

Gender mainstreaming of adult mathematics education: opportunities and challenges

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Abstract

Mainstreaming as a strategy for equality has been widely adopted by the international community. Mainstreaming of adult mathematics education entails that gender, ethnicity, social class and other difference defining categories are included consciously and explicitly in all activities. A growing body of research explore how pluralism and multiculturalism in mathematics education affect mathematical understanding, attitudes and participation. Gender mainstreaming investigates how cultural and economic factors influence the formation of female and male differences in these areas. In adult mathematics education curriculum, context, instruction and values have a gender dimension that should be acknowledged in teaching, planning and research. Likewise gender should be taken into account in statistics and surveys on adult numeracy. To mainstream successfully means to gather knowledge, analyse processes and suggest changes where necessary. Actual gender mainstreaming of adult mathematics education is not on the agenda anywhere today, but current knowledge on mathematics education points to a number of research questions and to knowledge gaps that have to be filled. Gender mainstreaming is but one aspect of the general mainstreaming strategy that encompasses other difference defining categories; hence research on adults learning mathematics must cut across borders of gender, ethnicity, age and social class. Creating a new and more adequate frame of analysis is a challenge to research in adult mathematics education.

Gender mainstreaming is a principle that means bringing gender thinking into the main stream – into all decision making and organizational (...) work. Many have used the image of gender equality as something that flows in its own tributary. Through gender mainstreaming, equal opportunities are brought into the main stream – i.e. the ordinary organizational and political efforts. (Resolution on equal opportunities. The Danish Trade Union Movement 2003)

Key words: gender, policy, research, work, affect, mainstreaming

1. Mainstreaming as a strategy for equality¹

Mainstreaming as a strategy for equality has been on the international agenda since the UN conference on women in Beijing, 1995. In the same year the European Council set up Group of Specialists on Mainstreaming that developed a much-cited definition of mainstreaming:

Mainstreaming is the reorganisation, improvement, development, implementation and evaluation of policy processes that incorporate an equal opportunities perspective into all policies at all levels and phases by the parties that are normally involved in policy-making.” (Group of specialists, 1998).

¹ This article is based on a lecture given in Topic Study Group 6, Adult and lifelong mathematics education, at the 10th International Congress on Mathematics Education (ICEM10), Copenhagen, 2004. (See www.icme10.dk.)

2. Gender mainstreaming

The general mainstreaming strategy aims at removing inequalities due to gender, race, age social class etc. and gender mainstreaming is but one aspect of this strategy. It is however the area with far the most ongoing activities.

The member countries in the European Union (EU) are committed to eliminate inequalities and promote equality between women and men (Amsterdam Treaty article 2 and 3). The EU has adopted a dual approach to achieve this goal: combining *gender mainstreaming* with specific measures targeted at the under-privileged. Gender mainstreaming is here defined as the integration of the gender perspective into every stage of policy processes – design, implementation, monitoring and evaluation – with the aim of promoting equality between women and men. A legal framework for mainstreaming is set out in Shaw (2005). The Danish Trade Union Movement states this in the following way in a resolution on equal opportunities adopted at the 35th Congress in 2003:

To mainstream is to accept a new political point of departure that recognises that what we have so far considered to be the standard – or the usual approach - is not necessarily gender neutral. Mainstreaming is not an objective in itself, but a strategy to bring us closer to the objective of obtaining actual gender equality. You could say that mainstreaming, as a strategy, focuses on the need to challenge the status quo (LO, 2003, p. 2).

Politics is a field for ongoing discursive struggles, where a given phenomenon is ascribed meaning in a specific way and part of the transformative potential in mainstreaming is embedded in the discursive practise (Squires, 2005). Inequality tends to be given a peripheral position on the political agenda, and from this perspective mainstreaming can be seen as a conscious effort to include the periphery in the ‘mainstream’. The gender mainstreaming strategy was formulated in general terms, thus creating an ‘empty’, yet broadly applicable and acceptable strategy for eliminating multiple kinds of gender gaps. The paradox of mainstreaming is that the strategy will relinquish gender equality as an end in itself as it enters into the mainstream of any organisation that works with different primary goals. Thus it is the abandonment of equality as the main objective that creates a unique opportunity for introducing equality strategies into organisations that would not take in a ‘traditional’ gender equality strategy (Brade, Hansen & Lyshøj, 2007).

3. Gender mainstreaming of adult mathematics education

In gender mainstreaming one has to look at adult’s mathematics education from the perspective of gender, and consider the many ways in which gender affect mathematical understanding, attitudes and participation. To mainstream one has to take into account how cultural, economic and other background factors influence the formation of female and male differences and create a new awareness and acceptance of differences in relation to gender, culture, economy, and background. Teaching or research on, and planning of adult education in mathematics are areas where the equality aspect should be integrated. This work is yet in its infancy. The international literature on gender and mathematics learning points, however, to a number of questions and problems that must be expected to be part of a mainstreaming process in adults learning mathematics. For an overview on gender and mathematics learning, see e.g., Fennema (1995) and Hanna (1996). With regard to mainstreaming of education Leo-Rhynie (2000) writing for the Commonwealth Secretariat provides inspiration. FitzSimons (1997) gives an overview of gender issues in adult and vocational mathematics education. For a Scandinavian perspective see Wedege (2007).

Although actual gender mainstreaming of adult mathematics education has to be specific, it is possible to pose some general research questions and point to knowledge gaps that have to be filled before we can develop a gender sensitive adult mathematics education. The aim of this

paper is to point to some intrinsic questions in mathematics education and to gender gaps and gender blindness in surveys and planning that are relevant in a gender mainstreaming framework.

4. Content, context and instruction

In mathematics education curriculum, context and instruction have gender content and many aspects of the structure and culture of mathematics teaching inadvertently work against efforts to increase successful participation for females and/or males in adult mathematics education. We have only limited research on women and men's priorities in adult mathematics education, although the highly gender segregated labour market can be expected to make different areas of mathematics relevant for men and women. This points to the need for a gender balanced composition of curriculum, teaching materials and examples on all levels of mathematics teaching. Research on mathematics education points to educational style (e.g., work in groups compared to classroom instruction) to be gender sensitive (Forgasz & Leder, 1996). The same is true of assessment, where girls/women are found to prefer problems with a people/nature content and where women seem to do better in internal/project oriented assessment compared to traditional timed exams and benefit more from a teaching style stressing collaboration and open-ended problems. (Blithe & Clark, 1995; Gipps & Murphy, 1994; Murphy & Gipps, 1996). Also the gender dimension must be analysed in connection with the introduction of information technology. Men and women are found to have different approaches in this field where men tend to favour a more experimental approach (learning by doing), while more women prefer a systematic approach (e.g., Noss & Hoyles, 1996). In all these areas gender impact assessment is obviously called for both on a national and an international level.

5. Gender, values and hierarchies

Hierarchy is one of the powerful exclusionary mechanisms in research. Mathematics has a well defined but implicit internal hierarchy with pure mathematics on top and applied disciplines at the bottom. A parallel hierarchy exists between learning styles in academic and advanced mathematics placing a 'social' approach above 'instrumental' learning (see Mellin-Olsen, 1987 for definitions). The hierarchy is found in curriculum discussions, where it is pointed out that the inclusion of 'soft' subject will cause the teaching to lose prestige (Cotton, 2002). On the other hand applied mathematics learning often focuses exclusively on the instrumental approach. These hierarchies interplay in many ways with men's and women's choices and approaches to mathematics, where women always tend to end up on the lower rungs of the ladder (Henningsen, 1993, 1998).

Mathematics is often considered value-free and intercultural. However, researchers like Alan Bishop have brought the impact of culture on mathematics into focus through the exposition of values and qualities in 'Western mathematics' (Bishop, 1988; Bishop, FitzSimons, Seah & Clarkson, 1999). In the Values and Mathematics Project, Bishop, FitzSimons, Seah and Clarkson have investigated values in mathematics teaching in order to make them explicit. Here the values are defined as the 'deep affective qualities which education fosters through the school subject of mathematics' (Bishop et al., 1999, p. 3). The affective dimension of students' relationships with mathematics interacts with the cognitive and social dimensions and different types of affective categories. Clearly gender will play a role in the construction of this affective dimension for the individual student and possibly at a population level too. However, although a limited amount of research in this area is available at present, one project (Adults learning mathematics in school and everyday life, 2007), focuses on the social and affective conditions of adults' learning processes combining quantitative and qualitative studies

Ernest (1995) describes 'Western mathematics' as characterised by what has been termed 'separated, stereotyped male values'. How does this influence the learning of mathematics for men and for women? Is a science of mathematics based on 'female values', relationships, connections, empathy, caring, feelings, and intuition possible? What would be the gender

implications of such a change? And do the (stereotyped) male and female values actually characterise men and women in 2007 across countries and classes or are other defining categories at work in some instances?

Finally, Coben (2003) points out the influence of feminist epistemologies on mathematics education and mathematics education research and discusses the interaction between gender and the competing theories of mathematics and mathematics learning.

Although there is an extensive literature on mathematics and values gender mainstreaming of adult mathematics education calls for a development of specific knowledge on the impact of hierarchies and values on adults learning mathematics.

6. Myths and stereotypes

Research on mathematics in primary and secondary education has revealed striking stereotypes about gender and mathematics (Skov, 2003); for a Swedish investigation see the GeMa-project described in Brandell et al. (2007). Cordeau (1995) and Damarin (2000) note that in some instances being too clever in mathematics has been a problem for girls. Wedege (1999) discusses the habitus of a girl born in 1922 in a Danish provincial town where it was acceptable for a girl not to know mathematics, and the literature points to geographical and temporal variation in “mathematics as fit for girls”. We do not have a comparable body of evidence about the myths and stereotypes harboured by adult learners, let alone the consequences of these for the learning of mathematics by men and women. In a Danish context Hasse investigating physics majors has pointed out how ‘the nerd’ is a possible positive role for male students, but not for female students (Hasse, 2002). Evans’ (2004) studies of public images of mathematicians might also yield some valuable insights on the gender dimensions of this problem.

7. Mathematics represents the danger of failure to men

Mathematics anxiety is important in adults learning mathematics. In her path breaking research Tobias (1978) studied female mathematics anxiety and this has been followed by a number of studies (see Osborne et al., 1997). A deeper understanding of the dynamics in the construction of gender in a field like mathematics might give additional insight in the gendering of mathematics anxiety. On the one hand women might more readily admit anxiety and it might even be identity confirming for a woman to have difficulties with mathematics. Failure in mathematics might on the other hand be more identity threatening for a man than for a woman, since mathematics is considered a ‘male’ field. Hence male mathematics anxiety might possibly be more pervasive and more deep-rooted. For the gender of anxiety in a numeracy context see Henningsen (2002). A number of studies could be interpreted or reinterpreted to point in that direction. Below are some examples.

Cotton (2002) points out that mathematics education creates ‘communities of failure’, where boys are over-represented - not because more boys fail mathematics education but because failing at mathematics matters more to boys. In a study of medical students in Norway Annfelt (1995, pp. 20-21) reports that male students thought that inferior results in mathematics in high school would impinge on their performance as doctors. None of the women had similar concerns. The men saw qualifications in mathematics as a measure of their general ability, while the women had no such notion. Evans (2000) studied mathematics performance for a group of polytechnic students. The women did consistently worse than the men in test and relatively more women had low entrance qualifications in mathematics. Could it be that bad grades or lack of qualifications in mathematics are less of a deterrent to women than to men? To unravel this one needs to take account of more than gender, with an analysis embedded in the broader context of mathematical affect (including beliefs, maths aversion and emotion). Problems with mathematics combined with a male belief that this could lead to failure in demanding jobs might help to explain the tendency of men to be under-represented in general education. These observations

all point to the possible understanding that mathematics represents the danger of failure for men and an opportunity for success for women.

8. Gender in international educational surveys

A recurrent theme in work on gender mainstreaming is the paucity of gender segregated statistics and gender blindness in design and analysis of investigations and surveys. Here adult numeracy is no exception.

A number of recent international surveys reported in Organisation for Economic Co-operation and Development (OECD) publications (OECD 1995, 1997, 2000, 2005), have focused on adult literacy and numeracy with the primary goal of assessing:

overall levels of proficiency as well as the distributions of adult literacy in each country highlighting the complex ways in which these distributions vary across countries and according to specific factors. (OECD, 1997)

*Table 1: Gender as a possible confounder in analyses of benefits of literacy.**

Figure	Comparison	Is gender included?	Description of possible confounding effect of gender
2.2	Adult literacy and earnings	No	Income is gender dependent even after controlling for literacy skills.
2.3	Earnings of native-born vs. foreign-born population by literacy levels	No	Income is gender dependent. Possible different effects for foreign-born and native-born women. Possible different gender composition in native-born and foreign-born populations
2.5	Net direct effect of education and literacy on income	Yes	Controlling for gender and parental occupation.
2.6	Labour force participation and literacy performance.	No	Women and men have different patterns of both labour force participation and literacy performance
2.7	Employment disadvantage of low-skilled adults (working hours)	No	Women and men work different hours and have differing literacy proficiency.
2.8	Unemployment and literacy	No	Women in all groups tend to have higher unemployment rates than men.
2.10	Income and experience controlling for education and literacy skills	No	Income is gender dependent even after controlling for education and literacy skills. Dependency varying between countries
2.13	Literacy proficiency and crime	No	Prison population predominantly male
2.14	Literacy proficiency and community participation	No	Women generally more community oriented.

*Note: The table is based on Chapter 2 in OECD (1997) and is derived from all the comparisons (figures) where the inclusion of gender could be relevant.

A recurrent finding in the literacy surveys is differences in literacy proficiency between men and women: women score higher on prose literacy while men have higher scores on document and quantitative literacy (numeracy). Hence any study of the interplay between numeracy and societal factors should take gender (and other difference defining categories) into account to

rule out effects and findings solely due to gender as a confounding factor². Moreover the inclusion of gender might lead to the discovery of major interesting differences in numeracy between men and women. Hence gender sensitive data analysis is an important part of gender mainstreaming but is unfortunately not the norm today. An example is given in Table 1. The table is based on Chapter 2 (*The benefits of literacy*) in OECD (1997) and lists those comparisons where the inclusion of gender could be relevant. Gender is, however, omitted in all but one case. The text in last column indicates how gender could act as a possible confounder.

There is no doubt that valuable insights are being lost - even that totally false conclusions are being drawn - because comparisons are not controlled for gender. The International Adult Literacy Survey (IALS) data are rich enough to include gender differences in the sub-studies. Hence, the omission of gender in the analyses is particularly unfortunate, representing either deliberate or incidental gender blindness.

9. Equal access to adult education and training?

Lifelong education redefines the question of the distribution of resources for education. In a global perspective women have less access to education than men. Most developed countries have, however, free general education at the primary and secondary level. This is not the case for adult education and training, where employers are by far the main external source of financial support (Rubenson, 2001). There are large differences between countries in the ways they plan and implement the teaching of mathematics for adults. Furthermore most countries have a highly gender segregated labour market with many differences between the educational careers of men and women. In a mainstreaming context this begs the questions “Do men and women have equal access to relevant adult mathematics education?” and “Do they succeed in education at the same rate?”

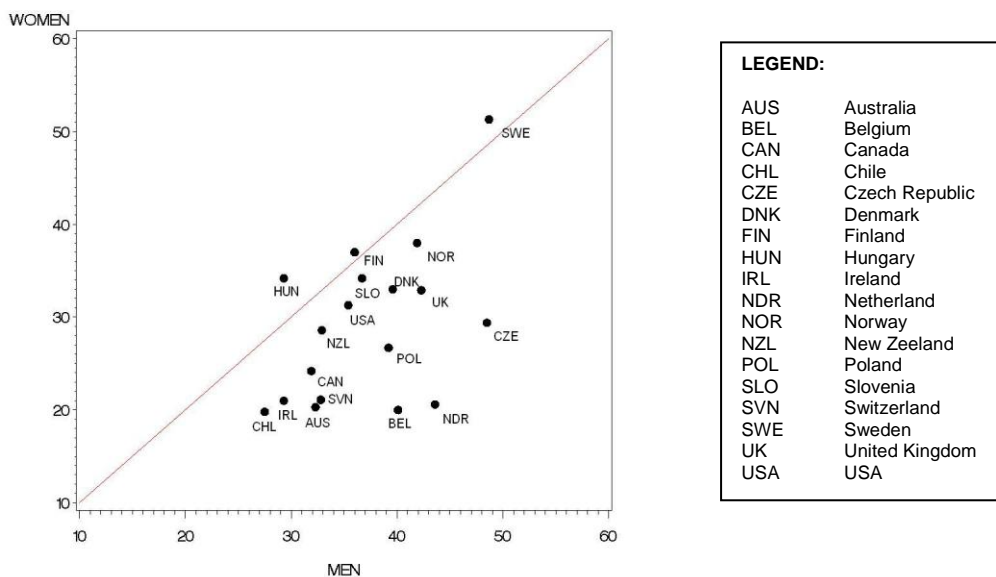


Figure 1. Percentage of employed women receiving employer financed adult education and training compared to the corresponding proportion of men. (Figure is based on data from Table 3.14 in OECD, 2000)

Figure 1 is constructed from table 3.14 in OECD (2000). It compares the percentage of employed men receiving employer financed adult education and training to the percentage of women in the same situation. The overriding trend is that when numbers are corrected for the size of the labour force, relatively more men than women have their training paid by the

² ‘Confounding by’ means that an effect of gender will disappear if the analysis is carried out separately for men and women.

employer, although we find differences between countries. The rate of employer paid adult education varies considerably between countries. In some countries the proportion men and women receiving employer financed adult education and training is about the same, while in other countries men are greatly over represented. In an international perspective women and men do not seem to have equal access to employer financed adult education and training.

In the report it is stated:

Even after controlling for full or part-time work, firm size and occupational category, workers in Canada, Chile, the United Kingdom and the United States with the highest use of literacy skills at work are still six to eight times more likely to receive support from their employers for education and training than those who use workplace literacy skills the least. (OECD, 2000)

This is an interesting example of gender blindness. The data are controlled for full or part-time work, firm size, use of workplace literacy skills and occupational category, but not for gender although gender seem to have an independent influence on educational possibilities. Proper mainstreaming would ensure that gender be included in such an analysis.

10. Concluding remarks

Gender mainstreaming is but one aspect of the general mainstreaming strategy that also encompasses other difference defining categories, such as, social class, ethnicity, disadvantage. Chassapis (2002) investigating the inclusion of social groups in mathematics education research in the period 1971-2000, found that only 9.1% of entries took into account one or more of the categories social class, gender, ethnicity, minority groups and disadvantaged groups - gender being far the biggest with 6.2% of all entries. A glance on Coben's (2003) impressive review of research and related literature on adult numeracy reveals that only 39 entries out of 730 include gender. In a mainstreaming framework gender should be considered explicitly in all areas of adult mathematics education to promote an equality oriented teaching of mathematics. But gender and mathematics education cannot be studied in isolation. In the learning of mathematics, gender interacts with other difference defining categories, combining into new hybrid categories. This 'intersectionality' must be acknowledged in all its complexity. Research on mathematics learning must cut across borders of gender, ethnicity, age and social class to create new and more adequate frames of analysis.

11. Opportunities and challenges

I would have liked to be able to present a somewhat broader discussion of mainstreaming in mathematics education containing some more concrete consequences of the concept, but the area is too new and not enough research has been done yet. My hope is that this paper will induce more people to do work in this field. Mainstreaming as a strategy challenges the status quo in adult mathematics education, and could be expected to lead to a revision of research and a major rethinking of curriculum, teaching material and assessment procedures. It offers, on the other hand, a promise of new insights through a gender lens and a more inclusive mathematics education.

12. Acknowledgements

I owe thanks to Martha Civil, Jeff Evans and Wolfgang Schloegelmann, who offered encouragement and valuable insights; to Gail FitzSimons and Diana Coben for their bibliographies and review articles that were of great help to the project; to John Gillespie, who corrected my English in the first version; and, last but not least, to Tine Wedege and Knut Liestøl, who, as always, have been patient, steady, and insightful discussion partners.

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