

MATHEMATICS AND ENGLISH: STEREOTYPED DOMAINS?

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Abstract

Historically, mathematics and English are academic disciplines which have been gender-stereotyped: mathematics as 'masculine' and English as 'feminine'. Mathematics is also generally considered to be more important. In this paper we report the findings of a study of grade 9 students' beliefs about themselves as learners of mathematics and English. Patterns of success and failure attributions across the two subjects were found to differ for males and females as were beliefs about achievement. Both males and females stereotyped the two subjects in predictable directions. The males were found to be more stereotyped than the females.

INTRODUCTION

Historically, the academic disciplines of mathematics and English have been gendered domains. Societal expectations for males and females and prevailing stereotypic images of men and women were reflected in the perspectives of the two fields put forward (Forgasz, in press). Mathematics and science have been described as logical, clinical, objective and complex pursuits; English as an imaginative and creative endeavour. Broverman et al (1972) reported that women were perceived to be "less competent, less independent, less objective, and less logical than men" (p.75), and men were seen to lack "interpersonal sensitivity, warmth, and expressiveness" (p.75). It was claimed that the stereotypic differences found "appear to be accepted by a large segment of our society" (Broverman et al., 1972, p.75). Today mathematics and science are considered high status pursuits and males are found to dominate in these spheres (see Leder & Forgasz, 1992). English language studies are deemed less important and have been stereotyped as female domains (White, 1986). Stereotyping of the two subject areas is still evident. Archer & Freedman (1989), for example, found that among a range of academic disciplines, both male and female university students similarly rated mathematics to be masculine and English to be feminine. White (1986) reported one fifteen year old girl's comments: "Girls may find sciences boring and keep away and so never know if they could succeed - same with boys and English" (p.572). The links between the gendered image of mathematics, achievement, and patterns of causal attributions for success and failure have formed the focus of much research. In areas that are seen as 'masculine', such as mathematics, gender-related differences in attributions have been found to be more pronounced (Wollett et al., 1980; Stipek, 1984). Many studies have revealed that males are more likely than females to attribute mathematical

success to ability and failure to effort; females are more likely than males to attribute success to effort and failure to lack of ability (Leder, 1992). Comparisons have also been made between mathematics and other academic fields including English (Language Arts). Gender differences in attribution patterns have been reported. For example, Ryckman & Peckham (1987) found similar patterns of attributions for success and failure to effort between mathematics/science (MS) and language arts (LA) for males and females in grades 9-12. Differences were found for ability attributions, however. Compared with LA, females saw little MS success attributable to ability. But males' ability attributions showed no difference between the two subjects for success and only small differences, with MA higher, for failure. Shea & Llabre (1985) reported no significant gender by subject interactions among successful mathematics and

English/social science undergraduates.

We were interested to explore whether grade 9 male and female students' beliefs about themselves as learners of mathematics and English differed. More specifically, would they attribute their successes and failures in the two subject areas differently, hold different beliefs about their achievement levels in the two subjects, and would they view mathematics and English as stereotyped domains?

The sample

All grade 9 students in one co-educational post-primary government school in Australia participated in the study. The sample comprised 187 students (97 males, 90 females).

The instrument and method

A questionnaire was administered to the students. Items which were prepared to determine beliefs about mathematics were slightly adapted for English. The questionnaire was in three sections: (1) The Mathematics Attribution Scales (Wollett et al., 1980) were slightly modified to suit Australian students. There were four success-related and four failure-related items. Students responded on a 5 point Likert-type scale (strongly agree to strongly disagree) to each of four statements following each item. The statements referred to ability, effort, task and environment; (2) For mathematics and for English six items were used to ascertain students' beliefs about: their personal achievement levels and the levels to which they aspired; the achievement levels their teachers, parents and their classmates would assign them; and the achievement levels they believed their parents would want for them. Each item was responded to on a five point scale: 1 = weak, 5 = excellent; (3) Three open-ended questions for mathematics and English were incorporated in the questionnaire to investigate stereotyping: Do you like mathematics/English?; What makes a person good at mathematics/English?; Are women better than men at mathematics/English?

Data analysis

The numerical data were analysed using the SPSSx computer package; the open-ended responses were analysed manually. If students had marked items mid-way between categories on the five point scales, these were conservatively coded towards the central value.

Paired t-tests were used to compare males' and females' responses for English and mathematics on the fourteen variables. To examine for gender differences within the disciplines, independent groups t-tests were used.

Results
A. Comparisons between mathematics and English

The results of the paired t-tests for success and failure attributions, and on beliefs about achievement levels are shown on Table 1.

The females attributed their successes to ability to a greater extent in English than in mathematics; their mathematical failures were attributed more to (lack of) ability than were their English failures. For males there were no significant differences in attributions to ability for the two subjects. For males and females, there were no differences in effort attributions across the two subjects. Both males and females attributed successes to English tasks more strongly than for mathematical tasks. Failures attributed to mathematical tasks were scored higher than for English tasks. Only males attributed success to environmental factors more strongly for mathematics and failures more strongly for English. It was interesting to note that there were no significant differences for males' beliefs about their achievement levels in mathematics and English while females differed on four of the six items. Females believed:

- they were better at English than at mathematics
- their English teachers would assign them higher achievement levels than would their mathematics teachers
- their parents would assign them higher achievement levels in English than in mathematics
- their classmates would assign them higher achievement levels in English than in mathematics

Table 1. Means for paired and independent groups t-tests for English and mathematics.

Subscale

	Females (N=90)	English	Mathematics	English	Maths	English
SUCCESS ATTRIBUTIONS						
Ability	13.65	13.49	14.07***	11.88	13.65	14.06
Effort	13.05	12.90	13.79	13.36	12.94	13.79
Task	14.12*	13.27	14.38***	12.54	14.13	14.38
Environment	11.20***	13.53	12.99	13.89	11.12***	12.99
FAILURE ATTRIBUTIONS						
Ability	12.16	12.10	11.17***	13.48	12.16*	11.18

Effort 12.94 12.77 11.64 11.90 12.95** 11.64 12.70 11.90

Task 13.07* 13.91 13.23*** 15.02 13.07 13.23 13.98 15.02

Environment 13.08*** 11.88 12.21 11.87 13.09* 12.21 11.88 11.94

BELIEFS ABOUT ACHIEVEMENT LEVELS

Perceived achievement level 3.46 3.33 3.76*** 3.19 3.46** 3.76 3.34 3.19

Desired level 4.78 4.80 4.86 4.78 4.78 4.87 4.80 4.78

Believed teacher's assessment 3.03 3.21 3.54** 3.19 3.03** 3.52 3.21 3.19

Believed parents' assessment 3.53 3.48 3.88** 3.42 3.53* 3.88 3.49 3.42

Believed parents' desired level 4.79 4.83 4.78 4.77 4.79 4.77 4.84 4.77

Believed classmates' assessment 3.38 3.37 3.99*** 3.50 3.38*** 4.00 3.37 3.50

a small differences in reported mean scores for paired and independent t-tests are due to missing data

*** $p < .001$, ** $p < .01$, * $p < .05$

B. Within discipline gender differences

The data were also examined for gender differences within discipline areas. The results of the independent groups t-tests on all variables by gender for English and for mathematics are shown on Table 1.

Mathematics: Gender differences were found for success and failure attributions to ability. Males attributed success to ability to a greater extent than did females; and females scored higher on attributing failure to (lack of) ability. These findings replicate those frequently reported in the literature (see Leder, 1992). There were no differences in males' and females' beliefs about their achievement levels.

English: Several significant gender differences were noted. Males scored higher than females on: attributing failure to (lack of) ability; attributing failure to effort; attributing failure to environmental factors. Females scored higher than males on: attributing success to environmental factors; perceived achievement levels; beliefs about achievement levels assigned by teachers, parents, and classmates.

Responses to the open-ended questions

i. "Do you like mathematics/English?"

The percentage of responses to the questions "Do you like mathematics/English?" are shown by student gender on Table 2.

Table 2. Percentage of responses to the questions "Do you like mathematics/English" by student gender.

Sometimes/

No

conditional undecided

MFMFMFMF

Do you like mathematics? 46 37 17 28 9 5 2 8 3 0

Do you like English? 42 51 20 16 9 2 3 2 9 9

For males the pattern is almost identical for liking mathematics and English. For females, however, a greater percentage disliked mathematics than disliked English, and more liked English than mathematics. The patterns for males' and females' liking/disliking of mathematics and English show similar trends to their assessments of their abilities in the subjects. Students' written comments tended to support links between liking/disliking a subject and perceptions of achievement at it. Of the 13 females who did not like maths, lack of understanding was given as the reason by six. Of the 13 males, five gave not understanding or not being good at it as reasons. Typical of these comments were:

Yes, I like maths because I do get reasonably good marks and enjoy it (female)

No I don't like maths because I am not good at it (male)

ii. "What makes a person good at mathematics/English?"

The frequencies of the most common responses are shown on Table 3. For mathematics, males and females agreed that a combination of ability and effort were required. However, while more females thought 'good understanding' to be important, more males believed 'logical thinking' was needed. One comment reflecting the most frequently given responses for mathematics is given below:

Some people are just good. If you apply yourself and study a lot, and if you have a good teacher who explains so you can understand it (female)

For English, more females than males gave multiple reasons for being good at the subject. Generally, factors mentioned tended to be more subject specific in English than in mathematics. One

example: spelling, vocabulary, being able to express feelings
(male)

Table 3: Frequency of responses for females and males to "What makes
a person good at maths?"

Ability 13 10

Hard work/ Try hard/ Studies 15 21

Good understanding 12 5

Listening skills 5 4

Thinks logically 3 8

Enjoying/Liking it 5 3

ENGLISH Females males

reading skills (reads a lot from an early age) 13 6

imagination 12 3

talent/ability/creative mind 9 5

hard work 8 7

being interested in it/enjoying it 7 3

good vocabulary 4 6

iii. "Are women or men better at mathematics/English?"

Table 4. Percentage responses to the questions "Are women or men
better at mathematics/English?" by student gender.
better better

MF MF MF MF

Mathematics 13 9 23 24 57 7 13 2

English 21 16 6 - 47 7 4 9 7

The percentages of responses to these questions for males and for females are shown on Table 4. The males exhibited more stereotyping in both mathematics and English than did the females. For both subjects, a smaller percentage of males than females thought men and women equally capable in both subjects. While the extent of stereotyping was about the same for the males across the two subjects, the females were more stereotyped about English. There was also evidence of reverse stereotyping of mathematics by the females:

males: 23% considered men better at mathematics and
21% considered women better at English.

females: 2% thought men were better at mathematics,
9% said women were better at mathematics and
16% said women were better at English

Examples of students who stereotyped mathematics and English are given below:

I think women are better at English. Women read a lot more than men do (female)

Women. Women think in a way that makes it easier for them to understand this subject (male about English)

Men. Most of the top people in the Westpac maths comp [an Australia wide mathematics competition] were boys (male about mathematics)

Conclusions

From the present study it appears that male and female grade 9 students hold different beliefs about themselves as learners of mathematics and English. Gender differences in causal attributions for success and failure were evident when comparisons were made across the two subjects, particularly for females. Overall, more functional attribution patterns were evident for males in mathematics and for females in English. There were clear indications that males stereotyped mathematics as 'masculine' and both males and females viewed English as 'feminine'. Men were considered to be better at mathematics by the males and women better at English by both males and females. The characteristics students considered necessary to succeed in each field were closely aligned to gender-stereotypic images of men and women (Broverman et al., 1972). The longer term implications for participation rates in the two subjects, and whether the findings reported here are specific to the age group of the participants or to the particular school in which the students are enrolled are issues worthy of further investigation.

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