Gender Differences in Student Achievement and in Rates of Participation in the School Sector, 1986-1997: A Summary Report

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This article summarises the main findings of a report completed by the Ministry of Education’s Research Unit in April 1999 entitled *Gender Differences in Achievement and Participation in the School Sector — A review of information held by the Ministry of Education 1986–1997*. The report was prepared in response to recent concerns about the educational outcomes of male students in New Zealand.

The report concluded that while there are areas where particular concern for male students is warranted, for example, their participation and achievement in English, and levels of suspensions from school, the data presented suggest that any differences in the relative participation and performance of males and females in the school sector are not new. Furthermore, given the considerable differences within each of the groups ‘boys’ and ‘girls’, the more pertinent question to ask with respect to gender is which boys and which girls are not reaching their potential. While gender clearly is important in students’ school experiences it is important to recognise how gender intersects with other aspects of identity, such as ethnicity, in the school environment. Both male and female students display particular areas where their schooling experiences could be enhanced, and support should in the first instance be directed to those boys and girls who would most benefit.

Background

In April 1999 the Ministry’s Research Unit completed the report ‘*Gender Differences in Achievement and Participation in the School Sector — A review of information held by the Ministry of Education 1986–1997*’ (hereafter referred to as ‘The Gender Report’). The report was prepared in response to recent concerns about the educational outcomes of male students in New Zealand.

The aim of the report was to review and document information held by the Ministry regarding the achievement, subject choice and participation of male and female students in the compulsory and post-compulsory school sector to help establish whether the education of male students is at risk. The particular curricular focuses were participation and achievement in literacy, mathematics and science. Data for the population groups ‘All students’, ‘Maori students’ and ‘Pacific Islands students’ were included in the review process.

Explanations of gender differences are not entered into in this paper. Rather, potential areas of concern are identified. These areas of concern are also being addressed in a separate literature review, the purpose of which is to deal specifically with explanations of differential achievement and school participation among male and female students. This review is due for completion by the end of this year — 1999.

The current article outlines some of the sources of data used in ‘The Gender Report’, discusses indices of student participation at school, including suspensions,
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THE RESEARCH BULLETIN No. 10, October 1999

retention, and subject choice, and provides some findings in relation to male and female students’ achievement. While this summary article focuses on patterns of gender differences within each of the broad population groups ‘All students’, ‘Maori students’ and ‘Pacific Islands students’, it is important to note that these within groups gender patterns were often not as marked as the differences in achievement between population groups.

Data Sources

A range of data was used for ‘The Gender Report’. Table 1 shows the main types of data used in the study and indicates: (1) the year(s) they were available and (2) whether information by gender was available for all the population groups of interest. A blank cell in the table indicates cases where information by gender was not available for a particular group.

The types of data listed in Table 1, together with data relating to retention rates and suspensions, were

<table>
<thead>
<tr>
<th>Types of data</th>
<th>‘All students’</th>
<th>‘Maori students’</th>
<th>‘Pacific Islands students’</th>
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<tr>
<td>Reading Recovery data</td>
<td>1996–1997</td>
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<td>National Education Monitoring Project (NEMP)</td>
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<td>Data from standardisation samples for the Progressive Achievement Tests (PAT)</td>
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<td>reading comprehension and vocabulary</td>
<td>1969, 1991</td>
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<td>mathematics</td>
<td>1974, 1993</td>
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<td>listening comprehension</td>
<td>1971, 1994</td>
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<td>study skills</td>
<td>1978</td>
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<td>Data from international comparative studies coordinated by the IEA</td>
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<td>Six Subject Survey</td>
<td>1971</td>
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<td>Second International Mathematics Study (SIMS)</td>
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<td>Written Composition Study</td>
<td>1984</td>
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<td>Reading Literacy Study</td>
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<td>Third International Mathematics and Science Study (TIMSS)</td>
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<td>Data on student achievement in senior school examinations</td>
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a School Entry Assessment (SEA)/Aro matawai: Urunga-a-Kura (AKA) is the first nationally standardised set of assessment procedures available for teachers to use to collect information on the skills, knowledge and understandings of children when they begin school. SEA/AKA, introduced in 1997, consists of three resources in both Maori and English, which assess emergent literacy, use of oral language, and numeracy. SEA/AKA is not mandatory but schools which decide to use it are asked to provide information for a national database. (See Gilmore, 1998).

b The National Education Monitoring Project (NEMP), which commenced in 1993, is part of the Ministry of Education’s strategic work on national assessment. The project aims to get a broad picture of the achievements and other educational outcomes of representative samples of students in New Zealand schools at Years 4 (standard 2) and 8 (form 2). Different essential learning areas and skills, including attitudes and values, are assessed each year, over a four-year cycle. The first four-year cycle began in 1995 and ended in 1998. Reassessment of skills covered in the first cycle will take place in the second four-year cycle — 1999 to 2002. (see Crooks and Flockton; Flockton and Crooks.)

c The IEA — The International Association for the Evaluation of Educational Achievement — is an international, non-profit cooperative organisation of research institutions. Principal purposes of the IEA include undertaking comparative educational research on an international scale, and promoting research aimed at examining educational problems in order to provide factual information which can help in the ultimate improvement of education systems. The Research Division of the Ministry of Education is the research organisation which facilitates New Zealand’s participation in appropriate IEA research projects and undertakes the project work. New Zealand has participated in a number of IEA studies since the early 1970s, most of which are listed in this table.

d In 1992, the grading system for School Certificate was changed, which means that School Certificate data collected before 1992 cannot be compared with data collected from 1992 onwards.
accessed through the Ministry of Education and other publications referenced at the end of this report. Although, as indicated in the title of this article, most of the data reviewed were collected between 1986 and 1997, some data were collected in 1998 and others were collected between 1971 and 1984.

**Limitations of the Study**

While the data permits some tentative conclusions to be reached with respect to some subject areas, these should be considered with the following points [limitations] in mind.

- First, in relation to data sources, the data reviewed here have come from a range of sources each of which differ on a number of dimensions. All data except that supplied for senior secondary examinations, are cross-sectional data, that is, they provide a snapshot of achievement at a particular point in time. In considering these data, the natural point of reference for comparison of male students’ achievement is the achievement of female students as there is no other available point of comparison. These type of data therefore simply address the issue of how males are performing in relation to females at a given time.

- Conversely, data on senior school national examinations are available over a period of six years or more in most cases, thus the performance of males in any particular year can be compared to performance in previous or subsequent years — these are ‘trends data’. The difficulty in making comparisons of student performance using trends data is that, despite the best efforts of assessment experts to maintain consistency in examination standards from year to year, consistency cannot be guaranteed. Fluctuations in the proportion of students attaining a specific grade from year to year cannot therefore be attributed directly to a ‘decline’ or ‘improvement’ in the ability of a student cohort. Trends data contained in this study may best be used to determine whether the performance of male students is declining or increasing relative to the performance of female students over time.

- A second point to keep in mind in relation to the data sources is that the information provided relates to a specific point in educational history with some studies pre-dating the current curriculum and others falling within it. This, and the fact that studies differ in terms of the extent to which test items used were derived from the curriculum current at the time of the research, the form of assessment used, sample size, and other methodological aspects, means that their findings are not comparable, and will be a reflection of factors both internal and external to the current education system.

- Finally, it is important to recognise that the categories ‘male’ and ‘female’ students (or ‘boys’ and ‘girls’) are extremely broad, and do not take into account potentially huge differences in educational and other experiences of individual students or groups of students within each broad grouping — take, for example, the differences between ‘All students’, ‘Maori students’ and ‘Pacific Islands students’. These categories beg the question of ‘Which male and which female students should be focused on when considering student achievement’?

At best, any conclusions reached in a report of this kind can be considered only as an informed indication of what is happening and what steps may be required to enhance the education of male and female students.

So what can we say about gender differences in education?

**Student Participation at School**

Several indices were used to gauge students’ participation in or engagement with the compulsory and post-compulsory school sector. The first of these was retention rates — the proportion of students who stay on at school after the age at which they are legally able to leave school\(^1\), followed by rates of student suspensions, participation in senior secondary school examinations, and subject choice in these examinations. Data related to each of these indices (with the exception of suspension rates, all relate to the post-compulsory school sector only) are now discussed in turn.

\(^1\) *The school leaving age was raised from 15 years to 16 years in 1993.*
Retention Rates

‘All students’

The trends for ‘all’ male and female students staying at school until the ages of 16, 17 and 18 years were very similar between 1986 and 1997, with retention rates for all male students being typically slightly below that for all female students. In 1998, although retention rates for 16- and 17-year-old female students were again slightly higher than those for males — 89 percent (females) and 84 percent (males) for 16-year-olds and 65 percent and 59 percent for 17-year-olds — the reverse was true for 18-year-olds, with slightly more male (17%) than female (15%) students staying on at school.

‘Maori students’

Retention trends for Maori students show increases of similar magnitude to those for ‘All students’ between 1986 and 1997. By 1998, almost 70 percent of Maori males and 75 percent of Maori females of 16-years-of-age were staying at school, while 40 percent of Maori males and 43 percent of Maori females aged 17 years remained at school. By age 18, 13 percent of Maori males and 11 percent of Maori females were continuing at school. As was the case for ‘All students’ in 1998, these data show that whereas the retention rates in 1998 for 16- and 17-year-old Maori students were higher for females than for males, they were lower for Maori female students aged 18 years than for their male counterparts.

‘Pacific Islands students’

Although data are available in too few years to establish a trend for the retention of Pacific Islands students, 1998 retention figures for these students were mostly similar to those for the group ‘All students’ — for example, 84 percent of 16-year-old and 62 percent of 17-year-old Pacific Islands males stayed on at school in 1998. The proportion of 18-year-old Pacific Islands males who stayed on at school, however, was 28 percent — the highest retention figure for an 18-year-old group. The retention rates in 1998 for 16- and 18-year-old Pacific Islands males were higher than those for females; whereas for 17-year-olds the reverse was the case.

Suspensions

In the year July 1996 to June 1997 males made up 73 percent of all suspensions, including 72 percent of specified period suspensions and 75 percent of unspecified period suspensions. Maori males were over-represented in suspension statistics, making up 30 percent of the total number of suspensions.

Participation in Senior Secondary School Examinations

Taking all nationally recognised subjects into consideration, there was little difference in the overall proportions of male and female students who took these subjects in Year 11 and Year 12 and in the proportions who offered them for examination. However, in the key areas of English, mathematics, and sciences, higher proportions of females than males offered these subjects for examination (the rate for females reaching a maximum of 10 percent more in each subject than the rate for males).

Subject Choice in Senior School Examinations

As Table 2 shows, ‘stereotypical’ gender differences continue to be evident in the relative rankings of the ten most popular subjects selected by ‘all’ School Certificate, Sixth Form Certificate and Bursary candidates.

At the School Certificate level, workshop technology and technical drawing/graphics featured in the top ten choices for males but not females, while home economics and typing continued to be popular with female but not male students.

Similar trends were evident in subject selection for Sixth Form Certificate. In addition, increasing gender differentiation in selection of sciences/social sciences subjects versus subjects in the humanities was evident both at the Sixth Form Certificate and Bursary levels, with higher proportions of males choosing subjects from the sciences/social sciences and higher proportions of

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1 The suspensions data are from Sturrock (1998).
2 Specified period suspensions are those of three days or less whereas unspecified period suspensions are for a period exceeding three days.
3 In 1997, Maori students made up 20 percent of all students attending New Zealand schools.
females choosing subjects in the humanities. Biology was the exception to this trend, with females being more likely than males to choose biology for both Sixth Form Certificate and Bursary. It is important to bear in mind that while gender differences were evident in choice of examination subjects, the differences reflected relative rankings within the ten most popular choices for both male and female students; also, English and mathematics were still the most popular subjects for all students — male and female — at all levels of examination.

Student Achievement at School
Data relating to gender differences in student achievement in each of language, literacy and listening, mathematics, and sciences[s] are discussed in this section. In most cases, data are presented separately for the three population groups — All students’, ‘Maori students’ and ‘Pacific Islands students’.

Achievement in Language, Literacy and Listening
‘All students’, ‘Maori students’ and ‘Pacific Islands students’
With few exceptions, females across all three population groups outperformed males at all levels of assessment in the areas of language and literacy, and usually the difference was at a statistically significant level. These differences in achievement favouring females have been a constant feature in the achievement data of recent years. Clearly, male students’ achievement in areas
related to language and literacy at all levels in their school career is of concern. It is important to note however that differences between male and female students within population groups were often not as marked as differences between population groups.

Achievement in Mathematics

‘All students’

The evidence with respect to gender differences in the mathematics achievement of ‘All students’ is equivocal.

In 1998, data from the only New Zealand study to examine mathematical potential at school entry level showed that females performed better than males. However, studies of the mathematics ability of older students have revealed inconsistent results. For example, in 1981 the IEA Second International Mathematics Study (SIMS) reported significantly better performances for males than females at the Year 9 equivalent level, whereas, in 1997, the IEA Third International Mathematics and Science Study (TIMSS) found no statistically significant differences by gender at the Years 4, 5, 8 and 9 levels. Further evidence of the equivocal nature of gender-based results for student achievement in mathematics comes from the National Education Monitoring Project (NEMP) (1996–1998) which found that Year 8 female students scored better than their male counterparts on seven of 53 mathematics tasks and that males scored better than females on one of the 53 tasks. In addition, data from the standardisation sample for the revised mathematics Progressive Achievement Tests (PAT) showed that female students in Years 4–6 outperformed their male classmates, whereas data collected using the original versions of the tests had shown no gender differences.

Cross-sectional studies examining mathematics at school leaving age (the senior secondary school level) found males performed better than females. In the mathematics literacy section of TIMSS (1997), males outperformed females on the test instruments used, regardless of whether students were undertaking mathematics subjects at school at the time of testing.

Time-series analysis of senior school examinations data shows that there has been no marked decline in the achievement of either gender in School Certificate and Bursary examinations over the last several years. However, mathematics performance at the Sixth Form Certificate level has declined for both males and females. As for English, any gender differences in mathematics are historical: that is, they have been consistent over recent years.

In School Certificate mathematics, higher proportions of males than females attained the top grade (A), but there was little gender difference in the distribution of B and C grades. As with all Sixth Form Certificate subjects, however, females were slightly more likely than males to achieve grade 4 and above for mathematics. While there was little gender difference in achievement in Bursary mathematics with calculus, males have outperformed females in mathematics with statistics.

Taken as a whole, reviews of the data on student achievement in the early years of schooling seem to indicate that there are either no gender differences in mathematics achievement, or that differences favour females, whereas at the senior secondary school level, some gender differentiation does occur, with males outperforming females at least in some areas of mathematics.

There is an apparent anomaly in the data for Bursary examinations which showed that males in the group ‘All students’ do not outperform females in either mathematics with calculus or mathematics with statistics and the data from the international studies (eg, SIMS and TIMSS) which showed that males do outperform females in mathematics across the board (although not necessarily at a statistically significant level). This apparent anomaly at the Bursary level may possibly be explained, at least in part, in that a smaller and perhaps more able group of females select mathematics with calculus, compared to the larger and more diverse group of males who select the subject. Females who take mathematics with calculus may therefore appear to have equivalent outcomes with males because only females who have a bent for calculus offer this subject for examination.

‘Maori students’

Patterns of gender difference for Maori students were similar to those for the group ‘All students’. However
Maori students on the whole tended not to score as well as the 'All students' group according to the data sources available.

The TIMSS study found that Maori females attained higher scores than Maori males in mathematics at Years 4 and 5 (standards 2 and 3). However at Years 8 and 9 (forms 2 and 3), differences were minimal. By school leaving age Maori males were again outperforming Maori females in mathematics literacy.

The performance of both Maori males and females in School Certificate mathematics has been relatively consistent over the years, varying from very slight differences favouring males to no gender differences in the proportion of students attaining grades B and C and no gender differences for grade A. The performance of Maori males, as for all males sitting examinations in Sixth Form Certificate mathematics, has declined very slightly over time, with slightly higher proportions of females attaining grade 4 and above than males.

Maori males’ performance in Bursary mathematics with statistics declined slightly between 1994 and 1997 while female performance in this subject remained consistent. Although males were outperforming females in this subject prior to 1995, since 1995 there have been no marked gender differences in achievement in mathematics with statistics at the Bursary level. Similar trends for Maori students are evident for mathematics with calculus.

Pacific Islands students’ performance in Bursary mathematics with calculus has fluctuated over time. However a gender gap favouring males was maintained in all years except 1994. Both male and female Pacific Islands students have performed consistently in Bursary mathematics with statistics examinations over time, with higher proportions of males than females attaining grade B or above.

Achievement in Science

‘All students’

Cross-sectional studies of science achievement in primary and early secondary schooling have produced mixed results. The National Education Monitoring Project (NEMP) found gender differences in science ability in favour of males at the Year 4 and Year 8 levels, while TIMSS data showed no significant gender differences at Years 4, 5, 8 and 9. Data from the science component of the 1971 Six Subject Study carried out under the auspices of the IEA also found gender differences in favour of males at age 14 years.

The TIMSS cross-sectional study of senior secondary school (Years 12 or 13) students in their final year of school found that males outperformed females in science literacy.
Other cross-sectional analyses show that the relative position of males compared to females with respect to science achievement in secondary school examinations has remained fairly static in recent years. Approximately equal proportions of males and females score the top grades in School Certificate science, while in Sixth Form Certificate females outperform males in all science subjects. In Bursary biology and physics, females have a slight edge, while in chemistry males have traditionally outperformed females.

While it is difficult to draw conclusions based on these studies, a number of the cross-sectional studies report gender differences in favour of males at all levels of schooling. One could argue that the senior school examinations tell a different story; however, sample selection biases, derived from students choosing their own subjects, come into play in examinations at this level.

‘Maori students’
The TIMSS study found that Maori females attained higher scores than Maori males in assessment of science achievement at Years 4 and 5 (standards 2 and 3) but by Years 8 and 9 (forms 2 and 3) gender differences had disappeared. However, in their final year of school, male senior secondary school students outperformed females in science literacy.

The performance of Maori males and females in School Certificate science remained fairly consistent between 1992 and 1997. There were generally no consistent gender differences in the proportion of males and females attaining grades A and B, and very slight though erratic differences favouring females in the proportion of students gaining a C. The trends in performance of males and females in Sixth Form Certificate biology, chemistry and physics were consistent between 1988 and 1997, with slightly higher proportions of females attaining a grade 4 and above for all subjects. As for the ‘All students’ group, this difference was slightly greater for physics.

Maori students’ performance in Bursary biology has been consistent over time, with gender differences, albeit very small, generally favouring females. Although being rather erratic in nature, the performance of all Maori students in Bursary Physics has improved over time, with there being no consistent gender differences. Maori males’ performance in Bursary chemistry has declined since 1993, while female students’ performance has remained relatively consistent. Thus the initial gender gap, favouring males, all but closed in 1997 for Maori students.

‘Pacific Islands students’
Pacific males outperformed females on TIMSS’ science achievement items at Year 4 and Year 9, while females marginally outperformed males at Year 5. In science literacy at the Years 12 or 13 level, females also slightly outperformed males.

The performance of Pacific Islands students in School Certificate science appears to have declined very slightly over time, with slightly higher proportions of females than males attaining a grade of C. Generally, no consistent gender differences are observable either in the proportion of Pacific Islands students who attained an A grade or in the proportion who attained a B grade.

The performance of Pacific Islands males in Sixth Form Certificate biology, chemistry and physics has generally declined over the years. While there are no consistent gender differences in biology and chemistry, from 1992 Pacific Islands females tended to outperform males in Sixth Form Certificate physics.

In Bursary level biology, Pacific Islands students performed consistently between 1992 and 1997, with slightly higher proportions of males than females attaining a B grade or above (this contrasts with the pattern found for ‘All students’ and ‘Maori students’). Overall, achievement scores for Bursary examinations were low for both male and female Pacific Islands students. The performance of Pacific Islands males in Bursary chemistry and physics has tended to fluctuate over time; however males have consistently outperformed females in chemistry.

Conclusions
This article has briefly documented indices, based mainly on data collected over the past twelve years, of male and female student participation in school and of their achievement in language, mathematics, and science with a view to establishing whether the education of boys is at risk in New Zealand.
As stated at the outset of this report, it is important to recognise that the broad categories ‘male’ and ‘female’ do not take into account the potentially huge differences in educational and other experiences of individual students within each of these broad groupings. The ‘male’/’female’ categories beg the question of which males and which females?

Also, while this paper has shown that different gender patterns are evident within each of the population groups ‘All students’, ‘Maori students’ and ‘Pacific Islands students’, often the more striking differences can be seen between the three groups as a whole. Statistics organised by gender and general population groups give some initial indications of where education is facilitating and failing students, however, they are perhaps not the most helpful in determining areas of concern or for directing strategies to ameliorate the problem. In terms of improving students’ educational experience and outcomes, other factors or variables may be more important mediators.

While there are areas where particular concern for male students is warranted, for example, participation and achievement in English, and levels of suspensions (especially in the case of Maori boys), the data presented in this report suggest that any differences in the relative participation and performance of males and females in the compulsory and post-compulsory school sector are not new. Information about male students taken as a whole indicates that males’ performance has not declined markedly over time; extant gender differences have been a consistent feature of participation and achievement statistics since the late 1980s and early 1990s. That these differences continue to feature in educational indices is a cause for concern in itself. However groups of students within each of the broad groupings ‘male’ and ‘female’ display particular areas where students’ schooling experiences could be enhanced.

References


