Commentary 1 on Feminist Pedagogy and Mathematics

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Research and community interests in gender differences in achievement and participation in mathematics burgeoned in the 1970s. Two broad and consistent findings were given particular prominence. First, that there was much overlap in the performance of females and males; consistent between-gender differences were invariably dwarfed by much larger within-group differences. Second, students who opted out of post compulsory mathematics courses typically restricted their longer term educational and career opportunities. Many courses and employment fields included, and continue to include, specified levels of mathematics attainment among their entry requirements, whether or not these levels are actually pertinent for such work.

Recognition of the critical filter role played by mathematics has ensured that key stake holders, researchers, practitioners, and policy makers have maintained a focus on gender differences in mathematics learning. The prevalence of such research is confirmed, for example, by Leder (1992) who noted that approximately 10% of the articles published in the influential *Journal for Research in Mathematics Education* [*JRME*] between 1978 and 1990 dealt with gender issues in mathematics education. This figure, I wrote, was "remarkably similar to that cited by Reyes (1983) for a summary of the topics submitted to that journal during the two year period 1981–1982" (Leder 1992, p. 599). Lubienski and Bowen's (2000) extensive content analysis of 48 major national and international educational research journals accessible through ERIC yielded similar results. Their search identified some 3000 mathematics education research articles over the period 1982 to 1998. Close to 10% of these included gender as a factor of interest.

Over time, multiple theoretical and value-driven perspectives have been used to shape and guide research on gender and mathematics learning. It is important to draw on the wider research literature to provide an appropriate context for work in this area. In line with the thrust of Judith Jacobs' article, *Feminist pedagogy and mathematics,* feminism is used as the lens of primary focus. "There is", Jacobs argued, "much for mathematics education to learn from women studies programs and their use of feminist pedagogy" (p. 12).

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Different Faces of Feminism

Feminism is commonly described as the movement organized around the belief in the social, political, and economic equality in the sexes.[1] The range of adjectives linked to feminism is large, apparently ever increasing, and reflective of the disciplines and theoretical stances taken by those drawn to the movement.[2] As noted by Schiebinger (1999, p. 3) "Feminism is a complex social phenomenon and, like any human endeavour, it has suffered its share of misadventures and travelled down a number of blind alleys". Increasingly it is accepted "that is it impossible to define the term *feminism* in a way that is acceptable to all those who seek to use it … historically, the terms *feminism* and *feminist* have always been hard to define and strongly contested" (Caine 1998, p. 419, emphasis in the original). Other frequently used descriptors such as first wave feminism, second wave feminism, third wave feminism, and postmodern feminism provide a sense of the movement's historical evolution. Simplistically, the first wave is typically associated with the suffragette activities in the nineteenth and early twentieth centuries and attempts to overturn explicit legal obstacles to equality; the second with the liberation struggles prevalent in the 1960s to 1980s to overcome explicit and more subtle barriers, i.e., the diverse pathways and efforts advocated to achieve equity in educational opportunities, in employment and working conditions, health care, and legal justice. Those identifying with the third wave of feminism have argued that, all too often, the emphasis on the empowerment of women as a group has shown signs of essentialism, downplayed the importance of individual differences, failed to take sufficient account of minority and disadvantaged groups, and ignored the multiple and perhaps conflicting identities descriptive of individuals. Finally, the term post-feminism, originally coined to describe the back-lash against second wave feminism, is now also generally used to encompass the many theoretical perspectives used to critique the research and the practices embraced and promoted by the different feminist discourses. This sequential listing of the different feminist waves should, however, not ignore the reality that the foci and strategies of earlier waves of feminism have continued to coexist with those championed at a later time.

[1] For example, feminism. (n.d.). "the doctrine advocating social, political, and all other rights of women equal to those of men; an organized movement for the attainment of such rights for women" *Dictionary.com Unabridged (v 1.1)*. Retrieved October 28, 2008, from Dictionary.com website: http://dictionary.reference.com/browse/feminism.

[2] The seemingly endless list includes: black feminism, contemporary feminism, eco feminism, liberal feminism, Marxist feminism, multicultural feminism, multiracial feminism, pluralist feminism, post colonial feminism, popular feminism, radical feminism, reformist feminism, socialist feminism, transnational feminism. Many of these are closely linked to gendered theories of education, both within and beyond mathematics—see e.g., Bank (2007).

Feminism and Mathematics Education

Elsewhere (Leder 2004) I have sketched changing lenses through which gender and mathematics learning have been viewed as follows:

> Gender differences in achievement in areas such as mathematics were typically assumed to be the result of inadequate educational opportunities, social barriers, or biased instructional methods and materials.... It was generally assumed that the removal of school and curriculum barriers, and if necessary the resocialization of females, would prove to be fruitful paths for achieving gender equity. Male (white and Western) norms of performance, standards, participation levels, and approach to work were generally accepted uncritically as optimum. Females were to be encouraged and helped to *assimilate*. This notion, helping females attain achievements equal to those of males, was consistent with the tenets of *liberal feminism*. The *assimilationist* and *deficit* model approaches proved persistent throughout the 1980s and continued to guide many of the intervention initiatives aimed at achieving gender equity. At the same time, different voices were beginning to be heard, undoubtedly influenced by work developed in the broader research community. The themes fueled by Gilligan's (1982) *In a different voice*, and the feminist critiques of the sciences and of the Western notions of knowledge proved particularly powerful. New questions began to be asked.... Should we accept, uncritically, the way in which subjects such as science and mathematics were being taught, valued, and assessed? Should young women strive to become like young men or should we acknowledge and celebrate their goals, ambitions, and values? Should we accept only learning styles, materials and conditions favoured by males? ... Rather than expect them to aim for male norms, attempts were made to use females' experiences and interests to shape curriculum content and methods of instruction. The assumptions of *liberal feminism* that discrimination and inequalities faced by females were the result of social practices and outdated laws were no longer deemed sufficient or necessary explanations. Instead, emphasis began to be placed on the pervasive power structures imposed by males for males.... Some researchers ... wished to settle for nothing less than making fundamental changes to society. Advocates of this approach, often classed as *radical feminists,* considered that the long-term impact of traditional power relations between men and women could only be redressed through such means. (pp. 106–107)

To what extent did mathematics education researchers embrace the changing perspectives driven by the evolving feminist positions? As part of the 25th anniversary celebrations for *JRME*, Fennema and Hart (1994) reviewed research on gender and mathematics published over the period 1970–1992). Under the heading "what has not been included in the *JRME*" they wrote: "With few exceptions ... an empirical-scientific-positivist approach to research was used in the published studies. Few qualitative studies have appeared, and no scholarship dealing with a re-examination of mathematics education from a feminist perspective can be found" (p. 652). The voice of work drawing on the last mentioned (i.e., feminist perspectives) could, however be found elsewhere. By the mid 1990s Leder et al. (1996) could confidently claim that their review chapter of research and intervention programs focusing on gender and mathematics covered "models of gender equity and the historical progression from empirical research to *feminist perspectives*" (p. 945, emphasis added). They referred, for example, to Rogers and Kaiser's (1995) edited collection on equity in mathematics education which contained a representative sample of the different paradigms embraced by mathematics education researchers and reflected the content and thrust of the prevalent mathematics curriculum. Drawing on a variety of

sources, Kaiser and Rogers (1995) described five "stages" in the mathematics curriculum. Though not spelled out explicitly, the link with various feminist discourses can readily be inferred:

- womanless mathematics—"mathematics was what men did … women (were) not necessary to the development of mathematics" (p. 4);
- women in mathematics—women mathematicians are exceptions. "It ascribes to women in the field a 'loner' status that makes them vulnerable to every setback" (p. 4);
- women as a problem in mathematics—"Mathematics is a field in which women have difficulty" (p. 5) but appropriate interventions can alleviate this;
- women as central to mathematics—"women's experience and women's pursuits are made central to the development of mathematics" (p. 8) and this can be done by changing the discipline and /or changing the content; and
- mathematics reconstructed—elusively described as a time when the mathematics curriculum is transformed so that "cooperation and competitiveness are in balance and mathematics will be what people do" (p. 9).

Several other contributions in this volume are particularly noteworthy. Becker (1995) drew heavily on the work of Belenky et al.[3] (1986) who in turn have been widely credited with exploring the educational implications of Gilligan's (1982) influential study, to which reference has already been made earlier in this commentary. Belenky et al.'s research findings, Becker argued, offered a powerful stimulus to "discuss ideas … that I think (have) major implications for how we can encourage girls and women to pursue mathematics and mathematics-related careers" (p. 163). Alternative approaches to traditional teaching practices in mathematics classes were also discussed by Rogers (1995) who explained her vision and translation of "a feminist mathematics pedagogy in practice" (p. 179). Burton's (1995) contribution provided yet another example of the impact of the increasingly strong and diverse voice of feminism on mathematics education. Under the heading "moving towards a feminist epistemology of mathematics" she argued for a redefinition of what it means to know mathematics, "to question the nature of the discipline in such a way that the result of such questioning is to open mathematics to the experience and the influence of members of as many different communities as possible" (p. 222).

It is against this background that Judith Jacob's article *Feminist pedagogy and mathematics* was written and published. It is useful to reiterate the article's main points.

Feminist Pedagogy and Mathematics—a Brief Summary

Core issues covered by Jacobs, with those most pertinent to mathematics educators fore grounded, included:

[3]It is difficult to estimate the impact of this work but it is undoubtedly significant. A recent Google search yielded close to 3000 citations of this book.

- Gender is a salient variable; females and males have different value systems…
- Changes must be made to the disciplines if females are to feel included and welcomed in the classroom and in intellectual pursuits.
- Generalization should not lead to essentialism—"the use of the word women to describe the way of thinking of some people does not preclude the possibility that some women do not think in this way nor that some men do".
- Belenky et al. (1986) hypothesized that women experience 'stages' in knowing which "differ in some fundamental ways from how men were found to come to know things.… These … represent a progression from dependence to autonomy, from uncritical to critical".
- Examples are given to illustrate how these different stages are reflected in the ways individuals explain their mathematical knowledge.
- Significantly, mathematics traditionally values separate ways of knowing; men tend to be *separate knowers*, women *connected knowers*.
- Subtle changes "in the language of discourse" used in the mathematics classroom, in the way "the discipline of mathematics is explored", and taught can create a more comfortable and inclusive atmosphere for females.
- Pedagogical strategies which engage rather than alienate females are described.

Finally, Jacobs concluded:

> Much of the previous research and intervention programs designed to promote females … have been based on the assumption of male as the norm.… Little research and work has begun from the assumption that females have strengths, experiences and learning styles that can succeed in mathematics. This article presented a theoretical basis and a model for beginning with the assumption that being a woman is the norm for females and that it is the instructor's responsibility to capitalize on females' strengths and interests in order to facilitate their success in mathematics. The next stage is to design specific programs based on this paradigm and test whether such an approach will succeed in enhancing the mathematics learning and participation of women. Using feminist pedagogy should benefit not only female students but also other students and society at large and in no way denies the power or beauty of mathematics. (p. 16)

Some 15 years have elapsed since Jacobs (among other mathematics educators) argued that feminist principles should be incorporated in new research and curriculum programs. How extensively has this call been heeded?

Contemporary Perspectives in the Mathematics Education Research Community—Some Pertinent Glimpses

To conform with inevitable space constraints, in this section I necessarily draw heavily on overviews of research on mathematics and gender included in several recent, comprehensive reviews of research in (mathematics) education. Specifically, these are the collections edited by Bank (2007), Forgasz et al. (2008), Klein (2007), and Lester (2007). Pertinent excerpts are shown below.

From Bank (2007)

"The past 20 years", wrote Boaler and Irving (2007)

> have witnessed various reforms in countries around the world aimed at moving school mathematics closer to an experiential, open, and discursive discipline, offering more opportunities for connected thinking. Despite these reforms, traditional pedagogies continue to dominate. The growing body of evidence showing that knowledge presented in this traditional, abstract, decontextualized way is more alienating for girls than boys … and for non-Western than Western students suggests that inequality in the participation of different sexes and cultural groups in mathematics—particularly at the highest levels—will be maintained at least as long as traditional pedagogies prevail in classrooms. (Boaler and Irving 2007, p. 289)

From Forgasz et al. (2008)

> Liberal feminism, with an emphasis on helping females to assimilate, is perhaps still the dominant perspective in research on gender and mathematics education. (Vale and Bartholomew 2008, p. 273)

> Of the studies published in the period 2007 to 2007 and reviewed by Vale and Bartholomew the majority was located in an implicit liberal framework. … There remained an assumption that when girls were opting out of mathematics, the solution lay in persuading them of the importance of continuing with the subject. Having said this, the influence of radical feminist or post-modern perspectives was increasingly in evidence, (and) not just in those few studies in which these frameworks were explicitly adopted. (p. 287)

From Klein (2007)

> We see increasing signs of gender equity in mathematics at the school and undergraduate level. … Whenever a statistically significant difference is found in the way males and females tend to do mathematics is observed, the male way of doing things … tends to be stated in a more positive way. … Putative sex differences in cognitive abilities continue to be advanced as the preferred explanation for sex differences. … Looking at mathematics from a feminist perspective, one would say, "Don't fix the women, fix the mathematics." Indeed, mathematics has changed considerably in the last 20 years or so. (pp. 249–250) (Lacampagne et al. 2007)

From Lester (2007)

> Too often, researchers are concerned with identifying problems and *ignore the opportunities to research and identify factors that contribute to these success stories*. Thus the significant questions to be raised here are: What is the sociocultural context of the research?; What are the histories of the situation or the practice?; Who are the holders of those histories?; Who is behind any proposals for change?; Who are the stakeholders in any future situation?; Who has the most to lose, or to gain from the research?; How will the different goals of the stakeholders be balanced in the research?; What can be learnt from models of successful practice? (Bishop and Forgasz 2007, p. 1163, emphasis added).

The thrust of these recommendations is implicitly consistent with those made by Jacobs, who, as mentioned above, argued that "there is much for mathematics education to learn from women studies programs and their use of feminist pedagogy" (Jacobs, 1994, p. 12).

Concluding Comments

From this brief account of the journey mathematics educators have travelled in recent years it can be inferred not only that "much reinvention of the wheels has

occurred without reference to past successes and failures" (Lacampagne et al. 2007, p. 250) but also that new directions, many consistent with the tenets of the later waves of feminism, are being explored. What changes has this work achieved?

Recently I interviewed a number of women who had been outstanding high achievers at school. They, together with some 300,000 Australian secondary school students had entered an annual national mathematics competition. Their results placed them in the top 0.0001% of entrants. None had chosen to become a mathematician, though all were well settled in their career. I conclude this commentary with reflections from two of these thoughtful young women on what life might have been like had they been male, comments which indicate how they perceive the current societal norms and expectations.

> Clearly, Australia (like other Western nations) continues to sustain disparities in men's and women's achievements in the workplace, public life and the economy (amongst other things). However, as a feminist and social constructivist I do not believe it is possible to separate my being female from other aspects of my identity and life. If I were male I simply would not be the same person.

> An advantage of being male would be to have been more encouraged to pursue a career in mathematics/engineering/technology. I would also have fitted in at high school better than I did—my Years 9 and 10 were spent on an all-girls campus where it was supremely uncool to be good at maths and science.

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