broadway, 2004). The eight authors cited in this list present eight different descriptions of what queer theory does; queer theory *appropriates, investigates, critiques, identifies, deviates, signifies, reveals*, and ultimately, *queers*.

In *A Critical Introduction to Queer Theory* (2003), Sullivan provided a detailed history of socially constructed sexuality and gay and lesbian rights activism. Two key movements, the assimilation and liberation movements, contextualize the strands within the queer theory movement in education. The assimilationist groups did (and continue to) fight for social acceptance; often their methods involve minimizing differences and emphasizing sameness through essentialization. Dissatisfied with hiding, gay and lesbian liberationists such as Wittman offered a different perspective: "Liberation for gay people is to define for ourselves how and with whom we live, instead of measuring our relationships by straight values… we must govern ourselves, set up our own

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institutions, defend ourselves, and use our own energies to improve our lives" (Wittman, 1970, as cited in Adam, 1995). These two camps, the assimilationists and the liberationists, continue to exist in tension today.

Although queer theory has its history in gay rights activism, there are "homophobic and marginalizing implications of leaving much queer studies work to queers themselves" (Marshall, 2014). That being said, if one cannot understand the implications of being queer as a result of one's own non-queerness, "the only way to act with integrity is to follow the leadership of those who are oppressed in that way, [to] support their projects and goals" (Indigenous Action Media, 2015). Having presented several understandings of queer theory, I now present queer curriculum and queer pedagogy. Queer curriculum and queer pedagogy represent only two instantiations of queer theory– examples of how queer theoretical concepts have been applied in the past, but not in an exhaustive nor definitive way. These examples do not wholly constitute queer theory but instead serve as starting points for mathematics education researchers to take a queer turn.

Queer Curriculum

The *queer curriculum movement* is my term for the collective efforts of researchers across the disciplines interested in developing queer-inclusive curriculum and queer curriculum theory. I contend that activity within the queer curriculum movement is the modern, educationally-relevant, reincarnation of the assimilationist's work in that queer curriculum is often of the "add-queers-and-stir" (Rands, 2009) variety. In other words, queer curriculum often features homonormatively-inclusive examples. As researchers work towards a queer curriculum, that curriculum must obtain additional demands; curriculum must now meet both the demands of content standards while including socially aware queer content. Scholars have argued that curriculum is obligated to interrupt the heteronormative, that sexuality is an analytic category appropriate to curriculum studies, and that curriculum might be better suited to unpack the "heterosexual closet" than to elaborate on queer identities (Davis & Sumara, 2000). By considering queer students and children with queer families or family members, culturally relevant mathematics that seeks to legitimize students' experiences in the "official" curriculum converges interest with queer curriculum (Ladson-Billings, 1994; Rands, 2009).

Such moves for queer-inclusive curriculum is not without theoretical basis. Sumara and Davis (1999, 2000) have contributed substantially to the development of a queer curriculum theory. They argued for curriculum theory to seek to understand desire, pleasure, and sexuality (1999), in part through creating *heterotopic* events, events which comprise the juxtaposition of not-often-associated objects (e.g., positive queer role models would be heterotopic to a dominant discourse of queers as perverse; the positive-queer association being heterotopic). In particular, these researchers investigated examples from queer literature curriculum and highlighted ways in which heterotopic events from the readings were juxtaposed with students' lived experiences. In a similar way, mathematics education should provide heterotopic events for students, not only for queer students by juxtaposing *visible inclusion* with their *lived hiding* (e.g., being "closeted") but particularly for non-queer students by juxtaposing queer voices with the dominant discourse of queer silence. Luecke (2011, p. 117) eloquently summarized Style's "Curriculum as Window and Mirror" (1996) as a call that "All children need curricular mirrors to see themselves reflected and thus feel safe in being themselves, and they also need curricular windows to feel safe with the differences of others."

There is a paucity of research in mathematics education using queer theory; in fact, searching ERIC for "Queer Theory" and "Mathematics" returned zero relevant articles (and five irrelevant ones; Google Scholar corroborated such findings). Broadening the search to "Queer" and "Mathematics" increased the total results to six and yielded Rands' seminal piece in queer theory and mathematics education. This article was published in *Sex Education* yet focuses exclusively on the mathematics classroom and exclusively offers mathematical examples. As Rands was, and remains to

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be, one of the few authors addressing the intersection of mathematics and queer theory, I present in detail two of her pieces here to center this previously marginalized work.

Add-queers-and-stir mathematics. In "Mathematical Inqu[ee]ry: Beyond 'Add-Queers-and-Stir' Elementary Mathematics Education," Rands (2009) began by recounting a story from personal experience as an elementary teacher and the choice to queer literacy, through heterotopic readings, prior to queering mathematics. Rands' literature review referenced several anthologies of queer theory in education, but none of these included mathematics. Addressing this gap, Rands provided six examples across 1st and 3rd-5th grades of how one might queer mathematics curriculum. These examples fall into one of two categories: "Add-Queers-and-Stir" or "Mathematical Inqu[ee]ry" (Rands, 2009). The former aligns well with the assimilationists while the latter begins to advance the liberationist's goals. To elucidate, Add-Queers-and-Stir examples would generally have a goal of inclusion in homonormative ways. One such example by Rands involves finding the area of queer symbols (such as the rainbow flag, pink triangle, etc.). This approach fails to consider sexuality as a dimension of "teacher practice, student learning, and the production of knowledge" (Letts, 2002, p. 119). We can contrast the superficial inclusion of this area example with the latter category of Mathematical Inqueery.

Mathematical inqueery. In Mathematical Inqueery, students appropriate the role of liberationists and there are often tones of teaching mathematics for social justice (viz., Rands, 2013). For example, consider Rands' (2009) fifth-grade mathematical investigation on income of married couples. In this investigation, students used mathematics to challenge the hegemonic structure of marriage by considering the intersectionality of sexuality, gender, and class. Men and women in same-sex married couples, due to the income inequality between men and women, would be structurally positioned financially ahead of/behind each other. This example clearly moved beyond the superficial inclusion of the area example and began to address systemic inequalities which oppress queer lives. By following this task about income inequality with an action component, one could see this progress towards action research (Cammarota & Fine, 2006) and, in particular, I see a clear connection to teaching mathematics for social justice.

In fact, in 2013, Rands published "Supporting Transgender and Gender-Nonconforming Youth Through Teaching Mathematics for Social Justice" in the *Journal of LGBT Youth*. In this piece, Rands "synthesize[d] perspectives on gender-complex education, teaching mathematics for social justice, and research on students' development of proportional reasoning and statistical concepts, and then propose[d] a mathematics project for middle schoolers to facilitate their agency in challenging transphobia and gender oppression in their schools" (p. 106). The benefit of such activities is two-fold: the benefit of inclusion and the benefit of the social justice/action component. There is a clear need for research on additional teaching mathematics for social justice projects which consider the queer student experience. We turn our attention to a novel concept in queering the content of mathematics, and specifically queering geometry with fractal geometry.

Queering mathematical content. Both Add-Queers-and-Stir and Mathematical Inqueery work within the prescribed mathematical context whereas queering mathematical content rejects existing borders and offers an alternative reality. The following example goes beyond the understanding of queer as an identity, and queer theory's minor goal of queer-inclusive curriculum, to queer as opposition-to-the-normative and queer theory's major goal of challenging the normative. Instead of providing queer-inclusive curriculum and working within the given mathematical structure, Davis and Sumara (2000) challenge the dominant position that Euclidean geometry holds in school mathematics. By reframing geometry as a "systematic reduction of all phenomena to fundamental particles, root causes, and original principles" (p. 823), the authors challenge the necessity of Euclidean rigidity particularly in light of fractal geometry which evades it. Furthermore, by making a connection between knowledge and fractals, the authors continue the analogy between fractals and grain size: regardless of individual, social, or cultural foci, each are nested within or wholly contain

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others. It is important to note that Davis and Sumara align themselves with post-modern curriculum theory in their piece, not explicitly queer theory. This, however, does not change the interpretation presented. Characterizing additional work *ex post facto* as having converging interest with queer theory would only further emphasize the lack of explicit attempts to queer mathematical content.

Queer Pedagogy

Moving beyond the queer curriculum movement, into what most closely aligns with the liberationist's work, is the queer pedagogy movement. In fact, at its center, queer pedagogy disrupts the normative and its reproduction of oppressive structures (Luhmann, 1998), by adding goals of social justice to the educational system. Such an approach of working within structures, however, echoes assimilationist motives. Nonetheless, as mentioned above, I am particularly optimistic toward projects which consider a queer turn in teaching mathematics for social justice. Furthermore, little work has considered a uniquely queer pedagogy and none has considered a queer mathematics pedagogy. One such queer pedagogy which might be suitable for the mathematics context is presented next.

Beyond aligning existing movements such as teaching mathematics for social justice with queer pedagogical goals, scholars such as Britzman have described features of a uniquely queer pedagogy. For Britzman (1995, p. 165), a queer pedagogy is a pedagogy that "refuses normal practices and practices of normalcy,… begins with an ethical concern for one's own reading practices,… is interested in exploring what one cannot bear to know,… [and is] interested in the imagining of a sociality unhinged from the dominant conceptual order." Britzman provided us with four key features of a queer reading pedagogy, which I offer as transferrable to the mathematics education context: a queer mathematics pedagogy is one that: rejects the normative, has an ethical concern at its center, explores "what one cannot bear to know" (p. 165), and decenters normative structures and discourses. In other words, I propose that a queer mathematics pedagogy is one that, from a center of ethical concern for queer students, rejects the heteronormative systems, structures, and discourses by bringing to light queer experiences excluded by the heterosexual understanding. There is a tangible need for research on what might further constitute a queer mathematics pedagogy and what that pedagogy might offer in practice.

Concluding Remarks

Looking ahead, I see several key directions in which mathematics education researchers must move. First, mathematics education researchers should strive to operationalize performative and intersectional notions of identity (e.g., Darragh, 2015); such a distinction challenges the normative (separable) notion of identity. Incremental changes to existing research trajectories, such as simply drawing on updated notions of gender identity within the current context of gendered research in mathematics education, will still fail to include queer students. Second, I challenge the mathematics education research community to push against the borders of mathematics education research by centering the experience of queer students in their current research while simultaneously advocating that more mathematics education researchers must adopt a queer theoretical stance to accomplish this centering, not only in the mathematics context, but within the overall education system. Finally, I urge mathematics education researchers to develop and engage with queer curriculum and queer pedagogy, despite a theoretical basis outside of mathematics education and the relative lack of adoption in mathematics education research thus far. In addition to simply including queer examples, however, mathematics education researchers should continue to question the nature and boundaries of mathematics itself to challenge the notion of mathematics as fixed, neutral, and culture free. By embracing the tension between queer and the self-imposed, artificial borders of mathematics education research, the mathematics education research community can only continue to grow as more mathematics education researchers draw on the queering notions of queer theory. Taking a

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queer turn in mathematics education research is the most direct path toward the safe and equitable education of queer students.

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