Part I

Equity and Gender

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Six chapters are included in Part I of the book. The first three are reproduced articles from ZDM. With the exception of the first chapter, authored by the late Leone Burton, each is accompanied by a preface written by the original authors. The preface to the Burton chapter has been thoughtfully crafted by Diana Erchick. The remaining three chapters in Part I are newly authored. Two commentaries by various authors with expertise in the pertinent research area follow each new contribution.

A major focus of each chapter in this part of the book is gender equity. We decided on gender equity for the opening part of the book as, historically, gender was the initial dimension of equity researched widely, and later served as the springboard for emphases on, or in combination with, other dimensions of equity within the field of mathematics education research.

Leone Burton’s chapter, Moving towards a feminist epistemology of mathematics, was a seminal contribution to feminist theoretical discussions on addressing gender inequities in mathematics learning beyond the liberal feminist approaches which had underpinned early work in the field. As identified by Diana Erchick in her preface, Burton “argued for a feminist epistemology that is parallel to the epistemologies of other STEM fields, but a case unto itself because of the nature of mathematics”. Burton proposed five categories for defining “knowing mathematics” based on her reading of philosophical, pedagogical and feminist literature: “its person- and cultural/social-relatedness; the aesthetics of mathematical thinking it invokes; its nurturing of intuition and insight; its recognition and celebration of different approaches particularly in styles of thinking; the globality of its applications”. Erchick honed in on Burton’s expressed hopes for the future, pointing out that some progress had been made in meeting Burton’s vision, but more was needed: “we are as a field moving in the right direction to enrich the discipline by nurturing learners whose epistemology of mathematics is less and less objectivist”.

In her chapter, Equity in mathematics education: Unions and intersections of feminist and social justice literature, Laura Jacobsen (formerly Spielman) conceived of gender equity as socially constructed and inextricably intertwined with social class and race/ethnicity, with women’s ways of knowing mathematics recognized as different from men’s. For a sustainable impact on equity and for the common good, traditional mathematics, it was argued, was in need of an overhaul. Support was needed for mathematics education to include mathematical literacy, critical literacy, and community literacy. In her preface, Jacobsen describes ensuing
research and curricular developments for pre-service teachers based in the theoretical perspectives she put forward in the original article.

In her chapter, *Adolescent girls’ construction of moral discourses and appropriation of primary identity in a mathematics classroom*, Jae Hoon Lim presents findings from a qualitative study of three American girls from different socio-economic and ethnic circumstances. Within their traditional mathematics classrooms, she traces their developing social and academic identities. The dynamics and culture of the classroom, peer group pressures, and personal class and ethnic backgrounds were interacting influences on their identity formations. The girls, she found, made choices that lead them into mathematics pathways that limited their future mathematical options. In the pursuit of “a more equitable intellectual pursuit and joyful learning in school mathematics across diverse groups of students”, Lim argued for a systematic change to the US public school system “directed toward various groups of underserved students”. In the preface to the chapter, she provides further research evidence to support her contention that “social and cultural disconnection between working class minority girls and their teachers has contributed to existing gender, racial/ethnic, and class inequities in mathematics education”. She called for the re-conceptualizing of mathematics teaching “in light of social activism”. She lamented that this perspective seemed “far removed from the dominant research discourse in mathematics education which has focused on the cognitive process of individual learners to explain how authentic mathematics learning may occur”.

Paul Dowling and Jeremy Burke provoke readers to contemplate addressing issues of social inequity with sound mathematical content within the mathematics classroom in their chapter entitled, *Shall we do politics or learn some maths today? Representing and interrogating social inequality*. They reflect on historical portrayals and the inferences drawn of gendered and class inequities manifest in photos and in the images found in mathematics textbooks, and present an overview of pertinent research findings. They introduce two variables for examining images: whether the image expresses tacit (connotative) or explicit (denotative) social inequity, and then whether the image is consonant or dissonant with that representation. They conclude that it is possible to ensure that students learn appropriate mathematics within the classroom, and they strongly endorse the imperative to remove representations reflecting patterns of social inequity. Yet, they claim, serious understandings of social injustice are not possible in the mathematics classroom “because the public domain settings that we construct will always be mathematically motivated distortions of the alliances that we want to destabilize”. Privileging “political motivations over our mathematical ones” by switching activities is needed. That is, “we can be both mathematics educators and political activists, just not at the same time”.

Gabriele Kaiser, Maren Hoffstall, and Anna Orschulik present recent empirical findings on the gendered perceptions of mathematics held by two age cohorts (11–12 year-olds, and 15–17 year-olds) of German secondary students in their chapter, *Gender role stereotypes in the perception of mathematics: An empirical study with secondary students in Germany*. They administered a modified version of the *Who and mathematics* instrument developed by Leder and Forgasz (2002) and included an additional open-ended question. They found that overall, mathematics
continued to be viewed as a male domain, with the older group holding stronger traditionally stereotyped views than the younger group who were generally more egalitarian. The reasons students provided for males or females being considered the higher achieving group differed. The three most frequently cited reasons for males to be considered more successful mathematically were: interest in mathematics, their ability to reason logically, and career. For girls to be considered the higher achieving group, effort, concentration, and ambition, were the three most prevalent response categories. The authors implored teachers and parents to “to strengthen girls’ mathematical self-concepts and make them believe in their own achievements”.

In the chapter, Students’ attitudes, engagement and confidence in mathematics and statistics learning: ICT, gender, and equity dimensions, Anastasios Barkatsas reports findings from three studies in which the Mathematics and Technology Attitudes Scale [MATS] were used to gauge students’ attitudes towards technology use for mathematics, and a further two studies in which the Survey of Attitudes Toward Statistics Scale [SATS] were administered. The MATS was completed by secondary school students and the SATS by university students. The participants were from Australia and Greece. Replicating previous findings, boys expressed greater confidence than girls in mathematics and in technology, greater confidence in using computers and CAS calculators, and had more positive attitudes to learning mathematics with computers and CAS calculators. At the tertiary level, males also demonstrated more positive attitudes than females toward statistics. In one of the studies, cluster analysis was conducted to examine the inter-relationships between the factors included in the MATS scale. The findings revealed that girls were more likely than boys to be found in some clusters, while boys were more likely than girls to be found in others. The commentators on this chapter both identified this analysis as of particular interest in that the model Barkatsas had described as underpinning the development of the MATS instrument appeared to have been challenged by the findings. It was suggested that gender might be a variable to be included in the model.

References