

Publishing in Mathematics Education: A Matter of Gender?¹

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Over time, academia has become a more attractive field for females. Yet males still dominate, particularly among senior academic staff. In this paper we document females' participation with respect to key academic indicators typically used as criteria for entry to, and promotion within, the tertiary sector. Our focus is on Australian mathematics education journals, and predominantly those published by MERGA. Using these data we examine whether females are (proportionately) as well represented as males or whether these measures of esteem act as subtle structural barriers not yet fully conquered by females in the mathematics education research community.

Introduction

We have focused on the elimination of overt discrimination but we are finding it difficult to remove structural barriers to discrimination. (Sex Discrimination Commissioner Elizabeth Broderick, as quoted by Gordon, 2009)

Mathematics and, as a consequence, mathematics education have traditionally been perceived as male domains. Subtle, yet consistent gender differences in favour of males in performance and participation in mathematics served as a strong catalyst for action in the early 1970s. Since specified levels of mathematics attainment are among the entry requirements for many courses and employment fields, students prematurely opting out of mathematics typically restrict their longer term educational and career opportunities. Appropriate interventions, it was hoped, would increase females' participation in post compulsory mathematics subjects and related areas. Collectively, the initiatives introduced were undoubtedly effective. Females' participation and performance in mathematics and in various other areas long considered to be male domains have improved over time.

Academia, employment data indicate, has become a more attractive field for females in recent years. In Australia there was "a declining ratio of male to female higher education staff between 2001 and 2006. In 2006, 59% of all academic staff were male, compared with 63% in 2001 ...(but) men still outnumber(ed) women at all levels of academic staff except at below lecturer level" (Yearbook Australia, 2008). Elsewhere, "women make up less than 20% of senior academic staff in the majority of EU countries - a surprising statistic when numbers of male and female university students are roughly equal" (Hampton, 2008).

Although MERGA membership is open to mathematics educators internationally, the bulk of members are associated with tertiary institutions in Australia and New Zealand – most frequently as faculty members or higher degree research students. Selected membership data, by gender, are shown in Table 1. Females, it can be seen, increasingly dominate and in recent years comprised just over 60% of MERGA members. Information on the number, age, rank, and gender of academics employed as mathematics educators *per se* in Australia is unavailable.

The contrast between the MERGA membership gender profile and that of the larger academic community is striking. To what extent this can be attributed to the greater

¹ We are grateful to Calvin Taylor (Research Assistant) for gathering the raw data reported in this paper.

number of females engaged in higher degree research studies is not readily identified. Through strategically designed initiatives, MERGA certainly strongly encourages and supports student membership and participation in its annual conferences². However, the balance between faculty members and higher degree research students fluctuates from year to year as student participation is heavily influenced by the location of MERGA’s annual conference - held on a rotating basis in different States and, from time to time, New Zealand.

Table 1¹.
Selected MERGA Membership Data, 2002-2009

Source	Males (%)	Females (%)	Unknown ² (%)	Total (N)
MERGA members 2009 (incomplete)	33.9	62.0	4.1	271
MERGA members 2006	35.7	61.6	2.7	263
MERGA members 2003	43.7	54.3	2.0	302

¹ Our thanks are extended to MERGA for providing these data

² When a member’s gender could not be determined, “unknown” was used

The American Mathematical Society [AMS] has monitored women’s involvement in the mathematics community in terms of a number of key academic indicators (Statistics on women, 2008). Membership of AMS editorial committees, invited addresses at AMS meetings, and council membership are among the participation rates monitored. Similar or equivalent data, not previously available for mathematics education internationally, or for Australia, are provided for the Australian context in this paper.

The Importance of Publishing and Other Measures of Esteem

Gender Profiles – Previous Research

As mentioned above, since 1985, the AMS has consistently monitored women’s participation in the mathematics community in the USA. In brief, over the 10 year period from 1998–2007, males greatly outnumbered females as “Invited Hour Address Speakers” at AMS meetings; 84% of those thus invited were males. Similarly, 81% of “Speakers at Special Sessions” at AMS meetings held between 2003 and 2007 were males. In the decade to and including 2007, the proportion of males on AMS Editorial Committees hovered consistently around the 85% mark. In terms of these indicators of merit and peer recognition, males clearly outperformed females. Given the well documented role of editors and editorial board members (as well as reviewers) as gatekeepers of what is published (Miller & Perruci, 2001; Robergs, 2003), the gender imbalance is noteworthy.

² According to the MERGA website: “Membership includes mainly people and institutions from Australia and New Zealand but also from other countries. There is a growing number of subscriptions from graduate students and teachers”. It should be noted that we did not separate the MERGA membership profile by country. We considered MERGA membership, a clear indication of identification with the mathematics education community, to be the best indicator of the gender profile of mathematics educators whose locations and affiliations within universities vary (e.g., by department and/or Faculty).

Promotion – The Australian Context

Within Australia there are various criteria which determine both entry and advancement in academia. The following selected points have been drawn from the range of promotion documents of a leading Australian university:

- Publication of articles in top-ranking national and international refereed journals;
- Publication of books, chapters, monographs and edited collections by internationally prestigious publishers and in highly respected contexts;
- Presentation of research findings at national and international conferences;
- Involvement in peer review activities, training and assistance to colleagues;
- Editorship or senior membership of editorial boards of journals;
- Significant organisational contribution to national or international conferences or workshops.

Reliance on these and related measures indicative of esteem within particular disciplines are widespread among the higher education community. Stark, Spielman, Shears and Ohnersorgen (1997) argued that publishing is “crucial to promotion and tenure decisions in academic jobs”. Colwell-Chanthaphonh (2004) similarly stated: “Publication constitutes an essential facet of the contemporary practice of social science, not only as a means to disseminate knowledge, but also to attain status and material rewards such as job advancement and salary increments”. “Within academia, success is often measured by a person’s research profile. A highly visible surrogate for this measure is appointment to editorial positions” wrote Lamp (2007, p. 125). Promotion data for 2005-2007 from one leading Australian university are summarised in Table 2³.

As can be seen in Table 2, for all levels of promotion in all years (with two exceptions), males comprised the higher proportion of applicants for promotion, and the percentages of male applicants were higher than their representation in the academic staff and MERGA membership profiles. The proportions of male applicants also increased as the level of promotion increased. With respect to success rates, the patterns are less clear, although there appears to have been a slight tendency for females to have been more successful than males in their promotion applications, particularly at the higher levels (Assoc.Prof/Reader and Professor).

In summary, the data presented here reveal that the gender profile of mathematics educators, as reflected by membership of MERGA, with females in the majority is quite different from that in the general academic population where males dominate. With respect to data on promotions, it would appear that males apply in higher proportions than their representation in the academic community, yet females who do apply appear to be slightly more successful than males. There are likely to be a number of contributing factors to women’s under-representation among promotion applicants. Consistent with findings reported by Forgasz and Leder (2003, 2006), one likely reason is that more women than men will not meet the necessary publication and other criteria necessary to meet promotion criteria. Forgasz and Leder examined aspects of the lives of academics at Australian universities. While their study focused on staff in two faculties of Education, they did not distinguish between those involved in mathematics education and other educational fields. They found that males were more likely than females to have been at off-campus lectures,

³ An agreement was made for the name of the university and the source of the data to remain confidential. The staff gender profile is consistent with that reported Australia-wide. It should be noted that the data examined were not disaggregated by Faculty or discipline.

conferences or professional societies and to have been engaged in research and committee work (i.e., activities meeting promotional criteria); females, on the other hand were more likely than males to have been assisting students with their studies, and in preparing and evaluating student work.

Table 2.

Promotion Data at One Australian University, 2005-2007

Level of promotion	Year	Applications (% of applicants)		Success (% within gender)	
		M	F	M	F
Lecturer	2005	6 (46%)	7 (54%)	6 (100%)	6 (86%)
	2006	3 (43%)	4 (57%)	3 (100%)	4 (100%)
	2007	5 (83%)	1 (17%)	5 (100%)	1 (100%)
Senior Lecturer	2005	36 (60%)	24 (40%)	21 (58%)	19 (79%)
	2006	25 (56%)	20 (44%)	20 (80%)	15 (75%)
	2007	37 (64%)	21 (36%)	30 (81%)	14 (67%)
Assoc.Prof / Reader	2005	27 (71%)	11 (29%)	12 (44%)	8 (73%)
	2006	27 (68%)	13 (32%)	15 (56%)	10 (77%)
	2007	31 (67%)	15 (33%)	15 (48%)	6 (40%)
Professor	2005	22 (76%)	7 (24%)	11 (50%)	5 (71%)
	2006	13 (72%)	5 (28%)	8 (62%)	5 (100%)
	2007	13 (72%)	5 (28%)	9 (69%)	2 (40%)
Total	2005	91 (65%)	49 (35%)	50 (55%)	38 (76%)
	2006	68 (62%)	42 (38%)	46 (68%)	34 (81%)
	2007	86 (68%)	42 (32%)	59 (69%)	23 (56%)

NB. Shading indicates higher percentage

This Study

Aims

In the study reported in this paper, we aimed to find out to what extent female mathematics educators are involved in areas considered to be measures of esteem. Are they (proportionately) as well represented as their male colleagues or do these measures act as a structural barrier not yet fully conquered by females? In part, the findings from this project will show whether female mathematics education researchers' publication records, and editorial experiences, are consistent with the proportion of their representation in the mathematics education community, that is, relative to their MERGA membership rates.

In the next section we describe our data gathering approach for obtaining selected measures of esteem typically used for the purpose of promotion, and present the findings gleaned from Australian sources. Covering the decade from 1999 to 2008, our focus was on scholarly and professional journals in which members of MERGA were likely to publish, and the MERGA conference proceedings.

Methods: The Gender Profile of Australasian Mathematics Education Scholarship

For the decade 1999-2008, we examined the gender profiles of the editors (and associate editors), editorial board members, and authors in leading Australasian scholarly and professional mathematics education publications. We also examined the gender break-up of the proceedings editors and keynote speakers for the annual conferences of the *Mathematics Education Research Group of Australasia* [MERGA] over the same timeframe⁴. It should be noted that there were some names that were unfamiliar to us and which, upon further searching, we were unable to determine if the person was male or female – these names were categorised as ‘gender unknown’.

The journals examined were: *Mathematics Education Research Journal* [MERJ], *Mathematics Teacher Education and Development* [MTED], and *Australian Senior Mathematics Journal* [ASTJ]; we also looked at the annual proceedings of the MERGA conference. Initially we limited our searches to information readily available online, since academics and postgraduate students are today more likely to search online than go to university libraries. However, we had to supplement these data with information obtained from hard copies as it became clear that online sources did not necessarily provide all the information we sought.

The gender profiles for the categories of interest from the three journals are summarised in Tables 3–5 below. No distinction is made between single and multiple authored articles. The gender break-up of the editors of the MERGA conference proceedings and the keynote speakers at the annual conferences for 1999-2008 are shown in Table 6.

Several trends are worth noting when the MERJ data for the periods 1999–2003 and 2004–2008 are compared (see Table 3). Only males served as the editor of MERJ in the earlier period; females in the latter. Over time, male participation in an editorial capacity decreased. Not only were all associate editors for 2004-2008 females, females were also heavily represented on the editorial board. They comprised 45% of board members for 1999-2003 and 57% for 2004-2008. When all editorial functions are combined – editor, associate editor, and editorial board member – females’ participation rose from 49% in the period 1999–2003 to 60% for 2004–2008. Females’ participation as author, or co-author of an article published in MERJ varied from year to year but nevertheless increased: from 50% over the years 1999–2003 to 57% for the period 2004-2008. Thus females’ participation in editorial work and research publications increased over the 10 year period. For the years 2004–2008 their contributions in these aspects of academic activity were broadly consistent with their level of MERGA membership.

The data in Table 4 reveal that the gender profile for those serving in an editorial function for MTED varied little over the period monitored. Over the period 1999–2003, as well as for 2004–2008, about 50% of those who served as editor were females. Over both periods, more females than males served on the editorial board: approximately 63% in both 1999–2003 and 2004–2008. Combining both categories of editorial work, just over 60 % of those involved were females. Females also dominated as authors or co-authors of articles published in MTED. Over both periods about 65% of those listed as authors were females. Once again, the gender profiles of those involved in editorial work and publishing in MTED were roughly consistent with the gender profile of MERGA members.

⁴ We recognise that our international colleagues are represented among the memberships of editorial boards, journal article authors, and keynote speakers at MERGA conferences. In the analyses reported here, we did not distinguish between Australasian and international contributors.

Table 3.
Mathematics Education Research Journal [MERJ] (3 issues per year)

	1999 ¹	2000	2001	2002	2003	2004	2005	2006	2007	2008
Editor/s and Associate Editor/s										
Male	3* ²	3*	2*	2*	2*	-	-	-	-	2 ⁴
Female	2	2	4	4	4	3*	3*	4*	4*	4* 2* ⁴
Editorial Board Members										
Male	9	14	14	14	14	10	10	7	7	9
Female	6	11	12	12	12	7	7	15	15	14
Authors (Research articles) ³										
Male	7	21	8	5	21	10	10	16	15	11
Female	12	18	10	13	11	17	15	21	9	21
N(Articles)	10	18	12	12	17	12	13	16	15	18

¹ 1999 – details of only two issues were available

² *denotes editor. Thus only males served as the editor 1999-2003; females in 2004-2008

³ Excludes editorials and book reviews

⁴ A new editorial team published issue 3, 2008

Table 4.
Mathematics Teacher Education and Development [MTED] (1 issue per year)

	1999	2000	2001	2002	2003	2004	2005/6 ¹	2007	2008
Editor/s									
Male	1	1	1	2	2	2	1	1	1
Female	2	2	1	1	1	1	2	1	2
Editorial Board Members ²									
Male	3	3	3	4	4	4	4	4	4
Female	6	6	3	7	7	7	7	7	7
Authors (Research articles)									
Male	5	5	3	5	4	6	5	1	3
Female	9	10	8	10	4	3	7	15	5
?	-	-	-	-	-	1	-	-	-
N(Articles)	8	9	7	5	5	6	5	6	5

¹ Volume 7 comprised the years 2005 and 2006

² Designated as the editorial team

Data for the ASMJ are shown in Table 5. The gender profile for editors of this journal is similar to that found for MERJ, with males (80%) dominating in the period 1999–2003 and females (80%) in the years 2004–2008. However, males outnumbered females on the editorial panel, and comprised about 75% for both periods. When the two categories of editorial work were combined, males outnumbered females; males comprised 77% in 1999–2003 and 65% in 2004–2008, in both cases well above their MERGA membership

levels. Males also outnumbered females as authors or co-authors of articles for both 5-year periods: 55% and 58% respectively, again above their MERGA membership level.

Table 5.
Australian Senior Mathematics Journal [ASMJ] (2 issues per year)

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Editor/s										
Male	2	2	2	1	1	1	1	-	-	-
Female	-	-	-	1	1	1	1	2	2	2
Editorial Board Members ¹										
Male	7	7	7	7	7	7	6	6	6	5
Female	3	2	2	2	2	2	2	2	2	1
Authors (Research Articles)										
Male	4	11	6	6	11	5	5	3	4	14
Female	6	7	8	5	3	4	4	6	3	5
?	2	-	-	-	-	-	-	-	-	-
N(Articles)	7	12	8	6	11	9	9	6	6	15

¹ Designated as Editorial Panel

As can be seen from Table 6, females are over-represented among the editors of the MERGA Conference Proceedings. Representation at 60% for the period 1999–2003 is close to their MERGA membership level; that of 67% for the years 2004–2008 is slightly higher. Apart from 2002, both males and females were represented among the keynote speakers. For the earlier period, 1999–2003, just over half (58%) were female; for the later period, 2004–2008, 47% were females. In both periods, females were proportionally under represented with respect to their level of MERGA membership.

Table 6.
Mathematics Education Research Group of Australasia [MERGA] annual conferences

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008 ³
Editor/s of conference proceedings										
Male	1	1	2	2	-	2	1	2	-	1
Female	1	1	1	2	4	1	6	1	2	2
Keynote speakers										
Male	2	2	1	-	2	2	1	1	3	1
Female	1	1	1	4	3	1	1	1	3	1

Concluding Comments

The continuing marked dominance of males as invited speakers at AMS functions and members of AMS editorial committees, described earlier in the paper, served as an important catalyst for the current investigation. Given that our focus was on mathematics educators and not on mathematicians, we were optimistic that the indicators of esteem we sought would reveal less gender bias, as indeed proved to be the case. Over the 10 year

period monitored (1999–2008), and based on the data gathered from the four publications examined, females' level of participation in activities prized and rewarded in academia in Australia was already broadly consistent with, or grew steadily towards, a level congruent with their representation in the mathematics education community.

As has been pointed out, we recognise that much of the data reported in this paper have shortcomings. We strongly recommend that a more refined exploration of Australian-only data on measures of academic esteem, focussing on Australian only academics and on a broader range of mathematics education journals, as well as data on promotions across the entire nation within the field of mathematics education (if possible) are needed in order to draw clearer, more accurate, conclusions. Based on our data, we very tentatively infer a positive trend among females towards higher, and more representative, contributions in publication-related esteem indicators leading to promotional eligibility. While also cognisant of the multiplicity of societal factors that may prevent females from applying for promotion as quickly as their male counterparts (e.g., family responsibilities), recent moves towards internal professorial promotions may counteract some of the disadvantages previously faced by women. More work to clarify the situation is clearly needed.

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