

Keitel, C. (Ed.):

## **Social Justice and Mathematics Education**

### **Gender, Class, Ethnicity and the Politics of Schooling**

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#### • **Introduction**

This book collects papers presented during the sessions of the International Organization of Women and Mathematics (IOWME) in ICME 8, in Sevilla, Spain. It gathers 25 papers from researchers who are not only interested in studying gender issues in mathematics education, but who also try to bring together other constructs such as class and ethnicity into their analysis. Although the book is not divided in sections, the introduction by Christine Keitel (pp. v-viii) points out to four main topics around which the papers are organized. One big topic relates to problems of conceptualization of mathematics and mathematics teaching and learning (chapters 1–7). A second thematic area deals with “social and cultural influences on gender-, class-, and ethnicity-differentiated attitudes and perceptions towards mathematics” (chapters 8 – 11). A third grouping tackles policy issues connected to the organization, curriculum and assessment of mathematics education (chapters 12–21). Finally, the fourth series of papers is devoted to reflections on research methodology and theoretical paradigms (chapters 22–25).

Although the 25 chapters share similar concerns in general, the particularities of the perspectives adopted by each author (or group of authors) related to their countries, theoretical standing points and experiences provide the reader with a variety of topics, issues and questions to think about and discuss. For the reviewer this variety poses the challenge of finding inviting ways of bringing together the diversity. When I started browsing through the book, I felt attracted by the distribution of the authors by countries and areas in the world. The distribution of authors’ regional affiliation is shown below:

<b>Countries and regions</b>	<b>Number of papers</b>
Australia and New Zealand	11
North America (US and Canada)	7 <sup>1</sup>
Europe (UK, Netherlands and Norway)	4
Africa (South Africa)	1
Oceania (Papua New Guinea)	1
South America (Brazil)	1

I found this distribution interesting in several ways.

First of all, it shows a dominance of English speaking authors in a book that emerged from an international meeting with a broad non-English participation, such as the ICME 8 in Sevilla. The issue of who is represented – and therefore whose perspectives are voiced in international research in gender, class, ethnicity and social justice– raises questions about the efforts in general of our international community of research in mathematics education to include people from non-English, peripheral communities. I will come to this concern along the text and at the end of it, since it is central in strengthening an agenda for social justice internationally in the community of mathematics education researchers.

Second, this distribution can be taken as an interesting invitation to explore the preoccupations of researchers in these different parts of the world. If the chapters that make part of this book are considered to be exemplary in depicting research and practice concerns in the four topics mentioned above, then one can somehow have a picture of the directions that research on equity, ethnicity, class and social justice takes in each of these countries and regions. In what follows I present the reflections that emerged from the reading of the chapters, clustered according to the authors’ regional affiliation.

#### • **Australia and New Zealand**

my putting in the same bunch these two countries in Oceania –and at the same time separating Papua New Guinea from the continental group. My main reasons for Readers and authors must forgive me if they get upset for this grouping is the consideration of the papers written mainly by English native speakers and representing, mainly, a white perspective. The paper by Collen McMurchy-Pilkington (pp. 108–115) is the exception since it considers Maori population in New Zealand, from the perspective of an insider in that community.

In this group of eleven papers, there are two different trends represented. A first trend is what I characterize as papers reporting *traditional research on gender issues*, which rely heavily on quantitative approaches. The paper by Sharleen Forbes, Megan Clark, Thora Blithe and Megan Chamberlain (pp. 258–277) presents a series of statistical evidence that supports the conclusion that women participation in mathematical studies at secondary school and university levels has increased. Nevertheless there is evidence suggesting that this participation is still unequal in terms of women’s ethnical and social class background. The authors claim that, given the existence of strong differences, it is necessary to keep updated, rich statistical evidence to monitor in which directions change occurs. The overview that this paper provides contrasts with the particularity of the issues tackled by some of the other papers in this trend. Helen Forgazs (pp. 32–44) presents data collected in two studies to support previous findings about the image of mathematics as a male domain, and girls supporting this view. As a result of a combination of quantitative –mainly a modified version of the Fennema-Sherman scale– with qualitative research methods, Forgazs was able to contrast responses to surveys with interview and observation data in high

school and university levels. She concludes that there is evidence supporting the maintenance of the perception of mathematics as a male domain. This existence is reinforced by diverse “gender-stereotyped behavior and expectations with respect to mathematics” (p. 42). Christine Brew, Catherine Pearn, Gilah Leder and Alan Bishop (p. 69-82) present a study that involved 372 students in 8 secondary, co-educational schools. Using a combination of quantitative –a self-rating scale on students’ attitudes to mathematics– and qualitative – interviews– methods, they studied the tendency of boys and girls to under- or over-rate their achievement. The data was not only discriminated by gender, but also by the belonging of students to a dominantly English speaking background, or to a non-English speaking background. Besides confirming the already documented tendency of boys to over-rate and girls to under-rate their achievement in relation to teachers’ rating, the study showed that this tendency did not hold for non-English speaking children. This fact led the authors to find possible sources of explanation for gender and cultural differences in over- and under- rating in the children’s perceptions of social pressures on their behavior. In general, the type of studies in this trend follows traditional research methodologies and theoretical constructs in gender studies. They select the individual and some of her psychological attributes as the unit of analysis, and try to explain the documented gender differences in terms of the social structure of the classroom and the teaching-learning interactions in it.

A second trend in the studies from this region is what I characterize as a more *progressive, qualitative, critical approach* to research on gender and social justice. This type of papers reports research that does not only rely heavily on qualitative methods, but that also put forward a broader sociological and political analysis. In this way, they offer a critical perspective on the area. In order to clarify the difference between this approach and the one adopted by the previous category, we can contrast the papers by Mary Coupland and Leigh Wood (pp. 238-244) and Robyn Zevenbergen (pp. 59-68) with the paper by Gilah Leder and Helen Forgasz (pp. 162-179). These three papers discuss girls and boys achievement in mathematics in Australia. As a result of different systematic initiatives to diminish gender differences in high stakes assessment in Australian schools, girls now seem to do better or as well as boys. At least that happened in 1996. Nevertheless, the apparent improvement of girls’ scores, as public debates in the media contended, seemed to be to the detriment of boys’ achievement. In a study evaluating the effects of single-sex classes on gender equity, Leder and Forgasz concludes that the splitting of students in single-sex mathematics classes contributes to lessening gender differences in favor of girls. However, this split does not change the perception of mathematics as a male domain; neither does it alter boy’s high and girls’ low confidence as achievers in mathematics. The authors conclude that, in relation to the public debate about the creation of disadvantage for boys, “a growing body of evidence suggests that new approaches should also include boys” (p. 177). In contrast, both Zevenbergen and Coupland and

Wood take the issue of the “boys beating the girls”, but interpret it in ways that consider the broader economic and political scene of this outcome. Zevenbergen examines the way the advantage of girls has been constructed in the media and the educational debate through their public discourse. As a result of a conservative reaction connected to economic needs of productivity and competition, boys are portrayed now as the victims of the feminist advance. Coupland and Wood, in an analysis of the treatment that the media gave to girls outperforming boys in New South Wales in 1996, also point to other factors that are hidden behind the debate such as social-class bias, unemployment and the social significance of high stakes examinations. Leder and Forgasz, in their study and reflections within a traditional frame for studies on gender and equity, do not seem to problematize boys’ disadvantage, but on the contrary, argue for the need of considering it. Zevenbergen and Coupland and Wood use a broader analysis to present a more critical reading on the issue, and argue for importance of understanding the social complexity of reactionary petitions to “now save the boys”.

Other papers such as Betty Johnston’s (pp. 20-31) also do a deeper reading of the relations between mathematics education, gender and power. Johnston was involved in a research with a group of adult women, on the development of their mathematical identities. Using memory work as a research strategy to generate life stories about the experiences of the group of seven women –including herself– with mathematics, she has been able to explore how mathematical practices are strongly connected to quantification, which serves the function of reducing the complexity of the social world. Through mathematics education we acquire and embody both the ideas of quantification and reductionism, which are part of a male, dominant world. Memory work has allowed showing how women resist or reaccomodate to the control and alienation of their identities provided by mathematics and mathematics education practices. This paper, no doubt, provides a richer view of the relations between gender, equity, power and mathematics in the Western world. This type of explanations surpasses the simplicity of assertions such as gender inequity in mathematics education being a reflection of gender inequity in society –as expressed in Forgasz, p. 42.

#### • North America

In the group of seven papers authored by people with US and Canadian affiliation, I would distinguish two dominant types of papers. One I would call an *intervention perspective*. Joanne Rossi Becker (pp. 251-257) offers an overview of the research on gender in the US. She point out that most of the research has been carried out under the implementation of programs with a concern for gender equity, and that the two central concerns of this research has been the issue of participation of women in mathematics related careers, and the difference in this participation according to subpopulations defined in terms of ethnical background and social class. In fact, within this classification one could place six of the papers from this geographical zone.

Denise Mewborn (pp. 207-214) and Julia Kimbell, Chantall Shafroth and Paula Sloan (pp. 215-219) describe intervention programs aimed at bringing gender equity into mathematics education and into girls' further educational mathematics-related choices. Frances Rosamond (pp. 245-251) describes a program to bring awareness on gender discrimination on mathematics education in universities. Claudie Solar (pp. 193-206) presents an international overview of conferences, educational activities, community activities, national campaigns and governmental actions directed towards the retention of women and particular ethnic groups in mathematics, science and engineering. Most of the initiatives described have happened in developed countries, and most of them in the US and Canada.

The dominance of this type of papers reflects a clear tendency to link research to the need of improving a given social reality, in this case, inequality of access to mathematics education. However, it seems to me that in most of this research work there is a reliance on the assumption of the desirability of having enlarged and as massive as possible participation of all population, specially those who have been traditionally marginalized, in further mathematical education. I do not find any critical examination of the "myth participation" (Dowling, 1997), the conviction that people are handicapped when participating in society if they do not understand and are able to use mathematics. It seems as if the fundamental commitment of the 1960's of making North America advance through the development of mathematics, science and technology has not been essentially modified despite of the dramatic changes that the world has witnessed since that time. As much as one can argue that the advancement of these fields supports part of the prosperous development of the world, one can also argue that it has also been associated with the creation of a "risk society" (e.g., Skovsmose, 1999). A critical examination of the role of mathematics in current society must also leads us to a critical examination of what mathematics education can –and cannot– offer to the people who create and live in this particular historical time. A naïve belief on the "intrinsic power" of mathematics and mathematics education can not stand untouched in any research dealing with social justice (Skovsmose and Valero, 2001). These concerns raised by critical trends in mathematics education are not considerations within this type of intervention studies.

Only one paper within this regional group adopts a *social and political critique* of mathematics and mathematics education. Swapna Mukhopadhyay (pp. 150- 161) examines the distance between mathematical practices out of school and school mathematics. Through the use of Barbie doll in the mathematics classroom to carry out different mathematical activities related to proportionality, she shows how the classroom can be a place where meaningful artifacts of our popular culture meet school mathematics. She also shows how mathematics can be a starting point for generating a critique of the way in which some of those artifacts alienate us. Politicization of and through mathematics education becomes an indispensable component of a rich, meaningful mathematical experience. In this paper the

author provides an alternative to the naïve belief on the power of mathematics, as adopted in the intervention approach research.

#### • Europe

This group includes four papers from authors in different countries. Two of these papers can be characterized as *theoretical investigations* on issues of gender and equity. Paul Ernest (pp. 45-58) explores the public image of mathematics and how it is of concern to mathematics education. Liv Berge (pp. 180-192), from a Norwegian perspective, raises issues related to the ideological underpinnings of co-educational settings in school and school mathematics education. In her analysis Liv brings together the global macro-context where the Norwegian school system is located, and the micro-context of the classroom and mathematics education in it.

The other two papers by Maria van den Heuvel-Panhuizen (pp. 135-149) and Jo Boaler (pp. 278-293) offer a *questioning* of particular ideas of research in mathematics education. Maria, based on a study of gender in the context of the Realistic Mathematics Education in primary school in the Netherlands, shows that this reform initiative seems to be in the advantage of boys' achievement. This finding, of course, is controversial given the internationally recognized suitability of this approach to mathematics education change. Maria points out to a crucial weakness of this approach and invites researching and rethinking how it may contribute to documented gender differences. Based on her study of two secondary schools in London with different approaches to the teaching of mathematics, Jo offers a challenge to dominant conceptions in gender studies. Most of these studies build upon a deficit model in which gender differences are attributed to the inadequacies of girls, e.g., inability to learn mathematics. Jo's study shows the flaw in this model and suggests that gender differences can be better understood in relation to the environment of teaching and learning. Her study, contrary to Walkerdine's analysis (1989) and even Maria's conclusions about girls' mathematical preferences, show that girls can and "in some cases require" getting involved in rich, open problems demanding conceptual understanding. This preference depends on what the environment makes available to them as opportunities for mathematical learning. This finding challenges the idea that there are particular learning styles that are intrinsic to females.

#### • South Africa

The only paper in this group is authored by Suchrita Singh (pp. 101-107). She presents a study carried out within the context of the Indian community in South Africa, with a group of forty, first-year students in the University of Durban Westville. She focuses on the conceptions and perceptions of these women on their mathematics-related career choice, having as an aim showing how these conceptions are both shaped by society and culture, but also by their own individual agency. Her study shows that "males and females react differently to the mathematics and science curriculum,

lending support to the notion of ‘a sexual division of knowledge’”. Suchrita’s analysis overpasses in complexity the types of traditional explanations given to girls’ mathematics-related career choice. As an example of this type, we can mention the paper by Myriam Seliktar and Lynda Malik (pp. 83-94), from the North American grouping. They carried a study on young, European-descent women’s career choice in a middle-upper class US university, using a quantitative research strategy and having as central notions psychological constructs such as confidence in mathematics. Suchrita’s analysis goes beyond psychological, individual explanations, and relies on a more sociological conception and analysis of gender differences in this particular topic. I find Suchrita’s paper to be representative of a South African trend in mathematics education research to pay more attention to *social, political and cultural approaches*. This approach to the study of the learning and teaching of mathematics has emerged in a highly politicized setting, where gender is not the only evident educational –and social– inequality (e.g., Adler, 2001, Vithal, 2000).

- **Papua New Guinea**

Neela Sukthakar (pp. 95-100) shows how social and cultural conditions have negatively impacted the roles and views of women in Papua New Guinean society. Women occupy a less advantaged position in a male advantaging society. She also shows the connection between these broad conditions on students’ choice of career, classroom experiences, and attitudes towards mathematics. The assumption under the questionnaire-based study she carried out was that the social and cultural conditions affect parents and teachers and, through them, have an impact on students. She concludes that “girl’s and women’s low or unequal participation is deeply rooted in cultural values and sex stereotyping” (p. 100). The paper ends with a call of attention on the importance of encouraging girls to break the stereotypes and start participating actively in mathematics and science related careers as a way of contributing to the development of the country.

- **Brazil**

Gelsa Knijnik (pp. 116-122) presents a reflection on issues of gender in her work in mathematics education with the people of the Landless Movement in Brazil. Within this context of strong political struggle for social justice, gender differences have been understood and overcome in the advantage of both women and men, and the purpose of their overarching political aims. Instead of defending difference and making of the male and female two separate worlds, Gelsa suggests that “possibly, crossing or subverting these borders could be an important contribution to the transformation process of gender relations” (p. 119). The story of a woman-leader in the movement shows that her lack of interest and hate towards mathematics was related to the fact that, before getting involved in the movement’s struggle, she perceived mathematics, calculations and book keeping as activities that men had to do. Now, as a leader, she sees

the importance of learning and appropriating into her practices those types of activities, not because she believes that mathematics in itself will empower her, but because she needs the tools to perform diverse tasks that the struggle demands. Mathematics education with an ethnomathematical approach, as Gelsa has conceived it, is not interested in glorifying neither mathematics nor popular knowledge. It rather seeks building pedagogical alternatives that “challenge the traditional curricular design” which is dominantly “Eurocentric, male and white”, in relation to the political purpose of the community where such a design will guide the education of women, men and children. This paper clearly represents a *political viewpoint* in Brazilian –and South American– educational thinking and research. This paper is not only framed within a tradition of popular education as formulated in the work of Paulo Freire and his colleagues, but also within the ethnomathematics trend that, as Ubiratan D’Ambrosio has stated, constitutes a political and ethical stance towards Eurocentrism in the dominant conceptions of mathematics and mathematics education.

- **What dominates and what is silenced in research on social justice and mathematics education?**

It is obvious that the question I pose cannot be answered in general terms after reviewing the papers in this collection. An extensive literature review on the field should be necessary. However, I find that the classification I have tried to present as a way of giving an overview of the contents of this book seems to resonate with my general impression of what we more frequently see and what we do not see in international literature.

English-native speakers coming from US, Canada, UK, Australia and New Zealand are strongly present in the international landscape. They occupy an advantaged position not only because English is the language that our international community has “chosen” as its mean of communication, but also because their research interests seem to define the international, dominant research agenda on the area. In this book and in many other collections we find a tendency towards traditional research studies in gender, intervention perspectives and, in a minor extent, theoretical formulations about issues of gender and social justice.

More critical approaches that rely on broad sociological, political and cultural constructs seem to be underplayed. These constitute a minority not only within the dominant groups but also in the global distribution of research. I find that some of the most interesting papers – in terms of the complex stance they take on the intertwining between gender, class, ethnicity and the construction of inequality in mathematics education and in society at large– belong to this minority. This minority offers a potential of advancing the field of research on social justice and mathematics education into new, more socially complex directions that can complement the individually, psychologically focused knowledge we have already developed in the area.

In the last decades, we have struggled to gain significant spaces for the issues of gender, class, ethnicity

and social justice in the international research in mathematics education. Now we urge to start a new struggle for building a more inclusive “international” research community where the concerns of the rest of the non-English speaking world has a strong and legitimate space.

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<sup>1</sup> Although Jo Boaler signs her paper with her current US affiliation, her paper builds on her work in England. Therefore I counted her paper as an “European” paper.