Title	Mathematics: Whose domain is it? Views from Australia and Singapore
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Mathematics – Whose Domain Is It? Views from Australia and Singapore

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Commonly reported findings on students' perceptions of mathematics as a male domain indicate that the view is held more strongly among boys, on average, than among girls. We were interested to know if this pattern of beliefs was still evident, and whether differences would be found among Australian and Singaporean students.

One of the most frequently used instruments for measuring students' perceptions of mathematics as a male domain is the Mathematics as a male domain [MD] subscale of the Fennema-Sherman Mathematics *Attitude Scales* (Fennema & Sherman, 1976). A new instrument, the *Mathematics* as a *gendered* domain scale was devised to address these criticisms of the MD. Following a first trial, a few changes were made and the scale was re-trialed. The findings reported here are from the second trial of the new instrument.

The study

What does the new instrument look like?

The *Mathematics as a gendered domain* scale is made up of three subscales: Mathematics as a *male domain*, *Mathematics as a female domain*, and *Mathematics as a neutral* domain. Some items included in the new scale are loosely based on those from the Fennema-Sherman *Mathematics* as a male *domain* subscale. Items reflecting contemporary research findings in the field were also written. On each subscale, items were included which related to the following factors identified from the research literature: ability, career, general attitude, environmental factors, peers, effort and task. Sample subscale items and the factors they represent are shown on Table 1.

Table 1. Selected items from the Mathematics *as a gendered domain* scale

SUBSCALE & FACTOR	ITEM
Male domain – ability	Boys understand mathematics better than girls do
Female domain – career	Girls are more suited than boys to a career in a mathematically-related area
Neutral domain – general attitude	Students who say mathematics is their favourite subject are equally likely to be girls or boys
Male domain – environment	Boys are encouraged more than girls to do well in mathematics
Female domain – peers	Boys are distracted from their work in mathematics classes more than are girls
Neutral domain – effort	Girls and boys are just as likely to be lazy in mathematics classes
Male domain – task	Boys, more than girls, like challenging mathematics problems

Each subscale consists of 16 items. The response format for each is a 5-point Likert-type scale ranging from SD (strongly disagree) to SA (strongly agree). A score of one is assigned to SD responses and five to SA responses. The range of possible scores on each subscale is 16-90.

The questionnaire used in this study included all 48 items. They were presented in a mixed order. A space for comments was provided at the end of the questionnaire.

The sample and methods

Australian and Singaporean students in grades 7-10 completed the questionnaire. In each country, the students attended a single large co-educational secondary school. The sample sizes are summarised in Table 2.

Table 2. Sample sizes

Country	Unknown gender
Australia	
Singapore	264

Data from the completed questionnaires were analysed using $SPSS_{PC}$. For each of the three scales, statistical tests were conducted to compare the responses of boys and girls and to examine if differences existed in the views of students in the two countries.

Findings

The results of the analyses exploring for differences in mean scores on each subscale by county and gender were as follows:

Male *domain:*

Students did not stereotype mathematics strongly as a male domain (mean scores < 3). However:

- **Singaporean** students believed more strongly than Australian students that mathematics was a male domain. For the Singaporean students, this was true for the females and for the males
- 4 males believed more strongly than females that mathematics was a male domain

Female domain:

Students did not stereotype mathematics strongly as a female domain (mean scores < 3). However:

- females believed more strongly than males that mathematics was a female domain.

Interestingly, mathematics was stereotyped slightly more strongly as a female domain than as a male domain by students in both countries.

Neutral domain:

In general, students strongly agreed that mathematics was a gender neutral domain (mean scores > 3). However:

- males were less convinced of this than were females

We were also interested to know if there were differences in the views of males and females within each country. The results of the analyses were as follows:

Among Australian students, males were:

- more convinced than females that mathematics is a male domain

Among Singaporean students, males were:

- more convinced than females that mathematics is a male domain
- less convinced than females that mathematics is a female domain
- less convinced than females that mathematics is a neutral domain

Conclusions

A very positive outcome of this study was that students in Australia and Singapore generally believe much more strongly that mathematics is a neutral domain than either a male or a female domain. Australian students, however, appear to believe this to a greater extent than their Singaporean counterparts. Overall, it was found that females held less stereotyped views than males. Although beliefs were not strong that mathematics was a male domain, in both countries males were more convinced that this was the case than were females. This latter finding is consistent with earlier reported research results.

Of all the groups, Singaporean males appeared to hold the most stereotyped beliefs about mathematics. Compared to Singaporean females, they believed more strongly that mathematics was a male domain, and less strongly that it was a female or neutral domain, Compared to Australian males, they were more convinced that mathematics was a male domain.

An unexpected finding that is worthy of further exploration was that mathematics was stereotyped more strongly as a female domain than as a male domain, except among Singaporean males. This finding among Australian students may reflect students' scores on large scale examinations such as the Victorian Certificate of Education and a growing perception that boys are now the disadvantaged group academically, a view receiving much media attention (see Forgasz, 1999).

From previous research in the field of gender issues in mathematics education, we know that attitudes and beliefs can impact on individuals' performance levels and influence decisions to persist with studies in mathematics at higher levels. The TIMMS results for students in the middle years of schooling indicated no gender differences in the performance levels of girls and boys in either Australia or Singapore. Yet, our results revealed differences in the extent to which students in each country stereotype mathematics. The data gathered in this study cannot provide explanations for the findings. Perhaps there are cultural differences that partially account for the differences in students' responses. There may also be differences in parents' and teachers' expectations of students. Perhaps variations in curricular emphases) teaching methods, and assessment strategies in the two countries are implicated. If equity in mathematics learning outcomes – performance levels and participation rates– is to be attained, further research is needed to pinpoint the often-subtle factors contributing to beliefs related to the stereotyping of mathematics.

References

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