Achievement in education - a study of senior high school achievement results based on gender

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Abstract

Gender inequality is a global issue. Although it is more commonly discussed in the context of social affordances, it is also prevalent in education. A secondary data analysis is used to interrogate differences in gender achievement using publicly available English and Mathematics data from 2012 to 2019. The study focuses on students studying in their final two years of schooling in government schools in South Australia, Australia. The paper considers both historical and international perspectives, and analyzes the publicly available senior secondary assessment data for South Australia, one of Australia's major educational jurisdictions. While data regarding achievement in gender-related differences in schooling remains contested, findings from this study suggest that, in the South Australian context, girls are outperforming boys in both Mathematics and English subjects.

Keywords: assessment; achievement; gender inequality; gender difference; secondary school

1. Introduction

In 1979 the United Nations General Assembly adopted The Convention on the Elimination of All Forms of Discrimination against Women in an attempt to realise gender equality. Forty-two years on, gender inequality remains a global and pressing issue (UNICEF, 2007) impacting the most vulnerable within society. Education, which should be a doyen of equity, is not immune to discrimination or inequality based on gender. Discrepancies in academic achievement based on gender (Butler & Hasenfratz, 2017; Panadero et al., 2020) have been previously investigated (Elwood, 2005; Kacprzyk et al., 2019; Leder & Forgasz, 2018), but key findings remain contested. Although it has been suggested historically that males are 'better' at maths than

females (Henrion, 1997; Leder & Forgasz, 2018; Robitaille & Travers, 1992) such claims remain disputed. Research undertaken by Smith and Walker (1988) contradicted this assertion and found that in some mathematic domains the gender gap was, in fact, reversed. Other research at the time, as well as more recent research suggests only a minor advantage to males (Hedges & Nowell, 1995; Reilly et al., 2015).

Evidence to inform the issue of academic achievement based on gender in an Australian context remains limited and when viewed internationally lacks consensus. This paper will, in part, further inform the issue of gender achievement by undertaking a secondary analysis interrogating the differences in gender achievement using publicly available achievement data. The research question used to guide and inform the study is; is there a discrepancy in achievement data for students completing secondary school based on gender? The study concentrated on students awarded the South Australian Certificate of Education (SACE) in the final two years of schooling. Achievement data across all available subjects was analysed from 2012 to 2019. An additional analysis was conducted for both English and Mathematics data across these years to further investigate any specific gender discrepancies within these popular subject areas.

2. Background

West and Zimmerman (1987) coined the term 'doing gender.' This term describes the stereotyping or casting of particular pursuits based on masculine and feminine "natures" (p. 126) where certain roles are deemed to be suited to one or other of the genders. The term is still relevant today as the perpetuation of gender-driven actions, exhibited either subconsciously or otherwise remains evident.

Whilst 'school' is where students acquire knowledge, it is also a social ecosystem in which they develop as individuals. In addition to the quest for academic competency across a range of subjects, children and adolescents are also seeking to develop self-concept and the necessary social skills to interact and exist within their social cosmos. The subjects offered within the curriculum can impose unforeseen gender consequences. Individual subjects can be associated with gender stereotypes based on either or both of the typical content of the subjects and the characteristics of students who typically like and undertake those subjects (Kessels, 2005). This application of gender stereotypes to subjects is another example of 'doing gender'. Research has shown that the personal, social qualities and characteristics adopted by students tend to reflect the societal characteristics of their schools (Buchmann & Dalton, 2002). Where these characterisations impose an influence on self-concept or academic aspirations, the notion of 'doing gender' is affirmed. As purported by Hobbs et al. (2019), where such cultural expectations and traditions are imposed on subject selection, then gender-bias exists. While it questionable whether the nadir of gender inequality has been reached, a conscious effort in recent years to redress the gender stereotyping of subjects (Kessels, 2015;

Spinner et al., 2021) to reduce gender bias has been made.

Although a corpus of work suggests that 'doing gender' results in differences in performance and achievement, research informing these claims specifically at pre-tertiary levels in an Australian context remains limited.

2.1 Gender and education performance

The effect of gender on performance has been observed at all levels of schooling. While some research (see Maccoby & Jacklin, 1974) suggests that there is little or no difference in gender performance in the early years of education, more recent research has found that gender-related biases do manifest in the early years of learning (Matthews et al, 2009). For example, within the area of literacy, several researchers have found that in kindergarten, boys have less advanced reading skills than girls (West et al., 2000; Ready et al., 2005; Tach & Farkas, 2006; Buchmann et al., 2008). What is not clear is whether these differences can be attributed to gender-related behaviours or whether there are other forces at play. Of interest, however, is the fact that boys continue to have issues with their reading in primary/elementary schools (Trzesniewski et al., 2006). It appears that even if early gender differences at kindergarten are small, the fact that they exist is important, as this gap in achievement leads to greater differentiation in future academic accomplishment (Penner & Paret, 2007).

The trend of females outperforming males is not restricted to kindergarten, but is apparent within high schools (Freeman, 2004). Early research by Clark (1967), reports that females outperform males in all subjects, but that by junior high school, males establish a superiority in Mathematics and Science. Others, without specifically limiting their considerations to Mathematics and Science, suggest that for a long time, females have attained higher grades in school than males (see Younger et al., 1999). Buchmann et al., (2008, p. 322) state that "Girls have long obtained higher grades in school than boys." Over thirty years earlier Alexander and Eckland (1974) asserted that "with status background and ability controlled, females outperform males in high school" (p. 676).

Globally, and in contrast to these findings, the Trends in International Mathematics and Science Study (TIMSS) and the Programme for International Student Assessment (PISA) suggest an alternative perspective, with data affirming minimal differences and inconsistencies between the achievement scores of males and females. Given the claims of other researchers (see Buchmann et al., 2008; Clark, 1967; Younger et al., 1999) regarding the prevalence of differences in achievement based on gender, this finding is unexpected. Mullis et al., (2016) point out that in the 2000 TIMSS Gender Differences in Achievement Report, the gender difference is minimal for Year 4 students, but by Year 8, males outperformed females. They add that some

three years later, the TIMSS 2003 International Mathematics Report suggested that neither gender was significantly dominant and that the most recent TIMSS data for 2015 shows that, for the thirty-nine participating countries, the international average for female Year 8 students was 483 and for males was 480. Further to this, seven of the thirty-nine countries identified female outperformance as achieving statistical significance, with statistical significance being achieved in the male cohort for outperformance in six other countries. In the remaining twenty-six countries, which included Australia, any difference between the levels of achievement based on gender did not achieve statistical significance. These results are noteworthy because only twelve months before, research by Kennedy, et al. (2014) suggested that at the school level, significant gender differences remain a persistent issue.

These findings indicated that, according to TIMMS data, there was little change in gender differences in Mathematics achievement over the past 20 years, and that the slight difference that did exist was in favour of males. Mullis, Martin, and Loveless (2016) noted that "girls did not perform significantly better than boys in fourth grade Mathematics in any of the 20-year trend countries" (p. 17) and "similar to Mathematics, there were no 20-year trend countries in 2015 where fourth grade girls had significantly higher average science achievement than boys" (p. 18).

In Science, TIMSS data indicates that differences between the genders has reduced noticeably, with only three of the sixteen countries demonstrating any significant difference. Mullis, Martin and Loveless (2016) reported that "girls did not have higher science achievement than boys in any of the 20-year trend countries" (p. 18).

The 2000 PISA assessments for Science provided a result similar to the 2015 TIMSS data regarding gender performance. Males outscored females in only three countries and in three other countries females outscored males. Of the remaining twenty participating countries, there was no statistically significant difference between genders in achievement (Kahle, 2004).

In relation to reading and literacy, however, the PISA 2000 data suggested that "the gender of a student made a significant contribution to the explanation of the variance between students" (Lokan, Greenwood, & Cresswell, 2001, p. 180). Data showed that the higher achievement scores of females over males on the combined reading literacy scale and on the three reading sub-scales was statistically significant.

Interrogating the international data, there remains a small but evident level of inconsistency. While this data suggests little difference, reviewing other literature suggests that a certain level of contention exists regarding gender inequality and how it is mirrored in achievement. Dependent upon the country and cultural context, when the research was undertaken historically, and the age and schooling level of the subjects of the research, there are bodies of research presenting both sides of the argument regarding the existence or

otherwise of gender inequality.

In the Australian context, the TIMSS and PISA data suggest very little difference between the achievement scores of Year 8 males and females. The question remains as to whether the apparent gender parity at Year 8 persists throughout the secondary years of schooling and/or whether significant gender differences arise in the senior secondary setting. Suggestions of this gender difference in academic achievement at pre-tertiary level have been highlighted in the media across the Australian educational landscape. Baker and Gladstone (2018) indicate a significant discrepancy in achievement in the final year of secondary education with females significantly outperforming their male counterparts. While the Baker and Gladstone report focused on final year results in New South Wales, the biggest education jurisdiction in Australia, further investigation is required to establish if such differences exist in other education jurisdictions in Australia, where published peer-review research and access to such public data is limited.

2.2 South Australian Certificate of Education (SACE)

Within the state of South Australia, the SACE Board administers the final two years of secondary schooling. The SACE Board was established by the SACE Board of South Australia Act 1983 and is the responsibility of the Government of South Australia's Minister for Education and Child Development. The SACE Board monitors and regulates the SACE to schools in government, independent and Catholic sectors. It also oversees the assessment of the achievements of students in the Northern Territory and in a number of regions throughout Asia.

The SACE Board administers the pre-university program by offering SACE subjects and courses across two stages of the SACE. In general terms, Stage 1 refers to Year 11 studies, and Stage 2 refers to Year 12 studies, although some exceptions exist depending upon individual SACE student enrolments. The SACE Board is responsible for the assessment of student achievement across the two stages, with a greater involvement in Stage 2 where it administers external examinations in a number of subjects. Subjects across both stages of the SACE are classified by both their learning area and the number of ‘credits’ contributed to the SACE. Subjects contribute either ten (10) or twenty (20) ‘credits’ and a student requires 200 ‘credits’ to achieve the SACE.

The analysis of differences in gender achievement for this paper centres on the Stage 2 (20 Credit) SACE data. Results for Stage 2 of the SACE are reported on an A+ to E- grade scale aligned with performance standards that define how well the students have demonstrated their knowledge and understanding of the subject matter. The raw marks used to determine final grades are subjected to a process of cross-subject scaling and the resultant scaled scores are used to calculate Australian Tertiary Admission

Rank (ATAR).

The research question used to guide this study is 'Are there any gender based differences in SACE achievement results across subjects and in particular differences in performance in Mathematics and English for students seeking secondary school completion?' This paper provides an analysis of achievement by gender from 2012 to 2019, utilising comparable information from 1996. No data was available for the 2020 or 2021 student cohort at the time of data collection and analysis.

Historical and current trends in achievement by gender found in the South Australian Certificate of Education (SACE) results are explored below. A number of differences in gender achievement are identified and recommendations for further research to determine the underlying causes of the existing gender differences in academic achievement at the senior secondary level are put forward.

3. Methodology

The methodology used in this study was a secondary source analysis. This is an accepted methodology used to provide a robust interrogative process to analyse large government datasets (Denscombe, 2017; Hakim, 1982). This methodology has been used by other researchers to analysis publicly available education data (Hedges &Nowell, 1995; Logan, 2020; Smith, 2008) and is an appropriate method of research for this study.

The secondary source analysis undertaken in this study used publicly available data downloaded from the SACE website (https://www.sace.sa.edu.au/) on the 29th of April 2021. The analysis of the data interrogated the differences in SACE Stage 2 (20 credit) results between male and female students from 2012 to 2019.

Data was aggregated based on gender and grade results from all available SACE Stage 2 subjects. Descriptive statistics were used, computing the aggregated data into percentages by comparing the proportional relationship between the grades awarded (i.e. A, B, C, D, E) to the gender group, to the number of total participants within that particular gender cohort. This form of descriptive statistics offers a powerful means to compare standardised data samples and provides an overview of the general subject grades and differences by gender. For reasons of brevity, only the A, B and C grade results (where appropriate) are discussed and reported in the results section, however all tables include a breakdown of all available grades.

A separate analysis was undertaken of the SACE Stage 2 (20 credit) results in the Mathematics and English learning areas in light of the gender differences noted in these subjects by previous research (see Clark, 1967; West, Denton, & Reaney, 2000; Lokan, Greenwood, & Cresswell, 2001; Ready, LoGerfo, Burkham, & Lee, 2005; Tach & Farkas, 2006; Buchmann, DiPrete, & McDaniel, 2008). A further historical

analysis is undertaken reviewing 1996 SACE Stage 2 results in both the English and Mathematics learning areas.

4. Results

4.1 2012-2019 allocation of overall SACE Stage 2 grades by gender

The overall achievement data of grade allocation based on gender for all the SACE Stage 2 subjects from 2012-2019 (see Table 1) was compiled into descriptive statistics for ease of analysis and explanation from the original publicly available raw data (see Supplementary Table 1).

Table 1. SACE grades by percentage of gender cohort 2012 to 2019

Year	Gender	% of cohort receiving A grades	% of cohort receiving B grades	% of cohort receiving C grades	% of cohort receiving D grades	% of cohort receiving E grades
2012	F	23.3%	45.1%	25.2%	4.7%	1.7%
	M	15.8%	39.5%	33.5%	8.1%	3.0%
2013	F	25.5%	45.7%	24.0%	3.8%	1.1%
	M	16.0%	41.3%	33.4%	6.6%	2.7%
2014	F	26.6%	46.7%	22.8%	3.3%	0.7%
	M	15.8%	41.6%	34.5%	6.4%	1.6%
2015	F	27.8%	47.0%	21.8%	2.8%	0.5%
	M	16.3%	43.4%	33.7%	5.2%	1.3%
2016	F	28.7%	47.2%	21.3%	2.3%	0.4%
	M	17.4%	44.2%	32.8%	4.6%	0.9%
2017	F	29.7%	47.1%	21.0%	1.8%	0.3%
	M	19.5%	44.6%	31.5%	3.7%	0.8%
2018	F	31.7%	46.0%	21.1%	1.9%	0.3%
	M	19.8%	43.6%	32.7%	3.4%	0.5%
2019	F	33.0%	45.4%	19.8%	1.6%	0.2%
	M	21.1%	43.8%	31.7%	3.0%	0.4%

Supplementary Table 1. SACE grades by gender 2012 to 2019

Year	Gender	Number of A grades	Number of B grades	Number of C grades	Number of D grades	Number of E grades
2012		11272	24255	16599	3592	1327
	F	7038	13664	7615	1430	517
	M	4234	10591	8984	2162	810
2013		11728	24383	15891	2859	1036
	F	7502	13460	7059	1122	327
	M	4226	10923	8832	1737	709

2014		12179	24969	15933	2657	620
	F	8021	14052	6868	981	197
	M	4158	10917	9065	1676	423
2015		13108	26537	16062	2301	530
	F	8588	14522	6742	862	165
	M	4520	12015	9320	1439	365
2016		13872	27103	15757	2025	379
	F	9046	14866	6694	739	123
	M	4826	12237	9063	1286	256
2017		14646	27036	15286	1590	323
	F	9203	14575	6497	568	97
	M	5443	12461	8789	1022	226
2018		14740	25840	15260	1516	153
	F	9393	14085	6458	594	28
	M	5347	11755	8802	922	125
2019		15978	25981	14750	1324	181
	F	10252	14094	6138	506	62
	M	5726	11887	8612	818	119

Analysis reveals several differences in grade achievement in relation to gender, with the number of females completing SACE Stage 2 subjects remaining higher than males. Based on the percentage of each of the gender cohorts achieving an A or B grade from 2012 to 2019, a trend of female students consistently outperforming males emerged. When this achievement data is further compared, from 2012 to 2019 there is an increase in the number of females achieving an A or a B grade when compared with males. According to 2012 data, 68.4% of all grades awarded to the female cohort were an A or B, compared to 55.3% of all grades awarded to the male. In the 2019 dataset, 76.8% of all grades awarded to the female cohort were A or B, compared to 64.1% of all grades awarded to the male cohort.

When reviewing the number of A grades in 2012, 23.3% of all grades awarded to the female cohort were A grades. This compared to 15.8% of all grades awarded to the male cohort. The 2019 data suggests a similar outcome with 29.7% of all grades awarded to the female cohort A grades, compared to 19.5% of all grades awarded to the male cohort. What is striking is that, considering the outcomes for gender cohorts in 2012, females achieved 7.5% more A grades than their male counterparts. In 2015, females achieved 11.5% more A grades than males and, in 2019, females scored 10.2% more A grades than males.

4.2 2012-2019 allocation of SACE stage 2 Mathematics grades by gender

Similar to the overall SACE Stage 2 data, the SACE Stage 2 Mathematics subjects from 2012-2019 (see Table 2) data was also compiled into descriptive statistics for ease of analysis and taken from the publicly

available raw data (see Supplementary Table 2).

Table 2. SACE Mathematics grades by percentage of gender cohort 2012 to 2019

Year	Gender	% of cohort receiving A grades	% of cohort receiving B grades	% of cohort receiving C grades	% of cohort receiving D grades	% of cohort receiving E grades
2012	F	24.9%	41.9%	25.5%	5.0%	2.6%
	M	19.7%	36.8%	30.7%	8.2%	4.7%
2013	F	26.8%	42.4%	24.4%	4.5%	1.9%
	M	19.5%	38.1%	32.0%	6.9%	3.5%
2014	F	29.7%	43.2%	22.7%	3.7%	0.7%
	M	19.9%	38.7%	32.3%	7.6%	1.6%
2015	F	29.2%	45.1%	22.0%	3.2%	0.5%
	M	19.9%	40.3%	31.4%	6.7%	1.8%
2016	F	30.3%	44.3%	21.3%	3.6%	0.5%
	M	20.4%	42.3%	30.6%	5.8%	1.0%
2017	F	30.3%	44.4%	21.7%	3.1%	0.5%
	M	21.9%	42.1%	29.6%	5.5%	0.9%
2018	F	30.5%	44.1%	21.6%	3.3%	0.5%
	M	21.9%	41.9%	30.0%	5.5%	0.8%
2019	F	32.6%	42.9%	21.0%	3.2%	0.4%
	M	23.8%	40.3%	30.3%	4.8%	0.8%

Supplementary Table 2. SACE Mathematics grades by gender 2012 to 2019

Year	Gender	Number of A grades	Number of B grades	Number of C grades	Number of D grades	Number of E grades
2012		1948	3477	2551	616	343
	F	907	1526	927	183	96
	M	1041	1951	1624	433	247
2013		2013	3553	2562	522	249
	F	1009	1592	918	169	70
	M	1004	1961	1644	353	179
2014		2125	3571	2468	518	107
	F	1144	1664	875	144	28
	M	981	1907	1593	374	79
2015		2178	3861	2489	470	111
	F	1153	1781	870	126	19
	M	1025	2080	1619	344	92
2016		2271	3957	2422	440	70
	F	1233	1801	864	146	21
	M	1038	2156	1558	294	49
2017		2398	4039	2447	418	67
	F	1243	1821	890	129	20

	M	1155	2218	1557	289	47
2018		2357	3922	2396	412	60
	F	1255	1818	889	138	21
	M	1102	2104	1507	274	39
2019		2594	3870	2436	382	55
	F	1375	1810	887	135	15
	M	1219	2060	1549	247	40

The analysis using descriptive statistics revealed similar patterns of achievement bias found in the overall grade data. Several differences in mathematical grade achievement in relation to gender, with females consistently outperforming males based on the percentage of each of the gender cohorts achieving A and B grades, was found. In 2012, 66.8% of the female cohort achieved an A or B grade, compared with 56.5% of the male cohort, a difference of 10.3%. When reviewing the 2019 data, 74.7% of the female cohort achieved an A or B grade, compared with 64% of the male cohort, a difference of 10.7%. When focussing on achievement of specific grades in 2012, 24.9% of the female cohort achieved an A grade, compared with 19.7% of the male cohort, a difference of 5.2%. Of particular interest was in 2019, when the percentage of the female cohort achieving an A grade increased to 30.3% whilst the percentage of the male cohort only increased to 21.9%, a difference of 8.4%. During the period 2012 to 2019, the percentage of females achieving an A grade increased from 24.9% to 30.3%, a net increase of 5.4%, while the comparative increase in the percentage of the male cohort achieving an A grade was from 19.7% to 21.9%, a net increase of 2.2%.

4.3 1996 SACE grades for Mathematics by gender

To investigate historical gender differences in Mathematics achievement, an analysis of achievement data per gender for all SACE Stage 2 Mathematics subjects taught in 1996 (see Table 3) was undertaken. These data was also compiled into descriptive statistics for ease of analysis and interpretation from the original publicly available raw data (see Supplementary Table 3).

Table 3. 1996 SACE Mathematics grades by percentage of gender

Year	Gender	% of cohort receiving A grades	% of cohort receiving B grades	% of cohort receiving C grades	% of cohort receiving D grades	% of cohort receiving E grades
1996	F	24.7%	30.6%	25.3%	11.2%	7.9%
	M	20.5%	27.1%	25.8%	14.3%	12.1%

Supplementary Table 3. 1996 SACE Mathematics grades by gender

Year	Gender	Number of A grades	Number of B grades	Number of C grades	Number of D grades	Number of E grades
1996		2774	3547	3153	1588	1258
	F	1435	1778	1469	655	464
	M	1339	1769	1684	933	794

Analysis of these results found that females outperformed males with 55.3% of the female cohort achieving an A or B grade, compared with 47.6% of the male cohort. In 1996, 24.7% of the female cohort achieved an A grade, compared with 20.5% of the male cohort, a difference of 4.2%. The discrepancy continued with 30.6% of the female cohort achieving a B grade, compared with 27.1% of the male cohort, a difference of 3.5%. It was interesting that approximately the same percentage of female and males received a C grade (F= 25.3%, M=25.8%).

4.4 2012-2019 allocation of aggregated SACE grades for English per gender

Similar to the Mathematics data found in Table 4 (below), the achievement data of grade allocation based on gender for all the SACE Stage 2 English subjects from 2012-2019 is compiled into descriptive statistics for ease of analysis and explanation from the original publicly available raw data (see Supplementary Table 4).

Table 4. SACE English grades by percentage of gender cohort 2012 to 2019

Year	Gender	% of cohort receiving A grades	% of cohort receiving B grades	% of cohort receiving C grades	% of cohort receiving D grades	% of cohort receiving E grades
2012	F	24.2%	53.2%	20.1%	1.6%	1.0%
	M	15.0%	47.4%	32.5%	3.6%	1.5%
2013	F	27.8%	51.9%	18.4%	1.3%	0.6%
	M	15.6%	49.9%	29.7%	3.5%	1.3%
2014	F	27.9%	53.8%	17.0%	1.1%	0.2%
	M	15.2%	50.6%	30.6%	2.8%	0.7%
2015	F	27.9%	54.8%	16.0%	1.0%	0.3%
	M	16.0%	51.5%	30.1%	2.0%	0.5%
2016	F	28.9%	53.5%	16.2%	1.0%	0.3%
	M	18.3%	51.1%	28.7%	1.4%	0.4%
2017	F	28.6%	53.6%	17.1%	0.6%	0.1%
	M	19.0%	51.1%	28.1%	1.5%	0.3%
2018	F	31.9%	51.5%	16%	0.5%	0%

	M	19.8%	51.2%	27.8%	1.0%	0.2%
2019	F	33.9%	51.4%	14.1%	0.5%	0.1%
	M	20.2%	52.6%	26.1%	1.0%	0%

Supplementary Table 4. SACE English grades by gender 2012 to 2019

Year	Gender	Number of A grades	Number of B grades	Number of C grades	Number of D grades	Number of E grades
2012		2030	5036	2485	239	120
	F	1429	3144	1187	96	59
	M	601	1892	1298	143	61
2013		2255	5083	2307	224	91
	F	1599	2985	1060	75	37
	M	656	2098	1247	149	54
2014		2309	5331	2292	186	39
	F	1677	3226	1019	68	11
	M	632	2105	1273	118	28
2015		2418	5640	2311	150	40
	F	1711	3358	980	63	20
	M	707	2282	1331	87	20
2016		2655	5712	2342	131	40
	F	1813	3356	1019	65	20
	M	842	2356	1323	66	20
2017		2672	5744	2390	109	21
	F	1774	3329	1065	38	7
	M	898	2415	1325	71	14
2018		2864	5513	2253	76	15
	F	1960	3178	984	30	5
	M	904	2335	1269	46	10
2019		3049	5630	2079	75	7
	F	2120	3215	881	29	5
	M	929	2415	1198	46	2

Analysis reveals several differences in grade and achievement in relation to gender, with females consistently outperforming males in achieving an A grade in English. Reviewing the 2012 data, 77.4% of the female cohort achieved an A or B grade, compared with 72.4% of the male cohort, a difference of 5%. The 2019 data indicated 82.2% of the female cohort achieved an A or B grade, compared with 70.1% of the male cohort, a difference of 12.1%. Specifically analysing students who received an A grade, in 2012, 24.2% of the female cohort achieved an A grade, compared with 15% of the male cohort, a difference of 9.2%. The 2019 the percentage of the female cohort achieving an A grade increased to 28.6% whilst the percentage of the male cohort increased to 19%, a difference of 9.6%. During the period 2012 to 2019, the percentage of

females achieving an A grade, increased from 24.2% to 28.6%, a net increase of 4.4%, while the comparative increase in the percentage of the male cohort achieving an A grade was from 15% to 19%, a net increase of 4%.

4.5 1996 SACE grades for English by gender

A similar pattern found in the historical Mathematics data was also discovered in the grade allocation per gender for English subjects for the aggregation of all SACE Stage 2 English subjects taught in 1996 (see Table 5). These data were also compiled into descriptive statistics for ease of analysis and explanation from the original publicly available raw data (see Supplementary Table 5).

Table 5. 1996 SACE English grades by percentage of gender

Year	Gender	% of cohort receiving A grades	% of cohort receiving B grades	% of cohort receiving C grades	% of cohort receiving D grades	% of cohort receiving E grades
1996	F	22.1%	48.5%	22.6%	4.4%	2.4%
	M	11.8%	40.3%	32.4%	8.4%	7%

Supplementary Table 5. 1996 SACE English grades by gender

Year	Gender	Number of A grades	Number of B grades	Number of C grades	Number of D grades	Number of E grades
1996		1446	3623	2118	480	340
	F	1073	2346	1093	213	117
	M	373	1277	1025	267	223

Analysis of the data reveals differences in grade and achievement in relation to gender with 70.6% of the female cohort achieving an A or B grade, compared with 52.1% of the male cohort. In 1996, 22.1% of the female cohort achieved an A grade, compared with 11.8% of the male cohort, a difference of 10.3%. Almost 48.5% of the female cohort achieved a B grade, compared with 40.3% of the male cohort, a difference of 8.2%. Females were, when compared with males, 20.3% more likely to achieve a B in English. The conclusion is that historically the females have outperformed males and that the gap has, in recent years, narrowed.

5. Discussion

The overwhelming theme that emerged from the 2012 to 2019 data was that females outperformed males in SACE Stage 2 subject results. In both Mathematics and English, males and females improved their achievement, increasing in percentage terms the number of A and B grades achieved during this period, however females outperformed their male counterparts in both the subject areas of Mathematics and English. Although the trend and bifurcation between the two groups grew, it was interesting to note that evidence of this achievement discrepancy was also found when the historical 1996 data was analysed.

It is evident that there is a difference in the SACE achievement data based on gender for those students seeking secondary school completion. The similar patterns of the female outperformance found in the SACE achievement data indicates that the practice of 'doing gender' has existed historically. While the idea that girls are 'not good' at certain subjects such as Mathematics and similar stereotypical ideas about males taking subjects with a language focus have persisted (Nagy, Trautwein, Baumert, Köller, & Garrett, 2006), evidence found in the analysis undertaken in this study does not support those assertions. Although some research has indicated a move towards a greater balance between female and male achievement in school Mathematics (Hobbs et al., 2019) the evidence found in this study suggests female levels of achievement exceed their male counterparts not only overall and in Mathematics but also English. These findings raise significant questions as to why such gender discrepancies exist.

Similar gender achievement inconsistencies to those found in SACE have been found elsewhere. Elwood (2005) found in UK A-level secondary leaving qualification data that males underachieved when compared to 'girls at the end of compulsory schooling' (p.374). Other similar findings were evident in Ireland in their Leaving Certificate data. A proposed explanation for some of the inconsistencies can be attributed to the type and style of assessments undertaken, with some evidence of gender differences arising from the type of assessment undertaken and the manner in which males and females engage in assessment tasks (Stobart, Elwood, & Quinlan, 1992).

Similarities have emerged between the context the South Australian SACE assessment data is situated and a global movement orientated towards the inclusion of coursework assessments along with or in lieu of a final subject exam. The inference of this is that coursework assessments may benefit one gender more than the other, while final exams may, in a similar manner, benefit a certain gender more than the other. Elwood (2005) found that the inclusion of coursework assessments did benefit females, but interestingly also found they also benefitted from exams.

A possible explanation for this can be reasoned when 'reading' achievement is examined. Data collected in several international studies suggests that males, including those at secondary level, tend to

underachieve in reading when compared with females (Mullis, Martin Kennedy, & Foy, 2012). The movement to coursework assessments can consist of a constructed-response format, one that requires a student to create a written response. This type of response with a heavy emphasis on reading and writing has favoured females (Hines, 2013; Schwabe, McElvany, & Trendtel, 2015) and may, in part, explain the gender difference. Research into which type of writing texts benefit certain genders suggests that females benefit more from narrative texts and males benefit from informational type texts (Oddny & Kjersti, 2018). With the SACE, assessments are moving towards more constructed-response texts, in a similar fashion to those of other jurisdictions. This may be a reason for more recent gender achievement discrepancies. However this explanation does not resolve the historical findings from 1996 where females, even when a greater emphasis was placed on final exams, still outperformed their male colleagues. The idea that males are 'better' than females at exams, while potentially stereotypically correct, does not necessarily hold true when viewing the SACE data. A number of factors such as motivation, the requirement of written response needing more effort and level of reading ability may all impact on male achievement and performance.

As the gender inequities in opportunity continue to be addressed, attention should turn to whether there is a genuine task assessment bias in the SACE subject areas of Mathematics and Sciences, or if there are other factors yet to be identified. Some researchers suggest that some females perform well in exams because they simply prepare better than males (Donnelly, 2015), while others consider the feminisation of the school environment to play a part (Serafini, 2013). Buchmann and Dalton (2002), whilst not using the term 'doing gender', reported that the nature of the school includes societal gender influences. Further research into this would seem prudent.

To what extent gender differences in academic performance can be attributed to the design of the assessment tasks and to what extent the teaching and learning environment is influencing the ways in which the genders approach assessment remains unresolved. The challenge for educators is to produce gender equity in outcomes through a renewed focus on pedagogy. To manipulate the style of assessment tasks to produce greater equality in educational outcomes without first addressing the teaching and learning pedagogy would be to simply mask and perpetuate any underlying gender inequality that exists. With that, there is an immediacy surrounding the issue of gender equality for entry into tertiary programs and so, acknowledging that systemic pedagogical change takes time, it might be that a degree of scaling back of the elements in the design of assessment tasks to which gender bias can be attributed should be considered in the interim.

6. Conclusion

This paper found the existence of gender-based difference in SACE achievement results across

subjects and a difference in performance in Mathematics and English for students seeking secondary school completion. Several questions have been raised because of this study. What is striking in the analysis is that when reviewing the historical 1996 data it is evident that females across subjects outperform their male counterparts. While data prior to 1996 was not publicly available, the question of how long this discrepancy in achievement has existed should be interrogated and why, with all the subsequent recent intervention, has a balance between gender achievements not been reached.

A central question that has been raised is whether the achievement results can be attributed to gender bias in either the teaching or assessment. Further investigation is required, but some evidence suggests changes in the design of the assessment tasks may need to be made to incorporate educational skills and outcomes that are believed to be either valuable or essential for the future. Any changes to assessment and pedagogical approaches would need to ensure that neither gender is disadvantaged and that the educational skills and outcomes are maintained to the highest levels. Investigation into why there is the apparent gender parity in academic achievement of Australian students in Year 8 in international testing, but differences exist in the Stage 2 SACE results of males and female students would further inform the field of study.

A critical aspect of the study has refuted the past myth of females and males not being ‘good’ at certain subjects and ‘better’ at others. The paper has wrestled back the reality that identifies the discrepancies in achievement based on gender in Australia that may not be compliant with public expectations. The focus on gender equity in educational opportunities has highlighted the need to address and investigate the issues of gender-based difference in achievement results for students seeking secondary school completion. With the ATAR being the primary criterion for entry into undergraduate university programs, any and all efforts to identify gender inequity or bias in its determination or within the elements used in its determination, should be welcomed. If and when such biases are found, steps to minimise and, where possible, eradicate those biases should be sought. Using the notion of ‘doing gender’ may help to identify such biases and thereby assist in the development of strategies to facilitate their eradication.

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