QUEERING, TRANS-FORMING, AND EN-GENDERING MATHEMATICS AND MATHEMATICS EDUCATION

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The purpose of this working group session is to launch a new working group focused on using lenses from queer, trans, and gender studies in mathematics education. As such, this working group actively and directly connects to the conference theme of "broadening perspectives on mathematics teaching and learning."

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Rationale

Western mathematics was traditionally thought of as a subdiscipline of philosophy or the humanities with the goal of uncovering philosophico-mathematical truths. Over the centuries, however, it has come to be viewed more as a natural science, akin to something like physics. Both the philosophical perspective and the natural science perspective view mathematics as being outside the social realm; mathematics, so this view goes, is neutral, universal, uninfluenced by society or culture, and ahistorical. As D'Ambrosio (1999) notes, "During the first half of [the 20th century] . . . mathematics and mathematics teaching were considered to be independent of the sociocultural context" (p. 48). In fact, Skovsmose (2009) points out that "[i]t is precisely mathematics that is assumed to strip away all those elements that can be associated with subjectivity" (p. 68). These days, mathematicians rarely study philosophy of mathematics anymore. This view of mathematics as separate from the social realm has shaped mathematics education. Culture and the societal context of mathematics have not been a part of the standard mathematics curriculum - outside the scope of the discipline, so to speak..

This asocial view of mathematics is so prevalent that queer studies as a discipline has virtually ignored mathematics. The fields of mathematics and mathematics education have similarly overlooked queer perspectives. As mathematics educators have begun to recognize that mathematics and mathematics education are sociocultural practices, new critical and social constructivist perspectives have shifted the way educators think about teaching math. Insights from queer and trans* studies have the potential to further these trends and provide new insights for the fields of mathematics and mathematics education.

We are a group of education researchers, graduate students, pre-service teachers, and practicing classroom educators who believe that the time has come to queer mathematics and mathematics education. To "queer" is the verb form of the noun "queer" which in its original meaning "unusual, strange, or odd." When homosexuality went from being a practice to being an identity (due to the increasing administrative and medical apparatus that was put into place along with the changing imperatives of capitalism) a new set of slurs emerged to denigrate that identity and keep homosexuals in their place. So queer became one of the key epithets used against homosexuals. In the 1980s, however, two related movements, queer activism and queer studies began a long process of reclaiming that word as a term of empowerment and as a

descriptor for a methodological approach, respectively. Concurrent with that was the shift from the noun ("a queer") and adjective (e.g., "a queer idea") to the verb, "to queer" implying the act or process of making something queer. What does it mean to queer something? Charlie Glickman year, in his piece, "Queer is a Verb," elaborated:

> To queer something, whether it's a text, a story, or an identity, is to take a look at its foundations and question them. We can explore its limits, its biases, and its boundaries. We can look for places where there's elasticity or discover ways we can transform it into something new. To queer is to examine our assumptions and decide which of them we want to keep, change, discard, or play with. This becomes a practice in transcending the habit of settling for pre-defined categories and creating new ones. And even when we leave something unchanged, we have changed our relationship to it.

Queer is a way of questioning foundations, unearthing alternate or double-meanings, and reshaping things in a new way. It doesn't have a fixed meaning; queer studies prefers to keep "queer" as fluid and ever-changing, and adaptable to new situations and new scenarios. It is what linguistists and semioticians refer to as a floating signifier; a term and an idea that isn't fixed in content, but changes as it is used to queer different things in different contexts. "Queer" as a verb and queering isn't something that is restricted to the humanities; more and more, researchers in the social sciences and natural sciences are using queer as a way of approaching their work and their research citation as examples. We, as a working group, are taking this momentum in the field of education and in natural science to transform the way we think about mathematics and mathematics education.

Focal Issues

Since our working group is in the initial stages of formation, clarifying our purpose and beginning to delineate the focal issues of the working group are high priorities. An important launching question addresses how we view the aim of our group: What does it mean to queer/ en-gender/ trans-form mathematics and mathematics education? (En-gender being the verb of gender, trans-form being the verb of trans)

Another issue of high priority include building a sustainable support network: What kinds of connections can we find among the work that our members are doing? What kind of support can we provide and do we need from one another? What kind of support do we need from organizations and how can we bring about this support? How can we find others interested in our purpose and provide and connect them with this growing support network? More specifically, what actions can we take within the next year to begin building this network in a sustainable way?

In addition to these two broad issues, our working group has consulted our members--consisting of practicing teachers, preservice teachers, MA and PhD students in education,, teacher credential instructors, and professors of education-- to see what kind of topics they are interested in exploring under this umbrella of queer. These specific focal issues are organized below into categories.

Gender

Each of the issues in this category consider gender beyond a normative, binary view. See, for example, Esmonde (2011), who discusses how research into gender in mathematics education either insists on boys as being stereotypically masculine and proposes having more problems about sports and cars and "boy" things or insist on girls as being stereotypically

feminine and wanting more of a soft mathematics and social interaction and group work in the study. Esmonde (2011) proposes more of a complex way of looking at gender in mathematics that doesn't rely on stereotyped categories and takes into account the fluidity of gender.

- *Queering gender in mathematics*-Trans inclusion in gender pipeline projects - Are trans people being considered when we say we want "women" in education? There was recently a project started in San Francisco to train and educate trans people in software engineering and computer programming - how can we study these projects and compile the best practices and find ways to include trans issues, people, theory, and perspectives in the agenda of the gender pipeline movement?
- *Gender Complex Math Education*--What does it mean to teach math in a way that takes a complex view of gender rather than a dichotomous view of gender? One working group member presented a paper at the *Teaching Math and Social Justice* conference in 2012 related to gender complex math education.
- *Trans studies perspectives in mathematics education*--Trans studies provide insights about gender that can benefit mathematics education. For example, what might it mean to consider gender beyond a dichotomous view when conducting research about gender and mathematics learning, attitudes, beliefs, identities, or affiliations?

Research

Each of the issues in the research category relate to queering or en-gendering research about mathematics education in some way.

- *Queering research methodology* - There's a whole set of issues about being out as queer in a classroom setting - and people who do not conform to standard gender and sexuality norms are not normally given access to school settings and classrooms to do research. Our perspective and presentation influences the kind of data we collect, and it's important to be self-reflexive about how that affects our work as queer researchers. One of the authors of this proposal presented at this topic at AERA 2010 in a session on innovations in qualitative methodology.
- *Queering citation formats* - Traditional APA style removes the first names of all authors - degendering and de-racing and de-culturing their identities through this erasure of authorial subjectivity in favor of a more neutral, genderless, cultureless presentation. Also, in what way does the use of "he" and "she" when citing works reinforce binary systems of gender?
- *Gender complex research* - Not simply reducing our research to the categories of "boys" and "girls", "men" and "women" but really looking at the complexity of gender - traditional gender roles, queer gender forms such as "butch" and "femme", the study of female masculinity as it plays out in mathematics education, and really seeing how people "do" gender - engendering as a verb instead of gender as a noun. One working group member presented a paper at PME in 2012 suggesting lines of research in mathematics education from a more gender complex perspective.

Curriculum, Resources, Representations

The issues in this category address queering mathematics curricula and resources. Educators or researchers might use a queer analytical lens to critique what is normative in each of these, and how inquiry/ inqueery might move beyond what is normative.

- *Queering the common core / Queering curriculum* - At AERA this year, one curriculum studies scholar was presenting a queer approach to the Common Core Standards in English and

expressed a desire to collaborate with anyone who would like to extend his approach and methodology to exploring the Standards in Mathematics. Another member of our working group has looked at the foundations of STEM education in the common core and looked at the ways that the agendas and requirements of capitalism are reflected in the rationale and justification for the mathematics standards and for reform mathematics.

- *Queering materials and resources available, images, texts* - why is it always heterosexuals that get pictured in texts and materials? how do you know this, can you tell someone is queer just by looking at them? if so, how... Why are there no queer sidebars? what does this mean? Why is homosexuality or gender nonconformity not discussed in discussions of historical mathematicians?
- *Queering representations:* for example, who makes it into textbooks - pictures, exercises, problems, etc; popular culture representations of mathematicians and math teachers/students. Do gays and lesbians make it into textbook problems? Transgender people? When problems discuss a family setting - What about two mothers or two father families? Families that have multiple generations at home? Gay men coparenting with lesbians? Who gets portrayed as mathematicians in media, and how is their gender and sexuality portrayed? An important issue here is the assumption of heterosexuality - when someone's homosexuality is unremarked upon in film, television, or books, they are assumed by readers to be heterosexual. But when they are portrayed as gay, what are the implications of that for readers' understanding of the text?) this is its own field of study

Pedagogy and Teacher Education

The topics in this category focus on pedagogical processes and perspec for example, is Alan Turing or Hardy portrayed as gay, what does it mean to portray them in that way in a particular context?

- *Queering math pedagogy/ Mathematical Inqueery*--How might a queer theoretical lens shape math pedagogy? One working group member has written articles and book chapters about what they term "mathematical inqueery".
- *Queering "Math Methods" (teacher education)*--How can teacher educators teach queer their math methods courses? What do queer and trans perspectives have to offer math teacher preparation courses? Are math teachers prepared to work with queer and trans students? One working group member has explored some of these issues when working with teaching candidates.
- *"Teaching math for social justice" and sexuality/ gender diversity*--A body of scholarship focuses on teaching math for social justice. How can educators teach math in ways that work toward social justice for LGBT folks? One working group member recently wrote an article suggesting a middle school project in which students analyze and collect survey data related to how often peers stand up for one another when they hear a negative comment about someone's gender expression.
- *Queering mathematical assessment*--One working group member recently presented a paper about queering assessment. A next step is to consider queering mathematical assessment.
- *Queering mathematics disability* - One working group member presented at the DC Queer Studies Symposium this year about what it would mean to queer mathematics disability and to rethink how we view difference when it comes to students who perceive numbers and mathematics different from the norm.

Mathematical Concepts and Content Areas

The topics in this category consist of specific mathematical concepts topics. The topics listed serve as a beginning place for considering what a queer perspective might offer mathematical content. For example, Elizabeth Freeman (2010) has explored the concept of time through using a queer lens and suggested the concept of chrononormativity. Working group members have considered in their research how this concept might be incorporated into mathematics education by getting students to rethink who makes it into historical timelines (and in what ways) and how time is used to structure their classroom experiences. In related fields, a physicist and feminist studies scholar named Karen Barad (2012) has considered what it might mean to queer physics and biology-- starting with queer animals and the hidden history of homosexuality in nature and eventually even contending that the atom itself is queer. Similar consideration might be given to the other mathematics concepts on the list, as well as other concepts not yet added to the list.

Queering:

- time
- infinity
- space
- topology
- knots
- numbers
- measurement
- statistics
- place value
- alternate number bases
- modular arithmetic
- composition and decomposition
- cardinality
- counting
- differentiation, integration
- zero
- irrational numbers
- rational numbers
- dimension
- binary
- polygons
- polyhedra
- spheres, tori, double tori
- gluing
- imaginary numbers
- complex numbers, the complex plane, complex analysis
- linear algebra

Plan for Working Group

Session 1: What does it mean to queer/en-gender/trans-form mathematics?

Our first session will provide the opportunity for group members to collaboratively explore

perspectives on the purposes of the working group. The working group has been actively working on coming up with these definitions during the preparation of this proposal; we hope to draw a lot of new participants into this conversation and re-work our shared definitions. Participants will have the opportunity to explore the session focus questions through discussion, and to review the list of focal areas and revise them based on their current understandings of their own research. From this, the participants will also brainstorm projects related to the specific focal issues. The working group will continue to develop our extensive list of participants' topical interests to further build our research network.

Session 2: How can we begin to build a sustainable network to support our work?

In the second session, the group will further develop our ideas for building and maintaining a sustainable network to support the ongoing work of group members. In addition to informal connections among participants and making accessible to one another potential research interests, the group will consider the types of support needed from various organizations and how to go about putting that support into place. For example, the group will consider questions such as the following: What kinds of changes would we like to see in organizations such as PME, PME-NA, NCTM, and AERA in order to enable our network to become sustainable? Might we want to consider forming affiliate groups or special interest groups within these organizations? What other strategies can we develop to foster sustainability?

Session 3: What does our activist agenda look like for next year?

In the third session, the group will develop more specific plans for the next year. What collaborative projects do we want to begin? What kind of product could we create collectively (for example, a queer math methods text or an anthology on queer mathematics)? What specific actions will we take to put our plan for sustainability in place?

Anticipated Follow-Up Activities

Follow up activities will entail enacting the plans developed in Session 3. These will involve engaging in a collaborative project or projects developed in Session 3. We will also take action to put our plan for sustainability in place to allow our supportive network to continue to grow. Finally, we anticipate proposing another working group session for PME-NA 2014 to allow for additional exploration of the focal issues.

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