Australian Journal of Teacher Education

Volume 39 | Issue 9 Article 2

2014

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Gilah C. Leder
Monash University, g.leder@latrobe.edu.au

Helen J. Forgasz
Monash University, helen.forgasz@monash.edu

Glenda Jackson
Monash University, glendamjackson@gmail.com

Recommended Citation

Leder, G. C., Forgasz, H. J., & Jackson, G. (2014). Mathematics, English and Gender Issues: Do Teachers Count?. *Australian Journal of Teacher Education, 39*(9).
http://dx.doi.org/10.14221/ajte.2014v39n9.3

Mathematics, English and Gender Issues: Do Teachers Count?

Gilah C. Leder
Helen J. Forgasz
Glenda Jackson
Monash University

Abstract: Pedestrians were stopped in the street and asked about their views on the teaching and learning of mathematics and English for boys and girls. Many commented on the importance of teachers for both subject areas; some respondents self-identified as teachers. In this article we present findings on the gendering of mathematics and English and the impact that teachers can have on learning outcomes in these disciplines. The data reveal that mathematics is endorsed by many as a male domain and English as a female domain, and that teachers play an influential part in the learning outcomes – achievement, future participation, and attitudes – in both disciplines.

Introduction

In this article we compare the views of the general public about the learning of mathematics and English at school and explore the role of teachers, as perceived by members of the general public, in facilitating or impeding girls' and boys' achievements in these disciplines.

Mathematics and English are considered core components of Australia's national curriculum, as is evident from the two excerpts reproduced below.

> A fundamental goal of the mathematics curriculum is to educate students to be active, thinking citizens, interpreting the world mathematically, and using mathematics to make predictions and decisions about personal and financial priorities. (Australian Curriculum, Assessment and Reporting Authority [ACARA], 2009, p. 5)
>
> The study of English… helps create confident communicators, imaginative thinkers and informed citizens. It is through the study of English that individuals learn to analyse, understand, communicate with and build relationships with others and with the world around them… It helps them become ethical, thoughtful, informed and active members of society. (ACARA, n.d., para. 4)

Given the importance of the English language and numeracy domains, students' performance in these subjects continues to attract considerable and persistent attention in media outlets and among stakeholders including governments, schools, and parents. In this study our focus is on the views of the general public rather than on those with direct interest in the education of students.

To contextualize our findings we begin by describing the national approach to assessing Australian student performance in mathematics and English. Gender differences in achievement, and explanations for them, are discussed next. We follow this with a synopsis of research on the importance attached to teachers' work and whether teachers' views and behaviours have an impact on student learning and achievement.

Assessing performance in mathematics and English in Australia

The National Assessment Program – Literacy and Numeracy [NAPLAN] is an important tool for assessing the progress, in the key areas of mathematics (numeracy) and English (literacy), of students at schools in Australia. NAPLAN "tests the sorts of skills that are essential for every child to progress through school and life, such as reading, writing, spelling and numeracy" (ACARA, 2011, para. 3). The NAPLAN tests were held for the first time in 2008 and have been administered annually since then. They are developed for students in Years 3, 5, 7, and 9. Compliance to sit for the tests is high; each year over one million students sit for the tests. At Years 3, 5, and 7 the participation rate in the NAPLAN tests is consistently at least 95% of eligible students; at Year 9 it is a little lower but is still above 90% (ACARA, 2013).

Gender differences in performance

Both in Australia, and internationally, consistent gender differences in performance are often reported on large-scale tests in numeracy and literacy. Since their introduction, a subtle but consistent pattern of gender differences in performance on the NAPLAN tests has emerged, with boys regularly outperforming girls in numeracy, and girls consistently outperforming boys in the reading, writing, spelling, and grammar and punctuation components (see annual NAPLAN reports, downloadable from the Australian Curriculum, Assessment and Reporting Authority [ACARA] website). Australian results from the large-scale international testing program, PISA 2012 [Programme for International Student Assessment], administered to 15-year olds, yielded similar patterns:

> [M]ales achieved a mean score of 510 score points, which was significantly higher than the mean score of 498 score points for females… equates to around one-fifth of a proficiency level or the equivalent of about one-third of a year of schooling. (Thomson, DeBortoli, & Buckley, 2013, p. 25)
>
> [T]he mean performance for females was 530 score points and the mean performance for males was 495 score points. This difference represents around a half of a proficiency level or around one year of schooling. (Thomson, DeBortoli, & Buckley, 2013, p. 176)

Gender differences in performance in mathematics, in favour of boys, and in reading, in favour of girls, are not confined to Australia.

> Girls outperform boys in reading in all countries and economies by the equivalent of one year of school.
> In most countries and economies, girls underperform boys in mathematics; and among the highest-achieving students, the gender gap in favour of boys is even wider. (OECD, 2014a, p. 1)

Persistent gender differences in aspects of mathematics and English language performance have also been reported in the wider literature beyond large-scale tests (e.g., For mathematics: Andreescu, Gallian, Kane, & Mertz, 2008; Kane & Mertz, 2012; Leder & Forgasz, 2010; For English: Logan & Johnston, 2009; Watson, Kehler, & Martino, 2010).

Possible explanations for gender differences

Multiple explanations, comprising both personal and environmental factors, have been put forward for the persistent patterns of gender differences in academic achievement – often in the area of mathematics (e.g., Halpern et al., 2007; Leder, 1992; Wigfield & Eccles, 2000), but less frequently with respect to English. Students' social and educational environments and the role of significant "others" in that environment are commonly included in the listing of environmental factors.

In this article we focus on two elements common to many explanatory models for gender differences: the social milieu or indicator of the social environment, gathered in this study by surveying pedestrians (members of the general public) in various street locations; and perceptions about the teacher, an important significant "other" in students' educational environments.

Teachers and student achievement

Quality teaching and student learning have been inextricably linked:

> Teachers are the most important individual factor affecting the educational outcomes of their students. (Education and Training Committee, 2009, p. xi)

The standard of teaching and the scope and quality of pre- and in- service teacher education programs have attracted widespread scrutiny and analysis. According to Akiba, Le Tendre, and Scibner (2007):

> Education policy makers around the world have paid attention to teacher quality as a major vehicle to improve student learning…. Attracting competent candidates for the teaching profession, retaining highly qualified teachers by providing incentives, and ensuring students' access to high-quality teaching have been major focuses of educational reforms in many countries. (p. 371)

In Australia, governments and education systems have persistently been concerned with teacher-competency issues. For example, between 1979 and 2006 more than 100 inquiries and reports on various aspects of pre-service teacher education were published (House of Representatives Standing Committee on Education and Vocational Training, 2007). Before, during, and since that period, much has been written about the important role-played by teachers in helping students learn. Assertions that "a growing body of research shows that student achievement is more heavily influenced by teacher quality than by students' race, class, prior academic record, or school a student attends" (Center for Public Education, 2008, para. 2) or that "educators know—and research confirms that …teachers tip the scale toward success or failure" (Darling-Hammond, 2012, p. 8) abound in scholarly and popular publications.

Some authors (e.g., Hanushek, Rivkin, & Kain, 2005; Nye, Konstantopoulos, & Hedges, 2004) have questioned the integrity and objectivity of research studies linking the quality of teaching and teachers to student achievement. Others, however, have relied on value added models to point to a positive link between the quality of teaching and gains in student achievement (e.g., Rockoff, 2004; Sledge & Pazey, 2013). Drawing on a large body of previous research, Hattie (2003, 2009) listed and quantified the impact of factors most commonly considered to influence student achievement. These were: the students themselves (50%), the home (5-10%), the school (5-10%), principals (whose influence is included in the school effect), peer effects (5-10%), and teachers (30%). “I therefore suggest”, he argued, “that we should focus on the greatest source of variance that can make the difference – the teacher” (Hattie, 2003, p. 3).

Teachers have also been found to be potential contributors to gender differences in learning outcomes – achievement, future participation, and attitudes/beliefs. For example, some teachers have been found to hold gender-stereotyped expectations of boys and girls (e.g., Legewie & DiPrete, 2012; Sadker & Zittleman, 2009), to assess identical work differently depending on whether the work was said to be that of a boy or of a girl (Cornwell, Mustard, & Van Parys, 2013; Dee, 2007), and to interact differently with boys and girls in the classroom (e.g., Duffy, Warren, & Walsh, 2001; Jones, & Wheatley,1990; Leder, 1987; Quaglia et al., 2013; Spilt, Koonen,, & Jak, 2012).

The study

Earlier stages of the study

In this article we present findings from the fourth stage of an ongoing research study. In the first stage, we approached pedestrians in 12 different sites in Victoria (Australia) – eight in the metropolitan area of Melbourne and four in regional/country Victoria – with a request to answer a short survey about issues that were linked primarily to school mathematics, with an emphasis on gender issues (see Leder & Forgasz, 2010; 2011). The focus of the first phase of the study is captured in the explanatory statement provided to the participants:

> We have stopped you in the street to invite you to be a participant in our research study. ...We are conducting this research … to determine the views of the general public about girls and boys and the learning of mathematics. We believe that it is as important to know the views of the public as well as knowing what government and educational authorities believe.

The influence and role of mathematics teachers featured conspicuously in the responses we received (see Leder & Forgasz, 2010), even though the views about teachers or teaching were sought directly in only two items. When asked to explain their responses, some participants also, unexpectedly, contrasted their beliefs about mathematics with those about English.

To extend our sample beyond Victoria, and gather the views of the general public more widely, we relied on an innovative recruitment tool, the social network site Facebook. We targeted those over 18 (to meet research ethics demands), placed an advertisement with a link to an online version of the same survey on Facebook, and thus gathered responses from people across Australia (see Forgasz, Leder, & Tan, 2011 for details) and around the world. Again, there were spontaneous references to teachers and, despite the focus on mathematics, there were frequent comparisons with the study of English in respondents’ elaborations to various items.

Next, to provide a context for our findings about mathematics we placed another advertisement on Facebook that was linked to a comparable online survey about English.

Intrigued by consistencies and differences in the two Facebook samples' responses to the mathematics and the English surveys, we decided to question a new group of participants about both mathematics and English. For this, the current study, we returned to our earlier method of approaching pedestrians in the street. Interestingly, during the data gathering, a small number of participants described themselves as teachers. A focus on teachers had not been an a priori goal of the study; however, their views were interesting and, where relevant, are highlighted in this paper.

Theoretical underpinnings

The instrument and its development

As described above, the current study builds on earlier work. The development of the items included in the original instrument used to gather the views of the general public on mathematics was based in the research literature on explanatory frameworks for gender differences in mathematics learning outcomes (described earlier in the article), and on empirical research findings in the field. The items reflected the following dimensions: self-perceptions of capability in and enjoyment of mathematics; beliefs about girls' and boys' relative mathematical and technological capabilities and suitability for particular careers; and beliefs about significant others' views on gender and mathematics. To maximize cooperation and completion rates, the survey was limited to 14 core, scorable items, and respondents were able to explain their responses.

For stage 3 of the study, the items were modified to focus on English rather than mathematics. By replacing the word 'mathematics' with 'English', identical wording was possible for most of the parallel items on the survey. A few items needed more attention, however. Because English, but not mathematics, is a compulsory subject throughout secondary school in Australia, a slight difference in the wording of two items (4 and 10 – see full set of items below) was inevitable. For two other items (11 and 13) different activities were strategically selected. It should be noted that items 12 and 14 were common to both surveys.

The full set of survey items for mathematics and English, with closed response options and supplementary open-ended prompts, were:

1. When you were at school, did you like learning Mathematics/English? [Yes/No./Unsure. Why do you say that?]
2. Were you good at Mathematics/English? [Yes/No/Average. Why do you say that?]
3. Has the teaching of Mathematics/English changed since you were at school? Yes/No/Don't know. If "yes", how?]
4. Should students study Mathematics when it is no longer compulsory/Should studying English be compulsory? [Yes/No/Don't know. Why do you say that?]
5. Who are better at Mathematics/English, girls or boys? [Girls/Boys/Same/Don't know. Why do you say that]
6. Do you think this has changed over time? [Yes/No/Don't know. If "Yes", how have things changed?]
7. Who do parents think are better at Mathematics/English, girls or boys? [Girls/Boys/Same/Don't know. Why do you say that?]
8. Who do teachers think are better at Mathematics/English, girls or boys? [Girls/Boys/Same/Don't know. Why do you say that?]
9. Do you think that studying Mathematics/English is important for getting a job? [Yes/No/Don't know. If "Yes", why do you say that?]

10. Is it more important for girls or boys to study Mathematics/to be good at English? [Girls/Boys/Same/Don't know. Why do you say that?]
11. Who are better at using calculators, girls or boys?/Who are better at spelling, girls or boys? [Girls/Boys/Same/Don't know. Why do you think that?]
12. Who are better at using computers, girls or boys? [Girls/Boys/Same/Don't know. Why do you think that?]
13. Who are more suited to being scientists, girls or boys?/Who are more suited to being journalists, girls or boys? [Girls/Boys/Same/Don't know. Why do you think that?]
14. Who are more suited to working in the computer industry, girls or boys? [Girls/Boys/Same/Don't know. Why do you think that?].

Finally, participants were asked if there was anything else they would like to say or add.

Research approach

Data for the study reported in this article were gathered at six heavy foot-traffic sites in the metropolitan area of Melbourne. Approval for the study was obtained from the ethics committee at our university and from the council for each region in which data were gathered. Some councils gave blanket approval for the study. Others helpfully specified areas they considered particularly suitable for the administration of the survey and stipulated certain dates for our data gathering to ensure this did not clash with other events.

One day was spent at each site to gather around 30 full surveys, comprising questions about both mathematics and English. The order in which the questions were asked about mathematics and about English was alternated. Half of the participants were questioned about mathematics first; for the other half views about English were sought first. Some personal background information about respondents was also gathered: age (in terms of broad age-range), whether the respondents were male or female, and, whether English was their first language, and, if relevant, a broad description of occupation. As well as the readily codable responses associated with the items (yes / no / don't know; boys / girls / the same / don't know), respondents were encouraged to elaborate and explain the reason for their answers to each of the items. The researcher conducting the survey in the street noted these responses manually.

The Sample

The full sample, that is, respondents who completed both the mathematics and English survey items, comprised 184 participants: 95 males (52%) and 89 (48%) females. Of these, 12 – six females and six males – indicated that they were, or had been, teachers. Taking the age of 40 as the cut off point for "younger" and "older participants", 79 (43%) were under 40; 105 (57%) were 40 or over. (We selected age 40 as a convenient cut off point, since, according to the Australian Bureau of Statistics (2012), the median age of the Australian population at June 2012 was 37.3 years.) Thus the sample was well balanced with respect to gender but contained somewhat more older than younger participants. The backgrounds and experiences of the participants in the study also varied considerably. This provided us with the views of a diverse cross-section of the Victorian community, including the views of some who had worked within the educational sector.

Data Analysis

Findings for both the quantitative and qualitative data for 10 pertinent items are reported in this article. These focused on participants' beliefs about mathematics/English and self (items 1 and 2); on teachers and the teaching of mathematics/English (items 3 and 8); on the importance and utility of mathematics/English (items 4 and 9); on gendered perceptions of mathematics/English (items 5 and 10); and on gendered perceptions of technology capabilities (items 12 and 14). The statistical significance of differences in the frequency distributions of the response options on the parallel items on these surveys was determined by McNemar-Bowker chi-square (χ^2) tests. This test is an extension of the McNemar chi-square test for 2 matched variables when testing for statistical significance of categorical repeated measure data for variables with more than 2 categories. We used the effect size phi (φ) to describe the strength of the difference. As 10 χ^2 tests were conducted, a Bonferroni correction to the p-value for statistical significance was adopted to avoid spurious positives; the Bonferroni correction is considered the simplest and most conservative way to do so (Weisstein, 2013). The revised p-value for statistical significance used was thus .05/10 = .005.

In addition, as an indicator of response reliability, we analysed responses for item 3 (Has the teaching of mathematics/English changed since you were at school?) by participants' age – expecting a higher proportion of older participants to indicate that the teaching of these subjects had changed since their own school days. Individual (for responses about mathematics, and for responses about English) Pearson chi-square (χ^2) tests were used for these analyses.

Although a short street survey limits the type of qualitative material gathered, the open-ended questions provided participants with the opportunity to comment briefly on their understanding of the topics discussed (Denzin & Lincoln, 2003). A selection of explanatory comments given by the respondents is also included in the article and serves as important additional qualitative information; spontaneous, representative references to teachers and teaching form part of this material.

Reliability check

It was considered important to gauge the reliability of responses. As noted above, responses for item 3 (Has the teaching of mathematics/English changed since you were at school) were used for this purpose. Analyses by age revealed statistically significant differences in the proportion of older respondents (those aged 40 or more) who thought that the teaching of mathematics/English had changed compared with younger participants (those under 40). For mathematics, 73.3% of older participants, compared with 25.3% of younger participants believed changes had occurred (χ^2= 47.67, df=2, p<.001, φ = .51). For English, 41.9% of older participants compared with 15.2% of younger participants considered there had been changes (χ^2 = 30.26, df=2, p<.001, φ = .41). That older participants were more likely than younger participants to think that the teaching of these subjects had changed was consistent with intuitive expectations. Their responses to these items gave confidence in the candour with which they answered other items on the survey.

Results

The presentation of results begins with remarks, both positive and negative, about teachers and mathematics and English learning. The comments were made spontaneously when explaining responses to various items in the survey. These comments serve to demonstrate the importance of teachers in shaping the respondents' beliefs on the range of issues canvassed.

Comparisons of responses to parallel items on the mathematics and English surveys are reported in the remaining sections on results. Where and when relevant, we highlight the opinions of the respondents who self-identified as teachers or former teachers.

References to teachers

Well over half the participants, 106 (58%) out of a total of 184 made reference to teachers, or teaching, in at least one of their responses to an item that was not specifically focussed on teachers; 57 participants did so on two or more occasions over the course of the survey. Thus, it seems, many respondents considered teachers' attitudes and behaviours to be relevant factors related to students' educational outcomes. Examples are provided below of some representative positive and negative comments about teachers, and about their influence on student learning outcomes. In the comments below the term in brackets indicates whether the response was made as part of the mathematics survey or the English survey.

Positive comments about teachers

> [Had a] teacher you can understand. (mathematics)
> Actually had a good teacher in Year 10 - who got me interested. (English)
> Just loved it. Had a really passionate teacher... she was wonderful (English).

Negative comments about teachers

> Hated! Maths teacher used to hit, smack knuckles so hard. (mathematics)
> No (not good at English), not at all, should blame my English teacher. (English)

Outcomes depend on teachers

> The teachers - if you had a good teacher, it was good. If a bad teacher, it was hard to learn (mathematics)
> I've had a good teacher and subject interesting (in English).

The public's views about themselves and mathematics and English (items 1 & 2)

Data pertaining to the participants' liking of, and proficiency in, mathematics and English are shown in Table 1. For this comparison, as well as the ones that follow, N = 184.

Item	Yes (%)	No (%)	Unsure/ Average (%)	McNemar-Bowker χ^2 test
Liked mathematics?	51.1	40.8	8.2	χ^2= 20.36, df=3, p<.001, φ=.21
Liked English?	76.1	18.5	5.4	
Good at Mathematics?	48.9	20.1	31.0	χ^2=16.61, df=3, p<.005, φ=.16
Good at English?	67.4	9.8	22.8	

Table 1. Liking of/being good at mathematics and English (items 1 & 2)

Higher proportions of the group indicated that they liked and were good at English (76.1% and 67.4% respectively) than liked and were good at mathematics (51.1% and 48.9% respectively). The McNemar-Bowker χ^2 tests revealed that the differences in the responses to the two item pairs were both statistically significant – see Table 1.

Many respondents gave reasons for liking or not liking mathematics and English at school. Indicative explanations included:

> No special reason, just enjoyed it. (mathematics)
> Loved it - because I was good at it, algebra and geometry. (mathematics)
> Liked maths because of the teacher. (mathematics)
> [Liked maths] 'Cause of the teachers. We had a specialist maths teacher in state primary school. (mathematics)
> Liked language, literature, English. (English)
> Enjoyable writing essays and stories, was fun, and I love reading. (English)
> Loved it … Good results, good feedback from teachers. (English)
> Yes I did because I was good at it. (English)
> Dig deep here. I think I liked the rhythm of it, literature and the cleverness of it. (English)

In summary, when thinking back to their schools days, more respondents indicated that they liked English than liked mathematics, and more were likely to consider themselves to have been good at English than at mathematics. Interestingly, as noted earlier, teachers were mentioned by many respondents as contributing to their enjoyment/dislike of and/or success/failure in mathematics or English.

The public's view about teachers and the teaching of mathematics/English (items 3 & 8)

Data pertaining to perceived changes in the teaching of mathematics and English are shown in Table 2.

Item	Yes (%)	No (%)	Don't know (%)	McNemar-Bowker χ^2 test
Mathematics: changed?	52.7	9.2	38.0	χ^2=30.06, df=3, p<.000, φ=.65
English: changed?	30.4	14.7	54.9	

Table 2: Have the teaching of mathematics and English changed? (item 3)

As can be seen in Table 2, more respondents believed that the teaching of mathematics had changed since they were at school than believed this about English. The responses tapping the public's perceptions of teachers' views on whether girls or boys are better at mathematics and English are found in Table 3. Differences in the response patterns for mathematics and English for these questions were statistically significantly different (χ^2 = 30.06, df=3, p<.000, φ = .651).

Item	Boys (%)	Girls (%)	Same (%)	Don't know (%)	McNemar-Bowker χ^2 test
Better at mathematics	9.8	4.3	22.8	63.0	χ^2= 31.23, df=6, p<.000, φ=.981
Better at English	1.1	19.0	24.5	55.4	

Table 3: Who do teachers think are better at mathematics and English? (item 8)

The data in Table 3 reveal that the majority of participants indicated that they did not know how teachers felt about the comparative achievement of boys and girls in mathematics and in English. Of those who thought teachers would rate boys and girls differently, more thought boys would be rated higher in mathematics and girls in English. Thus about 10% of the group thought teachers expected boys to be better at mathematics, compared with 4% who thought girls would be. In English the perceived difference was much greater, with almost 20% of the group indicating that they expected teachers to believe girls to be better in English compared with a mere 1% who nominated boys. The differences in the perceived expectations of teachers for boys and girls in mathematics and English were statistically significant.

Representative explanatory comments from participants about whom they thought teachers believed were better at mathematics/English included:

Mathematics and boys

> I'd say boys – because they spend more time with them.
> Sometimes in class, boys' standard is higher.

Mathematics and girls

> I'd say the girls. That's what the teachers have said.
> Because girls quieter – not as unruly.

English and boys

> When I was at school, boys had more questions. Boys were told they would pass.

English and girls

> I think girls. Girls can talk a lot more than boys. They have better ways of communication.
> I think they [teachers] believe this - because of the better results.
> Because studies show girls are [better].
> Think girls – teachers pay more attention to girls, not mucking around.

Views of the teachers among the group to item 3 and 8

The 12 teachers' responses generally reflected the attitudes of the general population, with the majority of teachers either indicating and hoping that teachers generally thought that there was no difference in girls' and boys' achievements in both mathematics and English (five teachers about mathematics and four teachers about English) or that they did not know how other teachers would respond (four teachers about mathematics and five teachers about English). About English, one teacher said, "I think equal. I grew up with both male and female teachers", and another teacher said the following about mathematics, "Would hope that they think same".

A few responses from the teachers reflected beliefs that other teachers would hold gender-stereotyped expectations. When commenting about English, views consistent with the gender stereotype were evident; several mentioned that girls were more compliant, studied harder, and showed more interest in their studies, and would therefore be considered to be better at English than boys. The following are examples of what the teachers said:

> I reckon most teachers think girls…
> I think girls show more interest. I don't think boys feel so comfortable expressing themselves in writing

One teacher believed that boys would be favoured in mathematics by other teachers, "I think boys. I think they teach to favour boys in class". Two, however, thought that other teachers would expect girls to be better in mathematics. One of them said: "Never really asked anyone but I'm sure most teachers say the girls".

The general public's views about the importance and utility of mathematics/English (items 4 & 9)

Respondents' views on the importance and utility of mathematics and English are shown in Table 4. Because of the subtle differences in the wording of the compulsory study of mathematics/English items, comparisons are problematic. Nevertheless the differences in the proportion that thought mathematics should be studied when no longer compulsory (59.2%) was startlingly less than those who thought studying English should be compulsory (90.2%). This difference was statistically significant (see Table 4). Studying mathematics and English was overwhelmingly considered to be important for getting a job (76.6% for mathematics and 94.6% English), with the study of English statistically significantly considered to be the more important – see Table 4.

Item	Yes (%)	No (%)	Don't know (%)	McNemar-Bowker χ^2 test
Should students study mathematics when it is no longer compulsory?	59.2	31.5	9.2	χ^2= 50.21, df=3, p<.000, φ=.19
Should the study of English be compulsory?	90.2	4.9	4.9	
Mathematics important for jobs	76.6	13.0	10.3	χ^2= 25.30, df=3, p<.000, φ=.18
English important for jobs	94.6	2.7	2.7	

Table 4. Importance/utility of mathematics and English (items 4 & 9)

The main reasons respondents gave for supporting the need to study mathematics when no longer compulsory were its utility in everyday life and its importance for and in employment. Typical examples included:

> Because maths is used every day.
> Solid grounding for later in life.
> But needs to be more about practical life skills, budgeting, applying for loans, comparing between mobile phones etc.
> Because it's useful for future employment.
> It helps even when people apply for Coles jobs, they have to do a maths test.

Those who said it was not necessary to continue to study mathematics when it was no longer compulsory felt that there was no point studying something that was not understood or not enjoyable, that advanced mathematics was not necessary for all jobs, and that success was still possible. Typical examples included:

> It's not absolutely necessary to know advanced maths.
> Because eventually discover later in life - used to be separate from maths. Maths can't help social mechanisms of life.
> Because people can still do well without. Nothing does pay - handy from time to time.
> Can't see value of doing higher maths if not going to use it.
> …I think people will have learnt all they need to know by Year 10.
> Maybe Not. Some jobs don't need mathematics.

The main reasons put forward by those who believed that English should be compulsory were related to general literacy levels, that English broadens people, because it relates to everyday life, is essential for effective communication, is an international language, and its importance for jobs. Representative comments included:

> Everybody should be literate.
> Because everybody uses - International language - very important.
> Critical - should be encouraged, and study broadens - makes people think about life and stuff.
> Need to survive and relates to everyday life.
> Because everyone needs to know how to write and speak and communicate.
> Definitely, basis of all communication.
> It teaches you good skills, communication for getting a job.
> If you can't communicate with each other you can't get a job.

Those who did not believe it was necessary to study English compulsorily said that some do not enjoy studying it, that there was no point, and it was not needed for jobs.

> Because no point in writing essays. Should be a life skills course instead of English.
> … Lot of people I know doing English are not happy - Important to be happy.
> Because, some people just don't enjoy it and it won't play into their job.
> … Doesn't seem to be a qualification you need.

Gendered perceptions of mathematics/English (items 5 & 10)

Data summarising participants' responses about the differences between boys' and girls' achievements in mathematics and English, and for whom mathematics and English are more important, are presented in Table 5.

Girls, it can be seen from the data in Table 5, were assumed to be better at English; boys at mathematics. The data for English are particularly startling. Close to half the group (42.4%) assumed girls to be better, while almost none nominated boys (1.6%). The differences in the response patterns to the "better in mathematics/English" item were statistically significant – see Table 5. In contrast, variations in the response patterns to the items about the importance of mathematics/English for boys and girls were not statistically significant. An overwhelming majority considered studying mathematics (85.3%) and to be good in English (90.8%) to be equally important for boys and girls.

Item	Boys (%)	Girls (%)	Same (%)	Don't know (%)	McNemar-Bowker χ^2 test
Better at mathematics	21.2	11.4	32.1	35.3	χ^2= 56.52, df=6, p<.000,
Better at English	1.6	42.4	26.1	29.9	φ=.60
Mathematics: more important	2.2	1.1	85.3	11.4	ns
English: more important	0.5	0.5	90.8	8.2	

Table 5: Who are better at Mathematics/English, girls or boys? For whom is mathematics/English more important, girls or boys? (items 5 & 10)

The reasons provided by people who believed girls were better at mathematics were that girls were more likely to do homework, that girls study harder than boys, and that girls are more interested and persistent. Typical examples included:

> …Girls more likely to do homework.
> Girls actually study harder than guys.
> As a teacher, I've always thought and proved girls more interested and persistent. … A large number of boys only want to play footy and sport and stuff.

The main reasons provided by those who said that boys were better at mathematics were: personal experience, that girls do not like mathematics, boys were pressured to succeed, and that was traditionally the case. Representative comments included:

> … don't know why, was the case in my experience.
> I feel like boys are. Seeing VCE [Victorian Certificate of Education] results, they always seemed to do better.
> I never knew a lot of girls who actually liked maths at school.
> When I was at school, it was always the guys – they had more pressure put on than girls to get passes maths.

The most common reasons given by respondents who said that girls were better at English were: personal experience, societal expectation, more studious/concentration better, innate, and better language skills. Typical examples included the following:

> Well, I've read that girls are more likely to be better.
> …not what society expects of boys.
> Girls are more switched on, study better…
> …language skills more advanced, more mature...
> …most of my female friends speak better English than my male friends.
> …maybe girls are just good at language.

Gendered perceptions of technology capabilities (items 12 & 14)

Two items – "Who are better at using computers, girls or boys?" and "Who are more suited to working in the computer industry, girls or boys?" – were asked only once as part of either the set of items about mathematics or about English, depending on which form of the survey instrument was asked first. The results for these two questions are shown in Table 6.

Item	Boys (%)	Girls (%)	Same (%)	Don't know (%)
Better at computers	33.7	3.3	47.3	15.8
More suited to computer industry	34.8	2.7	54.3	8.2

Table 6: Who are better at computers and more suited to working in the computing industry, girls or boys? (items 12 & 14)

As can be seen in Table 6, about half of the respondents considered that boys and girls were equally capable of using computers (47.3%) and were equally suited to working in the computer industry (54.3%). Yet about one-third nominated boys, and almost none nominated girls, as being better at computers (33.7% and 3.3% respectively) and more suited to the computer industry (34.8% and 2.7% respectively).

The explanations for the answers given were similar for the two questions about technology. Very few selected girls as being better with computers or more suited to working in the computer industry. The main reasons for selecting girls were that they were quick and had good keyboarding skills. Among those who responded that boys were better with computers and were more suited to the computer industry, the main reasons were: natural ability, interest in and savvy with technology, personal observation, like computers, and risk takers. Some typical examples the explanations were:

> I think as far as I know most experts are men.
> …boys like using computers and they know a lot about it.
> I think boys - …take more risks.
> Boys - interested in 'hows' and 'whys' of computers.
> They are just technically savvy, probably interested more.
> Boys - natural interest and also IT jobs tend to be very solitary.
> Boys - have more interest in computers than girls.
> …the male brain is more suited to technicalities; the female brain is more affect dominated.
> Just see more boys in that profession.
> …most people I know in the industry are males.

Final Comments

It was reassuring to note that the majority of the general public and those who self-identified as teachers thought there were no differences in girls' and boys' achievements in mathematics and in English. It was perplexing, however, to note that there are still small sections of the general community who hold gendered views of whom they, as well as whom they believe teachers, expect to succeed in both mathematics and English. The responses (of the limited number of respondents self-identifying as teachers) generally reflected those of the larger group.

As has been found previously, there were more people who believed that boys, than believed that girls, were better at mathematics, more capable with computers, and more suited to work in the computer industry. Traditional gender stereotyped views were also evident with respect to the learning of English; more people believed that girls were better than boys, than vice-versa. The respondents also believed that teachers would hold similar views to their own.

From the more detailed explanations given by our respondents to each question, it was found that students' personal attributes (e.g., a willingness to work hard) were regarded as important contributors to successful performance, a finding consistent with the OECD's (2014b) claim that "[W]hen students believe that investing effort in learning will make a difference, they score significantly higher in mathematics" (p. 1). Others seemed accepting of biological sex as the explanation for the differences in mathematics and English learning outcomes for boys and girls – despite the abundance of research challenging this notion.

It was noteworthy that teachers were frequently identified as having a positive or negative impact on students' achievements, attitudes towards mathematics or English, and on future career directions. This finding supports Hattie's (2009) claim that teachers "are among the most powerful influences in learning" (p. 238).

As an indicator of community attitudes and values, the findings from the survey presented in this article indicate that little progress has been made in changing attitudes and beliefs. More than 25 years ago, the same views with respect to mathematics were evident among stakeholders in the education enterprise (see Leder, 1992). There is a pressing need for a re-focus on gender issues in education more generally, and in mathematics and English education in particular. Raising awareness of the negative effects of stereotyping on individuals and groups should be brought to the attention of the general public, and integrated across pre-service teacher education programs and professional development activities. In the second decade of the 21st century, gender should no longer be a variable for which differences in educational and vocational expectations and outcomes can be predicted.

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