Innovations in “gender issues” research in mathematics education

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Gender issues have long been a focus of mathematics education research. Landmark research was conducted over four decades ago by Fennema and Sherman (1977, 1978). The focus of early research was typically gender differences in students’ achievement in, participation in, and attitudes toward mathematics (Leder, 2019; Leyva, 2017). Since that time, interest in researching this topic has fluctuated. Gender issues were a key focus of mathematics education research in the 1980s and 1990s. However, in recent decades, there has been less focus on this topic. For instance, in more recent editions of the *Research in Mathematics Education in Australasia* (RiMEA) 4-year reviews (Makar et al., 2016; Perry et al., 2012; Way et al., 2020) and the National Council of Teachers of Mathematics (NCTM) handbooks (e.g., English, 2008; English & Kirshner, 2016; Lester, 2007), gender has not been a focus, instead being part of a broader equity discussion. In contrast, in earlier editions of both the RiMEA reviews (e.g., Forgasz et al., 2008; Perry et al., 2004) and the NCTM handbooks (e.g., Grouws, 1992), entire chapters were focused on gender. With this Special Issue, we hope to bring renewed attention to this field and expose readers to a diversity of ideas—theoretically, methodologically, and empirically—from current researchers.

Although research about gender issues in mathematics education has continued into the twenty-first century, the conceptual and methodological frames used for such research have typically not progressed to align with contemporary conceptions of gender, despite earlier calls for change (e.g., Damarin & Erchick, 2010; Esmonde, 2011). For instance, many researchers still discuss gender in binary ways (e.g., only having “girls” and “boys” as participant groups), conflate the terms/constructs *gender* and *sex*, and use associated terminology inconsistently.

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Recently, there have been shifts in the ways that gender is conceptualized and investigated in mathematics education research (e.g., non-binary conceptions, queer lenses, research with transgender and non-binary students). Sessions regarding such topics have been held at recent international conferences, such as the 2018 Mathematics Education Research Group of Australasia conference, the 2018 to 2021 Psychology of Mathematics Education: North America conferences, and the 2017 and 2021 Mathematics Education and Society conferences. This year, a new institute (The Critical, Philosophical, and Psychoanalytic Institute for Mathematics Education) and journal (*Journal for Theoretical and Marginal Mathematics Education*) were launched; both of these avenues are suitable spaces for researchers who are pushing boundaries in mathematics education research regarding gender and other sociocultural issues.

Overview of papers

In this Special Issue, international researchers who are leading this shift in the field share their boundary-pushing work—theoretical, methodological, and/or empirical—pertaining to gender issues in mathematics education. Seven papers are featured in this Special Issue, with authors ranging from early-career scholars to experienced researchers. The papers have been grouped together to reflect their focus: (a) position papers, (b) theoretically-focused papers, and (c) empirically-focused papers.

Position papers

Helen Forgasz (Monash University, Australia) has a long-standing interest in equity issues in mathematics education. In her paper, “Gender: A Dilemma for Large-Scale Studies in Mathematics Education,” she discusses a range of issues associated with the inclusion of gender diverse students’ data in the analyses of large-scale mathematics education datasets. In large-scale assessments such as TIMSS (Trends in International Mathematics and Science Study) and PISA (Programme for International Student Assessment), data about intersex and gender non-conforming students have not been included. In contrast, in the Victorian Certification of Education in Australia, gender diversity has been recognized since 2018 with the inclusion of a third gender category. Due to the very small numbers of students who would be in such a category (e.g., non-binary), there are challenges when doing statistical analyses. However, Forgasz offers productive suggestions of ways to include gender diverse students’ data when completing such analyses.

Research on sexual identity is rare in STEM (science, technology, engineering, and mathematics) education, and especially rare in mathematics education. In her paper, “Prying Open the Closet Door: A Call for Research on Sexual Identity and Mathematics Education,” Lynda R. Wiest (University of Nevada, U.S.A.) calls for research on students’ sexual identities in relation to school mathematics experiences. She argues for researchers to take a look outside the mathematics education “bubble” to find relevant and informative research in other fields (e.g., psychology, social studies, science education). By drawing on findings from other disciplines, mathematics education researchers will be able to progress with research regarding sexual

identity in mathematics classrooms. Wiest provides suggestions for ways to expand in the field in a commitment to equitable mathematics teaching and learning.

Theoretically-focused papers

In his paper, “Queer Identity and Theory Intersections in Mathematics Education: A Theoretical Literature Review,” Alexander S. Moore (Virginia Polytechnic Institute and State University, U.S.A.) uses intersectionality as a theoretical lens on mathematical identity and queer identity, referring to mathematical identities outside the matrix of gender and sexual norms. Theoretically, he points to the sociopolitical turn in mathematics education (i.e., research on various social issues related to mathematics education). Moore performs a thorough, systematic, and theoretical review of the literature to articulate a basis for the intersection of mathematical identity and queer identity. He describes how identity, situated learning, and power are related to experiences in mathematics education. By articulating the theoretical basis for this intersection, he has built a framework in which he illustrates the intersectional nature of mathematical and queer identities. The framework, the Queer Identity Intersection of Mathematics Education, is a tool for researchers to use to better conceptualize queer identities in mathematics education.

In her paper, “The Possibilities of Feminist Poststructural Discourse Analysis as an Approach to Gender Research in the Mathematics Classroom,” Julia Przybyla-Kuchek (University of Georgia, U.S.A.) proposes feminist poststructural discourse analysis as a methodology to study gender and racial (in)equity in mathematics classrooms. She describes the theoretical underpinnings of the methodology (Baxter, 2003) and uses it to analyze interactions in a Grade 7 mathematics classroom. According to Przybyla-Kuchek, using Baxter’s (2003) feminist poststructural discourse analysis is transformative and will open up spaces for marginalized and silenced voices. What people say is to be viewed as evidence of discourses at work, not truths. Przybyla-Kuchek shows that there are contradictory discourses that lead to the creation of complex subject positions of girls in mathematics classrooms.

Empirically-focused papers

In her paper, “When Girls Do Masculinity Like Boys Do: Establishing Gender Heteroglossia in School Mathematics Participation,” Felicia Jaremus (University of Newcastle, Australia) provides novel insights into girls’ participation in secondary mathematics by employing an understanding of gender as heteroglossic. To Jaremus, it is essential that attention is drawn to new ways of theorizing girls’ participation in mathematics. She explores the post-compulsory mathematics participation choices of two students, a girl and a boy. Theoretically, drawing on Mendick, she demonstrates the reasons why these students chose to participate in post-compulsory mathematics, and does not distinguish them by their sex/gender, as would be expected in the monoglossic gender system. By drawing out feminine and masculine features of the two students’ choices, she creates new ways

of capturing gender in relation to mathematics and expands places for girls to be accepted as authentic mathematics learners. In her analysis, Jaremus found that although femininity was performed by both students, the two students' subject choices were mainly characterized as masculine performances, including establishing themselves as having mathematics brains and seeking to use their mathematics participation to attain prestige.

In their paper, "Finding Community and Overcoming Barriers: Experiences of Queer and Transgender Postsecondary Students in Mathematics and Other STEM Fields," Elizabeth Kersey (University of Northern Colorado, U.S.A.) and Matthew Voigt (University of California, U.S.A.) address a gap in the literature by documenting the experiences of queer and transgender students in university STEM programs. Drawing on poststructural, feminist, and queer theories, Kersey and Voigt investigated transgender and queer students' experiences in university STEM programs via a narrative inquiry study with transgender students and a grounded theory narrative study with queer students. The merging of these two studies resulted in a greater understanding of the experiences of transgender and queer students in such environments. Kersey and Voigt make connections between gender category oppression and gender transgression oppression, and suggest a variety of strategies to make university STEM fields more inclusive of queer and transgender students.

In her paper, "Gender, Sex, and Heteronormativity in High School Statistics Textbooks," Megan M. Parise (University of Minnesota, U.S.A.) discusses findings from her analysis of three high school statistics textbooks. She investigated how gender, sex, and sexuality are constructed and how that construction contributes to limited conceptions of gender and sexual identities. Using queer theory and critical mathematics frameworks to underpin critical discourse analysis, Parise highlights emergent themes, like females/women/girls portrayed as mothers and males/men/boys portrayed as athletes. She argues that underrepresented students, particularly queer and/or gender non-conforming students, are marginalized in educational settings by the lack of examples of their identities in textbooks, such as those that she analyzed.

Concluding remarks

We hope that readers of this Special Issue will be inspired by the papers to examine their own practices when conceptualizing, conducting, and reporting "gender issues" research in mathematics education. Whether gender is the focus of research or one of many "variables" that are examined, it is crucial to clearly communicate one's theoretical stance and operational definitions of the terms used. Furthermore, methodological choices must be made in alignment with one's theoretical positions regarding gender, sexuality, and related topics. With a shift to contemporary conceptions, the field can progress so that participants of all genders and sexualities are included and represented in mathematics education research.

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