

Improving Learning

Performance in first year mathematics and science subjects in Australian universities: Does senior secondary mathematics background matter?

Final Report

Prepared for the Australian Council of Deans of Science

2 December 2019

Julie McMillan and Daniel Edwards

ACER

Australian Council of Deans of Science (ACDS) © 2019

The Australian Council for Educational Research Ltd
19 Prospect Hill Road
Camberwell VIC 3124
Phone: (03) 9277 5555

ABN 19 004 398 145

www.acer.org

ISBN 978-1-74286-584-3

This report is copyright. All rights reserved. Except under the conditions described in the Copyright Act 1968 of Australia and subsequent amendments, and any exceptions permitted under the current statutory licence scheme administered by Copyright Agency (www.copyright.com.au), this publication (or any part thereof) may not be reproduced, adapted, stored in a retrieval system or transmitted, broadcast or communicated in any form or by any means, optical, digital, electronic, mechanical, photocopying, recording or otherwise, without the written permission of the copyright holder.

Recommended citation

McMillan, J. & Edwards, D. (2019). *Performance in first year mathematics and science subjects in Australian universities: Does senior secondary mathematics background matter?* Australian Council of Deans of Science & Australian Council for Educational Research. Retrieved from https://research.acer.edu.au/higher_education/62

Contents

Tables	iii
Figures.....	v
Executive summary	vi
Introduction	1
Methodology.....	3
What senior secondary school mathematics and science subjects had first year science students undertaken prior to university enrolment?.....	9
Does the level of mathematics undertaken in senior secondary school have an impact on pass rates in first year university science subjects?.....	11
Do university first year science subject pass rates differ depending on the performance of students in senior secondary school mathematics and science subjects?.....	14
Students with no General Mathematics, Mathematical Methods or Specialist Mathematics background	22
Summary	27
Discussion.....	29
References	31
Appendix: Supplementary tables.....	32

Tables

Table 1 Sample size, compared with administrative data for domestic, commencing, undergraduate, bachelor students in natural and physical sciences, 2015-2017	6
Table 2 Sample size, by university group and first year discipline area	6
Table 3 First year university students, by discipline and selected senior secondary subjects and university group.....	9
Table 4 Senior secondary subject levels, by state and territory	32
Table 5 First year biology students, by selected senior secondary subjects and university group	33
Table 6 First year chemistry students, by selected senior secondary subjects and university group	33
Table 7 First year mathematics students, by selected senior secondary subjects and university group	33
Table 8 First year physics students, by selected senior secondary subjects and university group	34
Table 9 Percentage of students passing a first year university biology subject, by senior secondary subject participation and university group	35
Table 10 Percentage of students passing a first year university chemistry subject, by senior secondary subject participation and university group	35
Table 11 Percentage of students passing a first year university mathematics subject, by senior secondary subject participation and university group	36
Table 12 Percentage of students passing a first year university physics subject, by senior secondary subject participation and university group	36
Table 13 Senior secondary science results, by university group	37
Table 14 University biology students: Senior secondary mathematics results, by university group ..	38
Table 15 University chemistry students: Senior secondary mathematics results, by university group	39
Table 16 University mathematics students: Senior secondary mathematics results, by university group	40
Table 17 University physics students: Senior secondary mathematics results, by university group ...	41
Table 18 First year biology performance (% passed), by senior secondary subject participation and achievement band	42
Table 19 First year chemistry performance (% passed), by senior secondary subject participation and achievement band	43
Table 20 First year mathematics performance (% passed), by senior secondary subject participation and achievement band	44
Table 21 First year physics performance (% passed), by senior secondary subject participation and achievement band	45
Table 22 Number of Go8 first year biology students, by senior secondary mathematics (highest level and achievement band), participation in senior secondary biology and ATAR	46
Table 23 Go8 first year biology pass rates, by senior secondary mathematics (highest level and achievement band), participation in senior secondary biology and ATAR	47
Table 24 Number of non-Go8 first year biology students, by senior secondary mathematics (highest level and achievement band), participation in senior secondary biology and ATAR.....	48
Table 25 Non-Go8 first year biology pass rates, by senior secondary mathematics (highest level and achievement band), participation in senior secondary biology and ATAR	49
Table 26 Number of Go8 first year chemistry students, by senior secondary mathematics (highest level and achievement band), participation in senior secondary chemistry and ATAR.....	50
Table 27 Go8 first year chemistry pass rates, by senior secondary mathematics (highest level and achievement band), participation in senior secondary chemistry and ATAR	51

Table 28	Number of non-Go8 first year chemistry students, by senior secondary mathematics (highest level and achievement band), participation in senior secondary chemistry and ATAR	52
Table 29	Non-Go8 first year chemistry pass rates, by by senior secondary mathematics (highest level and achievement band), participation in senior secondary chemistry and ATAR	53
Table 30	Number of Go8 first year mathematics students, by senior secondary mathematics (highest level and achievement band), and ATAR.....	54
Table 31	Go8 first year mathematics pass rates, by senior secondary mathematics (highest level and achievement band), and ATAR	55
Table 32	Number of non-Go8 first year mathematics students, by senior secondary mathematics (highest level and achievement band), and ATAR.....	56
Table 33	Non-Go8 first year mathematics pass rates, by senior secondary mathematics (highest level and achievement band),and ATAR	57
Table 34	Number of Go8 first year physics students, by senior secondary mathematics (highest level and achievement band), participation in senior secondary physics and ATAR.....	58
Table 35	Go8 first year physics pass rates, by senior secondary mathematics (highest level and achievement band), participation in senior secondary physics and ATAR.....	59
Table 36	Number of non-Go8 first year physics students, by senior secondary mathematics (highest level and achievement band), participation in senior secondary physics and ATAR	60
Table 37	Non-Go8 first year physics pass rates, by senior secondary mathematics (highest level and achievement band), participation in senior secondary physics and ATAR.....	61
Table 38	First year biology logistic regression models: Odds ratio estimates and Wald confidence limits	62
Table 39	First year chemistry logistic regression models: Odds ratio estimates and Wald confidence limits	63
Table 40	First year mathematics logistic regression models: Odds ratio estimates and Wald confidence limits	64
Table 41	First year physics logistic regression models: Odds ratio estimates and Wald confidence limits	65
Table 42	Highest level of senior secondary mathematics undertaken and achievement band, by ATAR (Go8 universities), column per cent	66
Table 43	Highest level of senior secondary mathematics undertaken and achievement band, by ATAR (other universities)	67
Table 44	Highest level of senior secondary mathematics undertaken and achievement band, by ATAR (all universities)	68
Table 45	University biology students: ATAR and highest level of senior secondary school mathematics, by university group (n)	69
Table 46	University chemistry students: ATAR and highest level of senior secondary school mathematics, by university group (n)	70
Table 47	University mathematics students: ATAR and highest level of senior secondary school mathematics, by university group (n)	71
Table 48	University physics students: ATAR and highest level of senior secondary school mathematics, by university group (n)	72
Table 49	First year biology pass rates, by ATAR band, selected senior secondary subjects and university group.....	73
Table 50	First year chemistry pass rates, by ATAR band, selected senior secondary subjects and university group.....	74

Table 51 First year mathematics pass rates, by ATAR band, selected senior secondary subjects and university group.....	75
Table 52 First year physics pass rates, by ATAR band, selected senior secondary subjects and university group.....	76

Figures

Figure 1 Highest level of senior secondary mathematics undertaken by first year university students, by university discipline and university type	10
Figure 2 Proportion of students passing first year subjects, by university discipline area and university type	11
Figure 3 Proportion of students passing first year subjects, by highest level of Year 12 mathematics, university discipline area and university type	12
Figure 4 Proportion of students passing first year subjects, by participation in Year 12 General Mathematics, Mathematical Methods and Specialist Mathematics, university discipline area and university type	13
Figure 5 Proportion of students passing first year subjects, by Year 12 science participation, university discipline area and university type	13
Figure 6 First year biology pass rates, by highest Year 12 mathematics level and results.....	15
Figure 7 First year chemistry pass rates, by highest Year 12 mathematics level and results.....	17
Figure 8 First year mathematics pass rates, by highest Year 12 mathematics level and results.....	19
Figure 9 First year physics pass rates, by highest Year 12 mathematics level and results.....	21
Figure 10 Proportion of first year students who had not undertaken General Mathematics, Mathematical Methods or Specialist Mathematics, by discipline and university type.....	22
Figure 11 First year subject pass rates of students who had not undertaken General Mathematics, Mathematical Methods or Specialist Mathematics, by discipline and university type.....	23
Figure 12 ATAR scores of students whose highest level of senior secondary mathematics was no mathematics or Essential Mathematics, by university type	24
Figure 13 First year biology pass rates, by ATAR band, selected senior secondary subjects and university group.....	25
Figure 14 First year chemistry pass rates, by ATAR band, selected senior secondary subjects and university group.....	25
Figure 15 First year mathematics pass rates, by ATAR band, selected senior secondary subjects and university group.....	26
Figure 16 First year physics pass rates, by ATAR band, selected senior secondary subjects and university group.....	26

Executive summary

Aims:

This study explores how senior secondary school mathematics subject choice and results are related to biology, chemistry, mathematics and physics pass rates in the first year of university.

Data:

The sample used for analysis comprises 16,436 school completers in their first year of a bachelor degree in science, who undertook first year biology, chemistry, mathematics or physics subjects. Twelve Australian universities provided detailed data for this project, which focussed on the first semester of 2015, 2016 or 2017. The participating universities include a mix of university groups, states, and metropolitan/non-metropolitan areas.

Data relating to the type of mathematics completed in senior secondary school, the achievement in these school subjects, and subsequent pass rates in first year science subjects were collected and analysed as part of this project.

Key findings:

- The majority of first year students – regardless of the level of mathematics in senior secondary school – pass their first year biology, chemistry, mathematics, and physics subjects. Subject pass rates are highest in biology (96% in the Group of Eight (Go8) institutions in the sample; 88% in non-Go8 institutions) and lowest in first year mathematics (83% in Go8 institutions; 73% in non-Go8 institutions).
- When it comes to passing first year mathematics and science subjects, the *level* of mathematics undertaken in senior secondary school counts, but so does Year 12 mathematics *performance*. In general, among students who had undertaken General Mathematics or higher level secondary mathematics at school:
 - Students who had undertaken General Mathematics had lower first year subject pass rates than students who had undertaken more advanced mathematics subjects (Mathematical Methods or Specialist Mathematics) in secondary school.
 - Students who were strong performers in Year 12 mathematics (irrespective of the level of mathematics undertaken) have very high first year pass rates.
 - Students who were strong performers in General Mathematics achieve similar or higher first year pass rates than students with weak performance in Mathematics Methods or Specialist Mathematics.
 - Multivariate modelling suggests that in most disciplines and institution groups, senior secondary mathematics background (measured by highest level of mathematics undertaken and results) remains a statistically significant influence on first year subject outcomes after controlling for students' secondary school science backgrounds, Australian Tertiary Admission Rank (ATAR) and other factors. The magnitude of the relationships and the specific aspects of mathematics background that are related to increased or decreased likelihood of passing varies across disciplines and institution groups.

- Students who enter university without having undertaken General Mathematics, Mathematical Methods or Specialist Mathematics in senior secondary school have a mix of academic abilities. This group includes students who had undertaken Essential Mathematics (the lowest senior secondary mathematics level in the Australian Curriculum) as well as students with minimal or no senior secondary mathematics. Interestingly, within this group, virtually all of those who have a very high ATAR pass their first year subjects.
- The overall trends noted above are seen across the entire sample of universities in this study. However, students enrolled in Go8 and non-Go8 institutions differ in terms of background characteristics, and there are nuanced differences between these two groups in the relationship between mathematical background and first year pass rates.

Future exploration on this topic:

This project focused on first year subject pass rates in selected disciplines. Further research focusing on **student pathways beyond first year** could be considered in order to further explore the extent to which students with weak mathematics backgrounds are able to achieve strong passes in university mathematics and science subjects and progress to advanced study within their discipline. Case studies would also permit an **exploration of the types of academic support** currently provided by universities, which may be mitigating the effects of entering university with a weak mathematics background. Furthermore, while complex and potentially providing more nuance than necessary, a study examining the actual grades of students at university within science disciplines (rather than pass/fail alone) and the relationship with secondary school outcomes could be considered in the future.

Introduction

This study explores the extent to which study of mathematics in senior secondary school is a predictor of success in core mathematics and science subjects in the first year of university. The study was commissioned by the Australian Council of Deans of Science (ACDS) and conducted by the Australian Council for Educational Research (ACER).

Background

The project was developed in the context of a decline in the proportion of senior secondary school students taking higher level mathematics subjects. Of those who do undertake mathematics in school, there has been a move away from higher level subjects to lower level subjects (Kennedy et al 2014). Reasons for these changing patterns of participation include students' desire to optimise their Australian Tertiary Admission Rank (ATAR). Enrolling in lower levels of mathematics is perceived as a means of getting better grades in high school mathematics as well as allowing additional time to focus on other ATAR subjects. Related to this, the lack of subject prerequisites for entry into many university degree programs may have contributed to a perception that higher level mathematics is not necessary (Hine 2016, 2017; MANSW 2014; Pitt 2015). However, the changing patterns of senior secondary mathematics participation potentially have implications for student performance at university.

A limited number of Australian studies have examined performance in first year science subjects, and they have yielded somewhat conflicting results regarding the association between performance in the first year of university and participation and performance in different levels of mathematics in Year 12. For example, one study of chemistry students at the University of Wollongong in 2010 found that level of high school mathematics was associated with the percentage of students passing first year chemistry, with virtually all students who had undertaken the more advanced high school mathematics subjects passing. The authors suggested that "even borderline performance in [intermediate] Mathematics is more advantageous than strong performance in General Mathematics" (Armstrong et al, 2014).

In contrast, a subsequent study of chemistry, physics and mathematics students at the University of Sydney in 2013 found that while completion of higher levels of mathematics in high school was a strong predictor of success in first year chemistry, physics and mathematics, high school *results* were also important. In particular, at this university, "students who achieve in the top bands of each level of mathematics taken in high school can and often do outperform their peers who had studied a higher level of maths at school but achieve a lower band result" (Nicholas et al, 2015).

Each of these studies was based on students attending one university, having completed high school in that state, and only a limited number of disciplines were examined. Furthermore, the Australian tertiary education sector has undergone rapid expansion in recent years, resulting in a greater number of students from diverse backgrounds (Koshy, 2018). Consequently, it is not clear if these earlier findings are generalisable today.

Aims

The aim of this study is to examine the extent to which the study of mathematics in senior secondary school is a predictor of success in core mathematics and science subjects in the first year of university, and to test whether previous research findings can be generalised across a wider range of Australian universities and a wider range of science disciplines.

Mathematics subjects in senior secondary school are offered at a range of levels, and this study was designed to explore the differences in university outcomes based on these levels as well as participation in specific senior secondary science subjects. First year university pass rates were examined in this study for subjects in the following disciplines: biology, chemistry, physics and mathematics.

Specific research questions explored in the analyses of this study are:

1. What senior secondary school mathematics and science subjects had first year science students undertaken prior to university enrolment?
2. Does the level of mathematics subjects undertaken in senior secondary school and/or participation in a school science subject in the discipline area have an impact on pass rates in first year university mathematics and science subjects?
3. Do university first year mathematics and science subject pass rates differ depending on the performance of students in senior secondary school mathematics subjects?

Report Overview

This was an ambitious study, and the first attempt in Australia to collate the school subject choices and achievement of science students, and examine them alongside progression through the initial semester of a science degree across multiple universities located in a range of states. The study recruited the participation of a sample of 12 Australian universities and the data collected covered the university outcomes and school achievement of 16,436 students.

The Methodology section of this report provides detail relating to the approach in data collection for this study and examines the sample achieved in relation to the total population in Australian universities. Subsequently, each of the above research questions is addressed in a separate section. An additional section provides further examination of students with lower level mathematics. The report concludes with a discussion of the results, examining these outcomes in relation to prior studies in this area and identifying potential areas of future research.

Methodology

This project involved the collection and analysis of student-level data from a sample of Australian universities.

The target population for the study comprised students enrolled in Australian public universities who had the following characteristics:

- Domestic undergraduates
- Commenced a Bachelor of Science or equivalent degree in Semester 1 of 2015, 2016, 2017
- Participated in one or more biology, chemistry, physics or mathematics first year subject in their commencing semester
- Basis for admission to university was Australian senior secondary school education
- Year left school was 2014, 2015 or 2016
- Information on the students' senior secondary maths and science subjects (if any), subject result(s) and ATAR was available.

Sampling comprised three stages:

1. **Universities:** A convenience sample of universities was selected. The universities were selected to include all university groups and a range of states, as well as mainland state capitals and regional areas.
2. **First year subjects:** Within each participating university, first year, first semester subjects in biology, chemistry, mathematics and physics were selected. All entry-level subjects were included, but "catch-up" subjects designed to make up for missing pre-requisites or assumed knowledge were excluded.
3. **Students:** All students within each participating university who fit the population criteria were included in the sample.

Data collection occurred in the first half of 2019 and involved two stages. First, universities were requested to provide a list of all entry-level biology, chemistry, mathematics and physics subjects which had been available to Bachelor of Science (or equivalent) students in the first semester of 2015, 2016 and 2017. From these lists, an ACDS working group identified in-scope subjects.

Universities were then requested to provide information from their administrative records on all in-scope students. Requested information included information on senior secondary mathematics and science subject participation and results, ATAR scores, and the outcomes of first year science and mathematics subjects.

Data checks were conducted, and a small number of cases that were identified as out-of-scope were excluded from analysis. These included students who completed Year 12 overseas, students who left school before 2014, students who commenced their BSc or equivalent degree after 2017, and students in a small number of bachelor degrees which were identified as out of scope by the ACDS.

Variables

Senior secondary mathematics participation

The Australian Curriculum identifies four levels of mathematics in senior secondary school in Australia:

1. *Essential Mathematics*, which provides preparation for post-school options of employment and further training

2. *General Mathematics*, which is designed for students whose future TAFE, university or employment pathways do not require a knowledge of calculus
3. *Mathematical Methods*, which includes calculus and is designed for students whose future tertiary pathways may involve mathematics and statistics and their applications across a range of disciplines
4. *Specialist Mathematics*, which builds upon and deepens ideas presented in *Mathematical Methods*, and is designed as a pathway for tertiary courses requiring a specialised mathematical knowledge base such as engineering and the physical sciences (ACARA, n.d.).

However, when the students in this project were in senior secondary school, states and territories were at different stages in the phasing in of the Australian Curriculum. The names of senior secondary subjects differed across states and territories and across years in some states and territories. A necessary component of this study involved the mapping of senior secondary maths subject levels across states and territories. Based upon the framework of the Australian Curriculum, subjects were grouped into four levels of increasing difficulty (Appendix Table 4).

While universities held information on students' participation in mathematics subjects at the level of *General Mathematics* and above, many universities did not hold information on participation in subjects equating to the lowest level (*Essential Mathematics*). Consequently, the following categories were used to measure highest level of mathematics undertaken in senior secondary school:

1. No *General Mathematics*, no *Mathematical Methods*, and no *Specialist Mathematics*
2. *General Mathematics*
3. *Mathematical Methods*
4. *Specialist Mathematics*

The first category includes persons who studied *Essential Mathematics*, as well as those who did not undertake mathematics in senior secondary school.

A student may undertake mathematics subjects at more than one level when in senior secondary school. Of particular note, students undertaking *Specialist Mathematics* (the highest level of mathematics) must also undertake *Mathematical Methods* (i.e. the second highest level). Unless otherwise specified, mathematics level in this report refers to the *highest* level of mathematics completed in senior secondary school. Therefore, the *Specialist Mathematics* category refers to students who undertook *Mathematical Methods* as well as *Specialist Mathematics*, while the *Mathematical Methods* category refers to students who undertook *Mathematical Methods* but not *Specialist Mathematics*.

Performance in senior secondary subjects

Senior secondary school subjects are scored differently in different states. Because this was a national study, spanning five different jurisdictions, it was necessary to equate senior secondary results. Tertiary admissions centres (TACs) have had to address the issue of how to compare subject results fairly, because students apply for universities in states other than where they completed secondary school. Consequently, Australasian Conference of Tertiary Admissions Centres has developed systems of subject result mapping that allow each TAC to map subject results for interstate applicants to the local system. As such, this concordance has been used in this study to classify students' senior secondary subject results into four bands (very high, high, sound, low/very

low), as well as an additional 'not studied' category. As alluded to above, many universities were unable to provide subject results for the lowest level of secondary mathematics (Essential Mathematics). In one of the twelve universities in the sample, data on senior secondary school subject results could not be equated.

Overall senior secondary performance

The Australian Tertiary Admission Rank (ATAR) is used as an indication of overall performance in senior secondary school. While ATAR is used as a basis for entry to university for many students, universities also admit students via alternative entry arrangements and universities do not always report ATARs for the latter group. The 'no ATAR' group in this report refers to students where the university was unable to supply an ATAR to the research team.

Performance in first year university subjects

Students enrolled in first year, first semester subjects in the fields of biology, chemistry, mathematics and physics were the focus of this study. As noted above, specific subjects for inclusion in the data collection were identified by the ACDS working group on this study. Within each of the chosen science subjects, participating universities provided the research team with information about student outcomes ('Withdrew', 'Fail', 'Pass', or 'Still in the process of completion or completion status not determined'). Data from students who withdrew (meaning that they left the subject in the early part of semester before the university census date closed) or who were marked in the fourth category were not included in the study. Data for subjects in each discipline, and across the three years of the collection period were aggregated for the purpose of analysis. For each of the four science disciplines, this enabled analysis of a dichotomous outcome for students – i.e. Pass or Fail.¹

Sample for analysis

The sample used for analysis comprises 16,436 bachelor-level students who undertook selected first year biology, chemistry, mathematics, or physics subjects at one of 12 Australian universities in 2015, 2016 or 2017. Table 1 compares the sample with the Australian Department of Education's Higher Education Statistics Collection (HESC) data on student enrolments. The ACDS sample size (16,436) is just under 20% of the population of domestic undergraduate bachelor students in the natural and physical sciences commencing at Table A institutions between 2015 and 2017, or 40% of commencing domestic undergraduates in the natural and physical sciences attending the 12 universities which were included in the ACDS sample.

¹ The majority of students completed one subject in a discipline in the first semester they first enrolled in that discipline. However, a small proportion of students completed more than one subject within a discipline in their first semester (6% of biology students and less than 1% of chemistry, mathematics and physics students). Four dichotomous variables were generated to measure results in the four disciplines (passed at least one subject within a specified discipline; failed all subjects within a specified discipline).

Table 1 Sample size, compared with administrative data for domestic, commencing, undergraduate, bachelor students in natural and physical sciences, 2015-2017

University type	Number of students			ACDS Sample representativeness (as a % of total population)	
	All Table A universities (HESC data)	Institutions in ACDS sample (HESC data)	ACDS study sample (ACDS data)	All Table A universities (HESC data)	Institutions in sample (HESC data)
Go8	40,806	19,981	8,816	21.6	44.1
Other	48,085	21,134	7,620	15.8	36.1
Total	88,891	41,115	16,436	18.5	40.0

Source: Department of Education. *Higher Education Statistics Data Cube (uCube)*, accessed 26 June 2019 from <http://highereducationstatistics.education.gov.au/>

The universities in the sample were selected to include a mix of university groups, states, and metropolitan/non-metropolitan areas. They comprised three Group of Eight (Go8) institutions and nine non-Go8 institutions. The HESC data on student enrolments from 2015 to 2017, shows that 46% of commencing, domestic, undergraduate students in the natural and physical sciences attended a Go8 institution. This is very similar to the HESC data on the proportion of students in the sampled universities who attended a Go8 institution (49%). The ACDS sample, which is restricted to first year students who enrolled in specific subjects in four disciplines, does not have a one-to-one correspondence with the HESC data. Nevertheless, a roughly similar proportion of students in the ACDS sample attended a Go8 institution (54%).

Table 2 reports the ACDS sample size by discipline. Of the 16,436 students:

- 10,599 students (65% of the sample) were spread across 27 first year biology subjects
- 11,092 students (68% of the sample) were spread across 25 first year chemistry subjects
- 7,629 students (46% of the sample) were spread across 34 first year mathematics subjects
- 5,460 students (33% of the sample) were spread across 22 first year physics subjects.

Table 2 Sample size, by university group and first year discipline area

University group	Biology	Chemistry	Mathematics	Physics	Total
Number of students					
Group of Eight	5,742	5,632	4,323	2,712	8,816
Other	4,857	5,460	3,306	2,748	7,620
Total	10,599	11,092	7,629	5,460	16,436
Column per cent					
Group of Eight	54.2	50.8	56.7	49.7	53.6
Other	45.8	49.2	43.3	50.3	46.4
Total	100.0	100.0	100.0	100.0	100.0
Per cent of university group					
Group of Eight	65.1	63.9	49.0	30.8	100.0
Other	63.7	71.7	43.4	36.1	100.0
Total	64.5	67.5	46.4	33.2	100.0

Notes: Based on students who undertook a subject in biology, chemistry, physics or mathematics

Approach to Analysis

For this study, the three years of data collected (first semester 2015, 2016 and 2017) were merged into one dataset. Analysis of results throughout the report are presented separately for students enrolled in universities that are part of the Group of Eight (Go8) and those who are enrolled in other universities ('other' or 'non-Go8'). The reason for building this into reporting of this study is due to the substantial overall share of science students in Go8 institutions (these eight universities account for nearly half of all commencing undergraduates in natural and physical science disciplines); these two groups of institutions have different patterns in terms of admission of students (Go8 institutions tend to be more selective and therefore admit students with on-average higher prior achievement) which is important to this study; and in the initial analyses for this project, there were differences between student outcomes at the Go8 and non-Go8 universities in the sample that the research team felt warranted a separate line of reporting.

Cross-tabulations are used to describe the senior secondary school mathematics and science subjects that first year mathematics and science students had undertaken prior to university enrolment; and to explore whether the level of mathematics undertaken in senior secondary school and/or the performance of students in these subjects are related to first year university subject pass rates. It is these bivariate analyses which form the focus of the results sections of this report.

In addition, logistic regression analyses were carried out to explore whether the effects of mathematics background on first year outcomes remain significant after controlling for various background characteristics. Eight separate models were built using stepwise logistic regression procedures: one for each combination for university type (Go8 and non-Go8) and discipline (biology, chemistry, mathematics and physics). In each case, the outcome modelled was passing a first year subject in the relevant discipline. Independent or predictor variables considered for inclusion in the models included mathematics background (measured by highest senior secondary mathematics level and results²), science background (measured by participation in a senior secondary subject in the corresponding science discipline and results³), overall school achievement (measured by ATAR), and other control variables (university, year commenced degree, and gender).

The logistic regression results are reported as odds ratios. Each of the independent or predictor variables used in this study are categorical, and each of these variables has one category denoted as a reference or base category. Odds ratios for categorical variables can be interpreted as follows:

² Mathematics background was measured by the following 10 categories: no Generalist Mathematics/no Mathematical Methods/no Specialist Mathematics; General Mathematics (low/very low achievement); General Mathematics (sound achievement); General Mathematics (high/very high achievement); Mathematical Methods (low/very low achievement); Mathematical Methods (sound achievement); Mathematical Methods (high/very high achievement); Specialist Mathematics (low/very low achievement); Specialist Mathematics (sound achievement); and Specialist Mathematics (high/very high achievement). Because of the distribution of students in various disciplines at Go8 and non-Go8 institutions, sometimes there were no students in particular categories, or categories had to be combined due to low numbers of students.

³ In the models for first year biology, chemistry and physics, science background was measured by the following four categories: no participation in a senior secondary science subject in the corresponding discipline; low/very low achievement in the science subject; sound achievement in the science subject; or high/very high achievement in the science subject. Again, it was sometimes necessary to collapse categories for particular analyses.

- An odds ratio of one (1) indicates that the likelihood of passing a first year subject is similar for students with a specific characteristic and students in the reference category.
- An odds ratio greater than one indicates a higher likelihood of passing a first year subject for students with a specific characteristic relative to students in the reference category. For example, an odds ratio of 2.00 indicates twice the odds of passing.
- An odds ratio less than one indicates a decreased likelihood of passing, For example, an odds ratio of 0.50 indicates 0.50 times (or one half) the likelihood of a student with a particular characteristic passing relative to the odds for students in the reference category.
- The further an odds ratio is away from one, the greater the increase or decrease in the likelihood of passing. Taking the previous example, an odds ratio of 0.50 indicated half the likelihood of passing. In contrast, an odds ratio of 0.25 suggests that the odds of students with a specified characteristic passing are 75 per cent less than the odds for students in the reference category.

What senior secondary school mathematics and science subjects had first year science students undertaken prior to university enrolment?

The mathematics and science backgrounds of first year students in each discipline are shown in Table 3. In terms of the mathematics backgrounds of students:

- Within each university discipline, the most common highest level of mathematics that had been undertaken when the students were in senior secondary school was Mathematical Methods (the second highest level of senior secondary mathematics) (around 50% of first year biology and chemistry students, 45% of mathematics students, and 41% of physics students).
- The next most common subject was General Mathematics (a lower level of secondary school mathematics) or Specialist Mathematics (the highest level of secondary school mathematics) – depending on the discipline. For both biology and chemistry nearly 20% of students had undertaken General Mathematics, while for mathematics and physics, just over 30% of the cohort had completed Specialist Mathematics.
- Between 11% and 15% of students in each discipline had not undertaken General Mathematics, Mathematical Methods or Specialist Mathematics in senior secondary school.

The data collected also explored the extent to which students undertaking a subject in the various science disciplines had also undertaken a subject in the corresponding discipline in senior secondary school. Students enrolled in first year chemistry were most likely to have completed a subject in the corresponding discipline (chemistry) in senior secondary school (71%), and two thirds of first year biology students had also undertaken senior school biology. For those undertaking first year physics, fewer than half had also completed physics in Year 12 (48%).

Table 3 First year university students, by discipline and selected senior secondary subjects and university group

First year discipline area	Senior secondary mathematics (Highest level)				Senior secondary science subject in discipline area	
	None or Essential Mathematics	General Mathematics	Mathematical Methods	Specialist Mathematics	Yes	No
Number						
Biology	1,458	2,105	5,419	1,616	7,010	3,589
Chemistry	1,581	2,001	5,495	2,014	7,858	3,234
Mathematics	834	947	3,402	2,444	-	-
Physics	809	695	2,240	1,715	2,635	2,825
Percent						
Biology	13.8	19.9	51.1	15.2	66.1	33.9
Chemistry	14.3	18.0	49.5	18.2	70.8	29.2
Mathematics	10.9	12.4	44.6	32.0	-	-
Physics	14.8	12.7	41.0	31.4	48.3	51.7

Note: Based on students who undertook a first year subject in the specified discipline area.

The highest level of senior secondary mathematics undertaken varied by the type of university attended (Figure 1; see also Appendix Table 5 - Table 8). Our focus in this section is on students who had undertaken General Mathematics, Mathematical Methods or Specialist Mathematics. Students

who had not undertaken any of these mathematics subjects in senior secondary school will be examined later in the report.

Across all disciplines, first year students at Go8 universities were more likely than students at other universities to have studied higher level mathematics when in senior secondary school. Differences were largest for first year physics: 94% of physics students at Go8 institutions had studied Mathematical Methods or Specialist Mathematics at school, compared with 51% of physics students at other universities. Differences were smallest for first year mathematics (82% of Go8 mathematics students, compared with 70% of mathematics students at other universities).

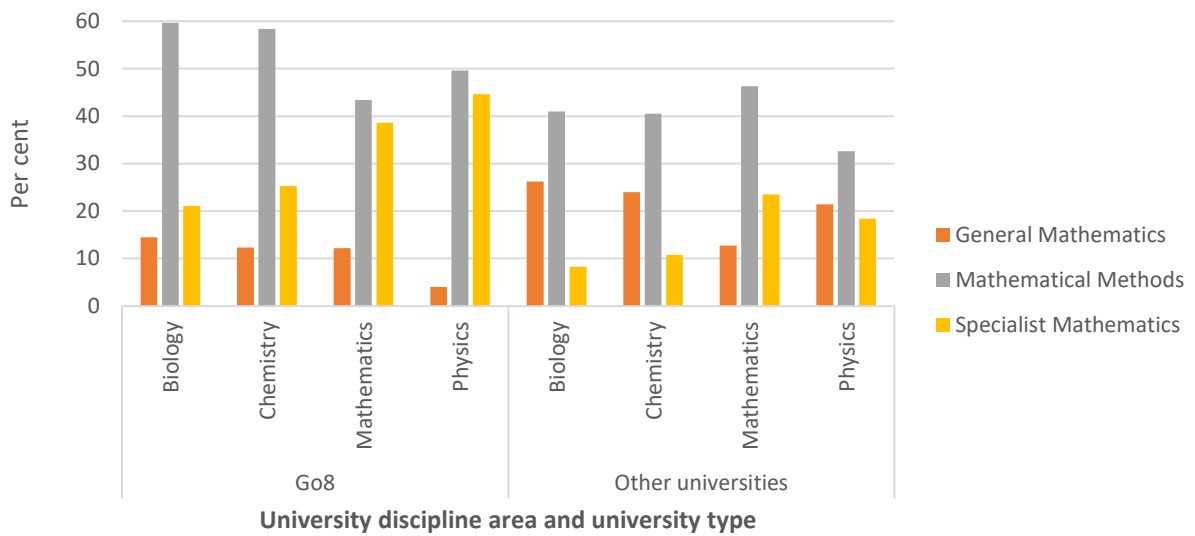


Figure 1 Highest level of senior secondary mathematics undertaken by first year university students, by university discipline and university type

Does the level of mathematics undertaken in senior secondary school have an impact on pass rates in first year university science subjects?

This section explores the relationship between first year subject performance and participation in senior secondary mathematics and science subjects. For each discipline area, students in Go8 institutions have higher first year pass rates than students in other institutions (Figure 2; see also Appendix Table 9 to Table 12). Pass rates are highest in first year biology (96% in Go8 institutions; 88% in non-Go8 institutions) and lowest in first year mathematics (83% in Go8 institutions; 73% in non-Go8 institutions).

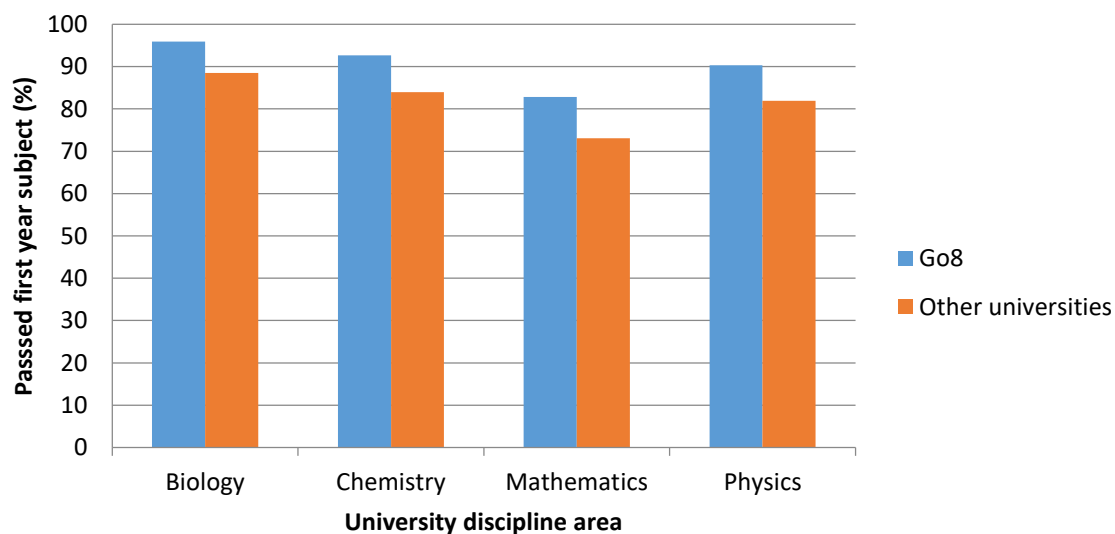


Figure 2 Proportion of students passing first year subjects, by university discipline area and university type

The relationship between the highest level of mathematics undertaken in senior secondary school and first year pass rates differs between Go8 institutions and non-Go8 institutions (Figure 3; see also Appendix Table 9 to Table 12). Again, our focus in this section is on students who had undertaken General Mathematics or higher level mathematics in senior secondary school. At both Go8 and non-Go8 institutions, those who had undertaken Specialist Mathematics had the highest pass rates in first year chemistry, mathematics and physics, while those whose highest level of school mathematics was Mathematical Methods had slightly higher pass rates in first year biology.

In general, students whose highest level of school mathematics was General Mathematics had lower first year subject pass rates than students whose highest level of school mathematics was Mathematical Methods or Specialist Mathematics. The one exception was first year mathematics students at Go8 institutions, where those whose highest level of school mathematics was Mathematical Methods had the lowest pass rate (Figure 3). Further investigations were conducted to understand this apparent anomaly.

Students may undertake more than one mathematics subject in senior secondary school. For example, Specialist Mathematics can only be taken in conjunction with Mathematical Methods. Figure 3 referred to the *highest level* of mathematics undertaken in senior secondary school. When

all students who had undertaken a specific level of mathematics are examined, the pass rates for first year mathematics students at Go8 institutions were lowest for those who had undertaken General Mathematics (82%) or Mathematical Methods (83%) in school, and highest for those who had undertaken Specialist Mathematics (87%) (Figure 4; see also Appendix Table 11). For first year students in biology, chemistry and physics, and non-Go8 mathematics students, the same broad patterns shown in Figure 3 (for highest level of secondary mathematics undertaken) are also evident when all students who had participated in a specified school mathematics level are examined (Figure 4; see also Appendix Table 9 to Table 12).

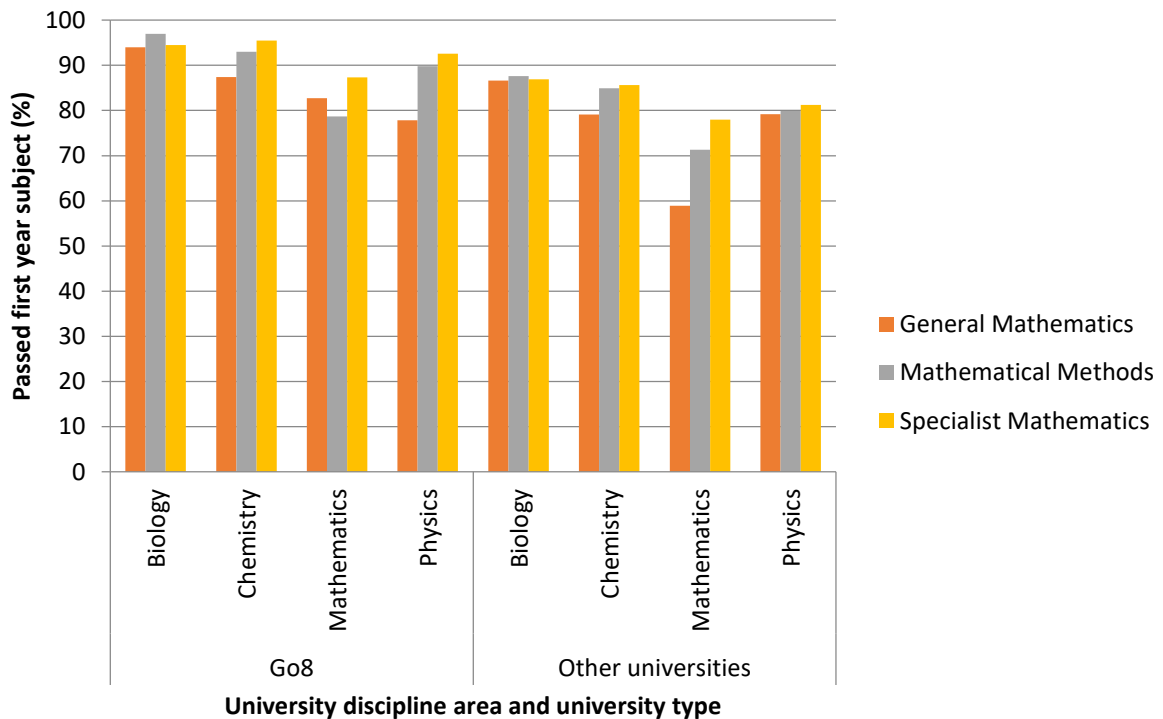


Figure 3 Proportion of students passing first year subjects, by highest level of Year 12 mathematics, university discipline area and university type

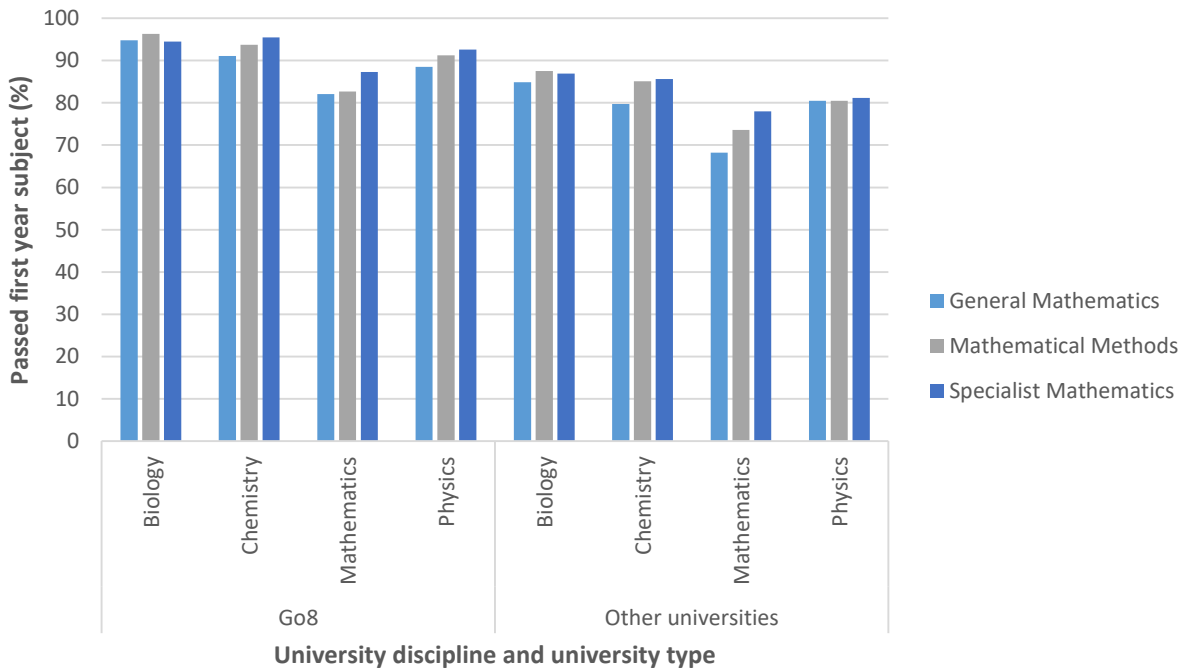


Figure 4 Proportion of students passing first year subjects, by participation in Year 12 General Mathematics, Mathematical Methods and Specialist Mathematics, university discipline area and university type

Having studied a science subject in a corresponding discipline in senior secondary school is also related to success in first year biology and chemistry, but not first year physics (Figure 5; see also Appendix Table 9 to Table 12).

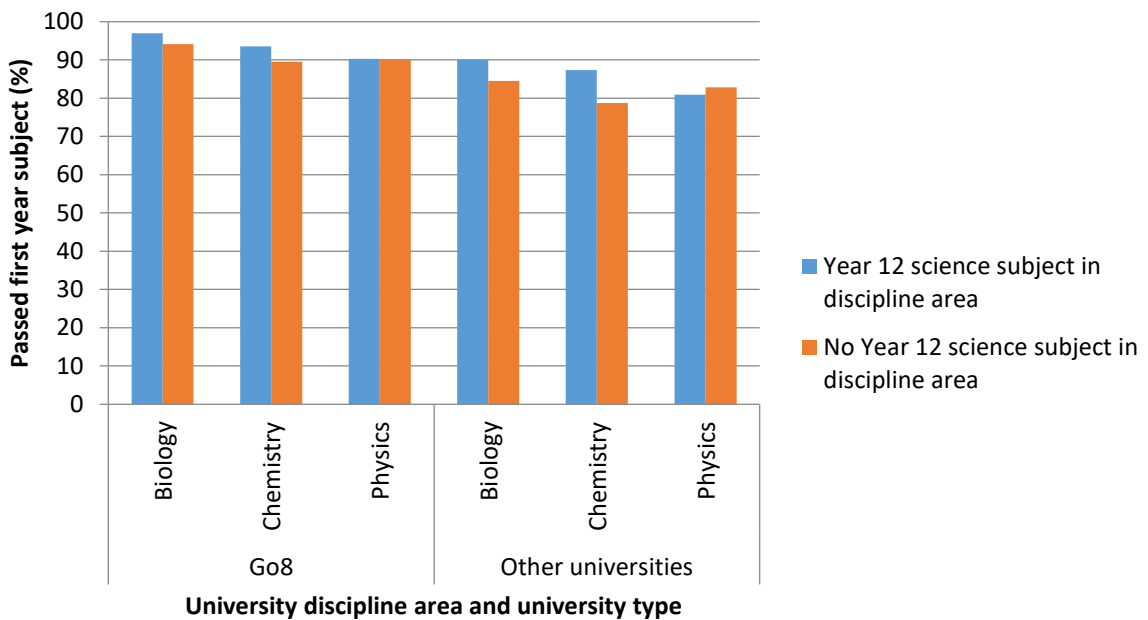


Figure 5 Proportion of students passing first year subjects, by Year 12 science participation, university discipline area and university type

Do university first year science subject pass rates differ depending on the performance of students in senior secondary school mathematics and science subjects?

This section examines the association between senior secondary mathematics results and first year subject pass rates. This includes an examination of whether students with borderline performance in advanced mathematics subjects in high school have higher or lower pass rates than students with higher performance in General Mathematics. Each science discipline in the study is explored separately in the analyses below.

First year biology

First year biology pass rates, broken down by Year 12 mathematics and biology subjects and results, are shown in Figure 6 (see also Appendix Table 18). Year 12 mathematics refers to the highest level of mathematics undertaken in senior secondary school.

Bivariate results

- Among students at Go8 institutions, first year biology pass rates are very high for all secondary mathematics levels and achievement bands. Virtually all students who were in the highest attainment band in Mathematical Methods or Specialist Mathematics passed first year biology. The lowest pass rates were for students with sound performance in General Mathematics (91%)⁴ or weak (low or very low) performance in Specialist Mathematics (89%).
- Among students at non-Go8 universities, school mathematics performance is more strongly related to biology pass rates. For example, first year biology pass rates ranged from 79% of those with low/very low achievement in Mathematical Methods to 99% of those with very high achievement in Mathematical Methods. As in Go8 institutions, virtually all non-Go8 students who were in the highest attainment band in Mathematical Methods or Specialist Mathematics passed first year biology. Pass rates were lower, however, for students with sound to weak performance in General Mathematics (75-78%) or weak performance in Mathematical Methods (79%).
- High achieving students in Year 12 General Mathematics have first year biology pass rates that are similar to or higher than low achieving students in higher level Year 12 mathematics subjects. At Go8 universities, students who had performed strongly in General Mathematics (Very high and High achievement bands) had similar or higher first year biology pass rates than those with lower achievement in higher level Year 12 mathematics subjects (Low/Very Low in Mathematical Methods or Sound/Low/Very Low in Specialist Mathematics). At non-Go8 universities, students who achieved Very High/High in General Mathematics had similar or higher first year biology pass rates than those who achieved Sound/Low/Very Low in Mathematical Methods or High/Sound/Low/Very Low in Specialist Mathematics.
- Students with sound achievement or higher in Mathematical Methods had first year biology pass rates which were similar to those of students who had corresponding achievement levels in senior secondary biology. In contrast, students with a sound achievement in

⁴ The results for Go8 first year biology students who had weak performance in General Mathematics are not reported as very few students were in this category (Table 14).

General Mathematics had first year biology pass rates which were lower than students with sound achievement in senior secondary biology.

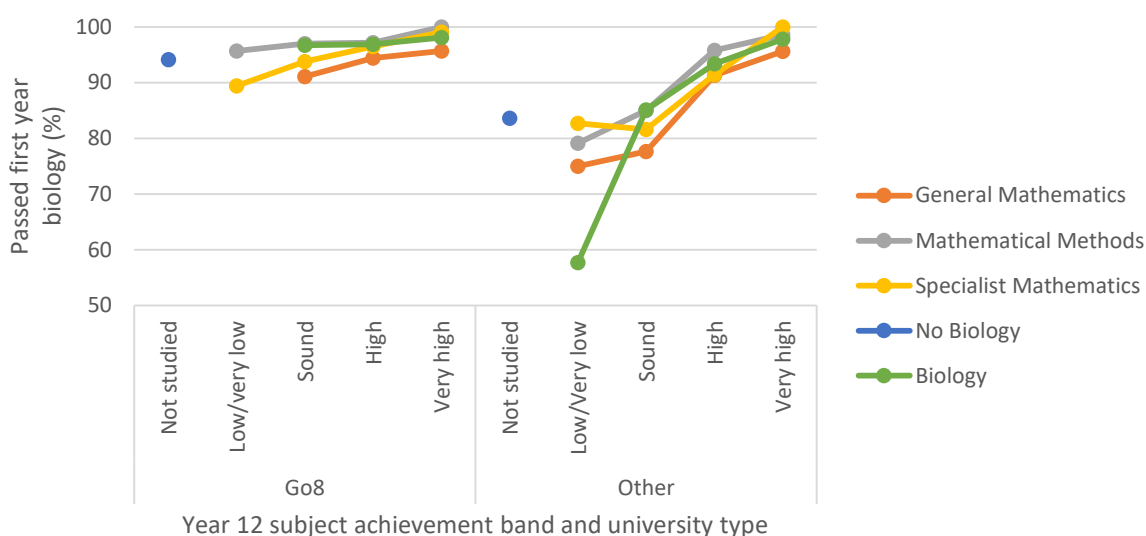


Figure 6 First year biology pass rates, by highest Year 12 mathematics level and results

More detailed breakdowns of first year biology pass rates are available in Appendix Table 22 to Table 23 (Go8 institutions) and Appendix Table 24 to Table 25 (non-Go8 institutions). These include a consideration of ATAR as well as senior secondary subjects.

Multivariate results

Logistic regression models were also developed in order to examine first year biology pass rates. As described in the Methodology section, these analyses explored university pass rates in relation to mathematical background (measured by highest level of senior secondary mathematics undertaken and associated results) after taking into account students' senior secondary biology background (measured by participation and results), overall senior secondary achievement (measured by ATAR) and controlling for gender, university and the year of university commencement.

The output of this analysis is discussed in terms of an 'odds ratio' – whereby the predicted likelihood of a student passing their first year science subject is calculated after controlling for a range of characteristics. The results relating to the influence of mathematical background use the group of students with sound performance in Mathematical Methods as a reference group for comparing the likelihood of passing university science subjects. The overall outcomes of this modelling are discussed below, while the detailed odds ratio estimates are provided in Appendix Table 38.

Overall, the logistic regression models for exploring first year biology pass rates confirm the outcomes identified in the bivariate analysis described above. However, this more sophisticated analysis allows for some further nuance in understanding and substantiating these broad findings.

The most telling outcome from the logistic regression is that students who had studied senior secondary biology were more likely than those with no biology to pass first year university biology when other variables in the models were controlled for. In addition, there was a positive association with achievement in secondary school biology and likelihood of passing first year biology at university

– this was the case in both Go8 and non-Go8 universities. Specifically, those students with high or very high secondary school marks in biology were two to three times more likely to pass university first year biology than those who had not studied senior secondary school biology. Even those with sound biology scores in secondary school were up to two times more likely to pass first year biology than those with no biology in secondary school.

In both Go8 and non-Go8 institutions, mathematical background remained statistically significant as a predictor of first year performance in biology after controlling for the other variables. However, like the bivariate analyses, the logistic regression did reveal some differences between these two types of institutions.

In the non-Go8 institutions, the logistic regression showed a relatively consistent pattern whereby the higher the secondary mathematics achievement, the higher the odds of passing first year biology – regardless of the type of senior school mathematics undertaken. For example, non-Go8 students with high or very high General Mathematics performance were one and a half times more likely to pass first year biology than students with sound Mathematical Methods performance. Importantly, within the Mathematical Methods student group, those students with high or very high achievement were more than twice as likely to pass first year biology as those with sound achievement in this school subject.

In Go8 institutions, this pattern was not as evident – an outcome that is unsurprising given the very high pass rates for first year biology in these institutions (as highlighted earlier). For the Go8s, the strongest findings for the first year biology pass rates were confirmation that those students with sound, low or very low achievement in General Mathematics were less likely to pass than those with sound Mathematical Methods achievement. Somewhat counter-intuitively, those with sound or higher achievement in Specialist Mathematics were also less likely than students with sound achievement in Mathematical Methods to pass first year biology at Go8 institutions, although again this finding needs to be set against a background of very high first year biology pass rates across all mathematical backgrounds at Go8 institutions.

First year chemistry

Bivariate results

First year chemistry pass rates, broken down by Year 12 mathematics and chemistry subjects and results, are shown in Figure 7 (see also Appendix Table 19).

- Among students at both Go8 and non-Go8 institutions, first year chemistry pass rates are associated with both senior secondary mathematics level and achievement band.
- Within each school mathematics achievement band, students who had undertaken Mathematical Methods or Specialist Mathematics in secondary school had higher first year chemistry pass rates than students who had only undertaken General Mathematics.
- Within each school mathematics level, pass rates have a positive association with Year 12 mathematics achievement.
- Of the students who had undertaken Mathematical Methods or Specialist Mathematics in secondary school, virtually all who attained the highest achievement band (Go8 and non-Go8 institutions) or the second highest achievement band (Go8 institutions only) passed first

year chemistry. In contrast, the lowest pass rates were for those who had received sound/low/very low achievement for General Mathematics (68%-74%)⁵.

- Students who had performed strongly (Very High/High) in General Mathematics while at school had similar or higher first year chemistry pass rates than those who had undertaken Mathematics Methods or Specialist Mathematics but attained lower grades (Low/Very Low for those attending a Go8 university; Sound/Low/Very Low for those attending a non-Go8 university).
- Students with sound achievement or higher in Mathematical Methods had first year chemistry pass rates which were similar to those of students who had corresponding achievement levels in senior secondary chemistry.

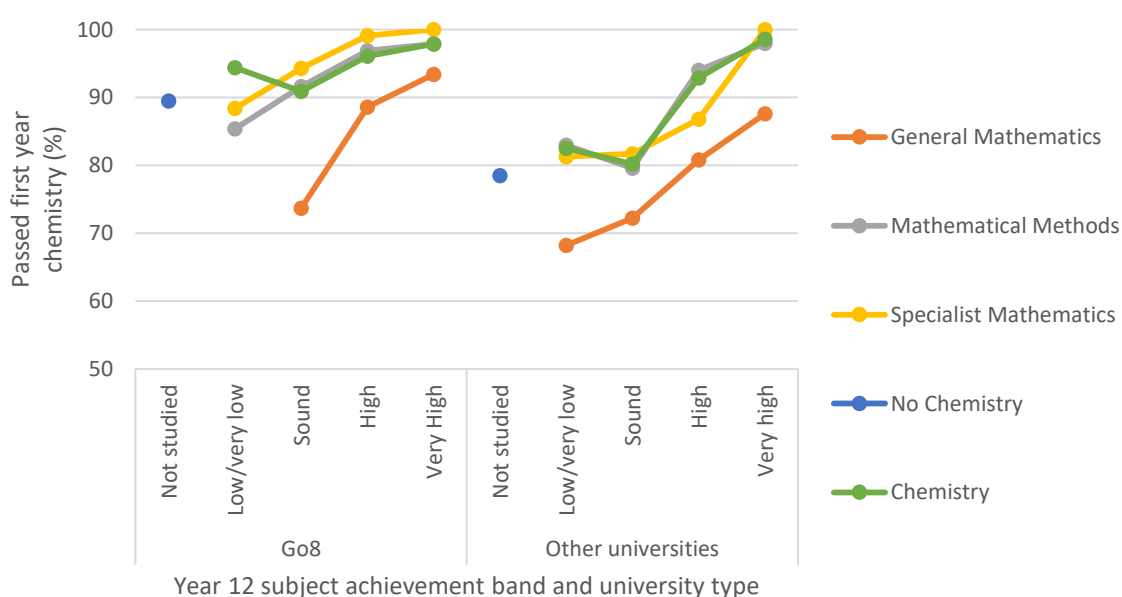


Figure 7 First year chemistry pass rates, by highest Year 12 mathematics level and results

More detailed breakdowns of first year chemistry pass rates are available in Appendix Table 26 to Table 27 (Go8 institutions) and Appendix Table 28 to Table 29 (non-Go8 institutions). These include a consideration of ATAR as well as senior secondary subjects.

Multivariate results

The results of logistic regression modelling for first year chemistry outcomes help to confirm the bivariate outcomes described above after controlling for a range of factors including ATAR, gender, university and commencement year. Overall, these results showed first year chemistry pass rates are related mathematical background. These results are discussed further below, while the odds ratio estimates are provided in Appendix Table 39.

⁵ The results for G08 first year chemistry students with low/very low achievement in General Mathematics are not reported as very few students were in this category (Table 15).

The overall pattern shown in the output from the logistic regression for first year chemistry pass rates is similar for both Go8 and non-Go8 institutions. The largest odd ratios produced from this analysis relate to the link between performance in senior secondary school chemistry and first year chemistry pass rates. Students with high or very high senior secondary chemistry achievement were between two (Go8 institutions) and three and a half (non-Go8s) times more likely to pass first year chemistry than those with no senior secondary chemistry. In addition, those in non-Go8 institutions with sound secondary school chemistry outcomes were about one and a half times more likely to pass first year chemistry than students who had not completed senior school chemistry.

For secondary school mathematics background and first year chemistry pass rates, the logistic regression helped to confirm the general pattern described in the bivariate analysis: that mathematical level has an impact on pass rates, and that achievement within the level further predicts this outcome. Three statistically significant examples in the logistic regression output particularly exemplify this finding. First, the models show that in Go8 institutions, students with high or very high General Mathematics achievement are about half as likely to pass first year chemistry as students with sound Mathematical Methods achievement. Second, in non-Go8 institutions, students with high or very high Mathematical Methods achievement are about three times more likely to pass chemistry than those with sound Mathematical Methods achievement. Third, in both Go8 and non-Go8 institutions, students with high or very high Specialist Mathematics achievement are about one and a half times more likely to pass chemistry in first year than those with sound Mathematical Methods marks in secondary school.

First year mathematics

Bivariate results

First year mathematics pass rates, explored by Year 12 mathematics subjects and results, are shown in Figure 8 (see also Appendix Table 20).

- Overall, first year mathematics pass rates are associated with both Year 12 mathematics level and Year 12 mathematics achievement band. However, there are some differences between Go8 and non-Go8 institutions.
- Among students at Go8 institutions, those with higher levels of secondary school mathematics and those with higher mathematics achievement at school have higher pass rates. Virtually all who had attained a very high achievement in Mathematical Methods or Specialist Mathematics and 92% of those who attained very high achievement in General Mathematics passed first year mathematics. In contrast, the first year mathematics pass rate was only 50% for those with low/very low performance in Mathematical Methods or sound achievement in General Mathematics⁶.
- Among students at non-Go8 institutions, students who had undertaken Mathematical Methods or Specialist Mathematics had higher first year mathematics pass rates than those who had undertaken General Mathematics. School mathematics achievement band tended to be positively related to first year pass rates. However, among students who had

⁶ The results for Go8 mathematics students with low/very low performance in Mathematical Methods or sound achievement in General Mathematics are based upon a small number of students and so should be treated with caution (Table 16). No Go8 mathematics students in the sample had Low/Very Low achievement in General Mathematics.

undertaken Mathematical Methods and Specialist Mathematics, those with sound achievement in school mathematics had lower pass rates than those who had low/very low achievement in school mathematics. The lowest pass rates were for those who had sound or low/very low achievement in General Mathematics (50% and 39%, respectively).⁷

- At Go8 institutions, students with high/very high achievement in General Mathematics have first year mathematics pass rates that are similar to or higher than lower achieving students in Mathematical Methods or Specialist Mathematics. Similarly, at non-Go8 institutions, students with very high achievement in General Mathematics had a higher first year mathematics pass rate than students in the lower achievement bands for Mathematical Methods and Specialist Mathematics.

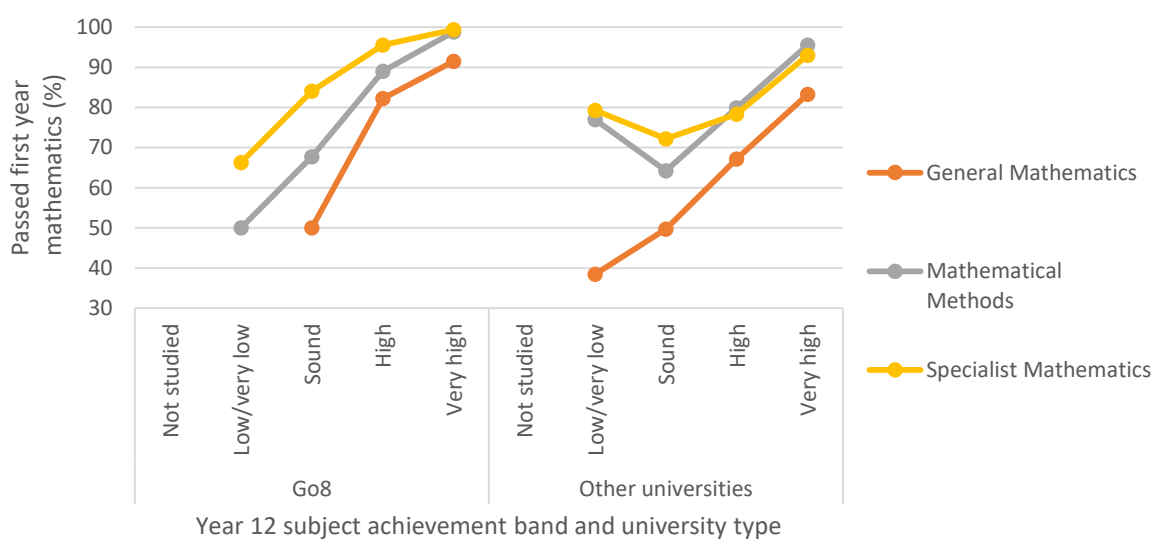


Figure 8 First year mathematics pass rates, by highest Year 12 mathematics level and results

More detailed breakdowns of first year mathematics pass rates are available in Appendix Table 30 to Table 31 (Go8 institutions) and Appendix Table 32 to Table 33 (non-Go8 institutions). These include a consideration of ATAR as well as senior secondary subjects.

Multivariate results

Logistic regression modelling was used to explore whether first year mathematics pass rates are related mathematical background, after taking into account students' ATAR, gender, university and commencement year. In both Go8 and non-Go8 institutions, mathematical background remained statistically significant after controlling for the other variables in the models. Importantly, this more sophisticated analysis generally confirm the findings described in the bivariate analyses above. Odds ratio estimates for the regression models exploring first year mathematics pass rates are provided in Appendix Table 40.

For mathematics pass rates, there was a nuanced difference in the logistic regression analysis for Go8 and non-Go8 institutions. For the Go8s, the pattern generally suggests that secondary school mathematic achievement levels play a critical role in predicting pass rates in first year mathematics,

⁷ However, only a small number of non-Go8 mathematics students had low/very low achievement in General Mathematics, so the result for this group should be treated with caution (Table 16).

and that this pattern is stronger the higher the level of secondary school mathematics. For non-Go8s, the pattern suggests that the level of secondary school mathematics is a critical element, followed by achievement within these subjects.

To further explain this, within the Go8s in comparison to the group which had sound achievement in Mathematical Methods, students were more likely to pass first year mathematics if they had high, or very high achievement in General Mathematics (one and a half times more likely to pass), Mathematical Methods (almost three times more likely to pass), or Specialist Mathematics (three times more likely to pass). In the non-Go8 institutions, the statistically significant odds ratios showed that compared with those with sound Mathematical Methods achievement, students who studied Specialist Mathematics had a higher likelihood of passing first year mathematics regardless of their Specialist Mathematics achievement (two to three times more likely to pass).

First year physics

Bivariate results

First year physics pass rates, broken down by Year 12 mathematics and physics subjects and results, are shown in Figure 9 (see also Appendix Table 21).

- At Go8 institutions, Year 12 mathematics level and Year 12 mathematics results were related to first year physics pass rates. The vast majority (94%) of first year physics students at Go8 institutions had studied Mathematical Methods or Specialist Mathematics (Table 8). Among students with Specialist Mathematics, pass rates ranged from 74% for those in the low/very low achievement band to 100% for those in the very high achievement band. The pass rates for students who had studied Mathematical Methods but not Specialist Mathematics were lower, especially in the low/very low achievement band where only 60% of students passed first year physics⁸.
- At non-Go8 institutions, Year 12 mathematics achievement band is positively associated with first year physics pass rates for students with sound or higher achievement in their senior secondary mathematics subject. However, as was the case for first year mathematics, Mathematical Methods and Specialist Mathematics students in the low/very low achievement band had higher first year physics pass rates than those in the sound achievement band.
- At Go8 institutions, students who achieved Very High or High in General Mathematics have first year physics pass rates that are similar to or higher students in the Low/Very Low achievement bands for Mathematical Methods or Specialist Mathematics. Similarly, at non-Go8 institutions, students who achieved Very High or High in General Mathematics had higher first year physics pass rates than students in the Sound achievement band for Mathematical Methods and the Sound/Low/Very Low achievement bands for Specialist Mathematics.
- At Go8 institutions, compared with students with sound achievement in senior secondary physics, students with sound achievement in Mathematical Methods had similar first year physics pass rates, while those with sound achievement in Specialist Mathematics had

⁸ The number of Go8 first year physics students with low/very low achievement in Mathematical Methods was low, so the pass rate for this group should be treated with caution (Table 17).

higher first year physics pass rates. At non-Go8 institutions, students with sound achievement or higher in Specialist Mathematics had first year physics pass rates which were comparable to the pass rates of those with similar achievement levels in senior secondary physics.

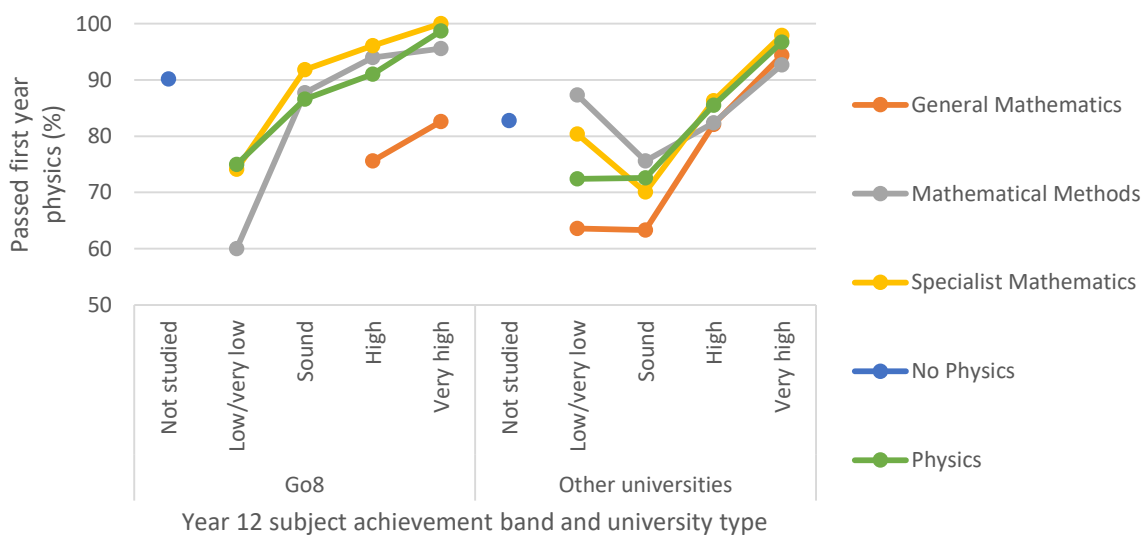


Figure 9 First year physics pass rates, by highest Year 12 mathematics level and results

More detailed breakdowns of first year physics pass rates are available in Appendix Table 34 to Table 35 (Go8 institutions) and Appendix Table 36 to Table 37 (non-Go8 institutions). These include a consideration of ATAR as well as senior secondary subjects.

Multivariate results

Logistic regression modelling, using stepwise selection, was used to explore whether first year physics pass rates are related mathematical background, after taking into account students' senior secondary physics background, ATAR, gender, university and commencement year. The output from this analysis is detailed in Appendix Table 41. Overall, the logistic regression analysis for first year physics helps to confirm the bivariate results discussed above, although the more detailed analysis did not result in the same level of statistically significant outputs that were found in the other first year subject areas.

The logistic regression model shows that the largest statistically significant odds ratio identified for predicting first year physics was high or very high achievement in senior secondary physics. In both Go8 and non-Go8 institutions, students with this level of secondary school achievement in physics were nearly twice as likely as those students with no school physics to pass first year university physics subjects.

For Go8 institutions, the detailed analysis showed that students with high or very high achievement in Mathematical Methods, or in Specialist Mathematics had a greater likelihood of passing first year physics (about one and a half times) when compared with students who had sound achievement in Mathematical Methods. For the non-Go8 institutions, the analysis of physics outcomes by senior secondary mathematics background were not statistically reliable enough to report.

Students with no General Mathematics, Mathematical Methods or Specialist Mathematics background

This section explores the group of students who had not undertaken General Mathematics, Mathematical Methods or Specialist Mathematics in senior secondary school (the “low mathematics” group). This group includes students who had undertaken Essential Mathematics (the lowest mathematics level in the Australian Curriculum), as well as students who had not undertaken mathematics in senior secondary school.

In Go8 institutions, the proportion of students in the “low mathematics” group is very low: 4%-6% of first year biology, chemistry and mathematics students and 2% of first year physics students. In non-Go8 institutions, the proportion of students in the “low mathematics” group is higher, ranging from 17% of first year mathematics students to 28% of physics students (Figure 10; see also Appendix Table 5 to Table 8).

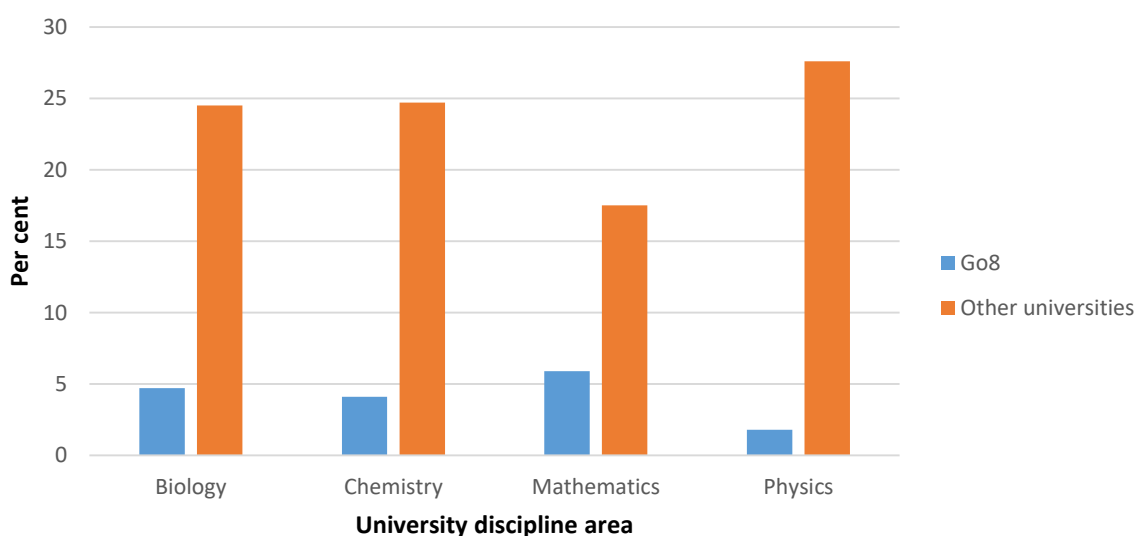


Figure 10 Proportion of first year students who had not undertaken General Mathematics, Mathematical Methods or Specialist Mathematics, by discipline and university type

The first year pass rates of the “low mathematics” group are shown in Figure 11 (see also Appendix Table 9 to Table 12). Pass rates for this group are highest in first year biology subjects (93%-94%), followed by first year chemistry (86%-87%) and first year mathematics (81-83%). The pass rate for first year physics subjects is higher in non-Go8 institutions (87%) than in Go8 institutions (74%). However, it should be remembered that only a very small proportion of Go8 physics students have a “low mathematics” background (Figure 10; see also Appendix Table 8).

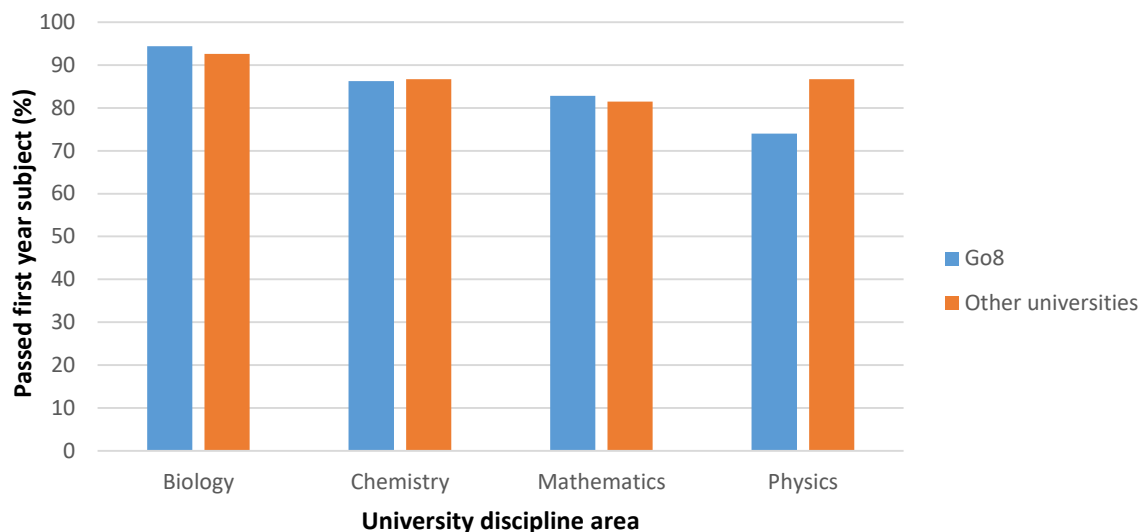


Figure 11 First year subject pass rates of students who had not undertaken General Mathematics, Mathematical Methods or Specialist Mathematics, by discipline and university type

At Go8 institutions, across each of the discipline areas examined in this report, the first year pass rates for the “low mathematics” group were similar or slightly lower than the pass rates for those whose highest level of senior secondary mathematics was General Mathematics (Appendix Table 9 to Table 12).

A somewhat different pattern is evident at non-Go8 institutions, where the “low mathematics” group had higher first year pass rates than students who had undertaken General Mathematics, Mathematical Methods or Specialist Mathematics in senior secondary school (Appendix Table 9 to Table 12). This apparent anomaly is explored below, first by more nuanced analysis incorporating the achievement levels of those who had undertaken General Mathematics or higher level mathematics in secondary school, and second, by including a consideration of ATAR scores.

The results of the more nuanced analysis revealed that it is important to take into consideration high school mathematics achievement levels. Among non-Go8 students, the first year pass rates of the “low mathematics” group tend to be *lower* than the pass rates of those with very high achievement in Mathematical Methods or Specialist Mathematics. However, among non-Go8 students, the pass rates for the “low mathematics” group tend to be *higher* than those for students with sound or low achievement in General Mathematics, Mathematical Methods or Specialist Mathematics (Appendix Table 18 to Table 21).

While the “low mathematics” group includes students who had undertaken Essential Mathematics, the study did not have data on the Essential Mathematics achievement levels of these students. However, information on overall school achievement (measured by ATAR) was available for analysis. As indicated earlier, one of the reasons suggested for students not undertaking mathematics or opting for lower level mathematics in senior secondary school is a desire to maximise ATAR scores. Figure 12 (see also Appendix Table 42 - Table 44) shows that among first year science students, the “low mathematics” group contains a mix of high and low achievers (as measured by ATAR). Among Go8 universities, 23% of this group had an ATAR of 90 or higher, while 21% had an ATAR below 90

and 56% had no ATAR recorded⁹. At non-Go8 universities, 12% of this group had an ATAR or 90 or more, while 7% had an ATAR below 70 and a further 13% had no ATAR recorded.

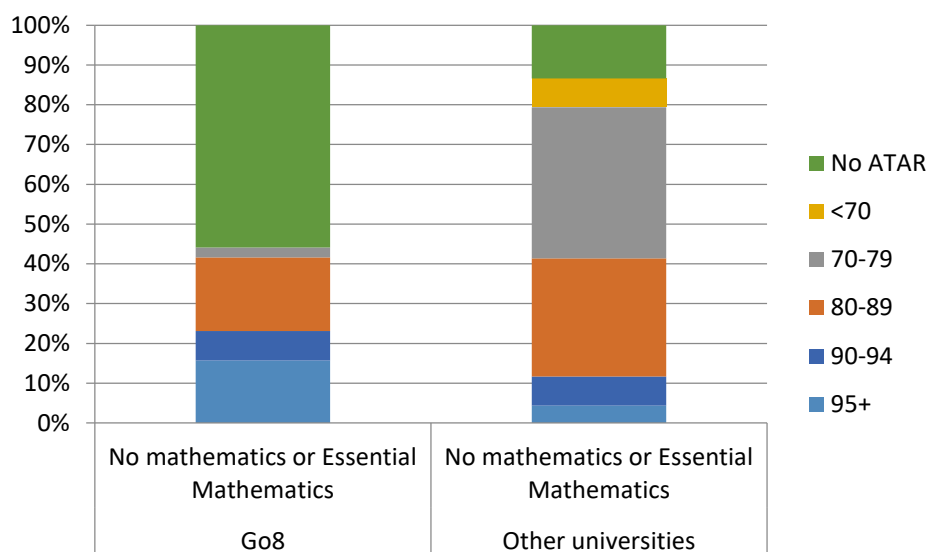


Figure 12 ATAR scores of students whose highest level of senior secondary mathematics was no mathematics or Essential Mathematics, by university type

The results of this study suggest that high achieving secondary students who do not undertake higher level mathematics in Year 12 can succeed in first year mathematics and science subjects. For example, virtually all students at Go8 institutions who had an ATAR of 95 or above but were in the “low mathematics” group passed their first year subjects in biology (Figure 13; Appendix Table 49) and chemistry (Figure 14; Appendix Table 50), and 94% of students with these characteristics passed first year mathematics (Figure 15; Appendix Table 51).¹⁰ This was similar to the pass rates of those who had studied Mathematical Methods or Specialist Mathematics in Year 12 and attained an ATAR of 95. A similar pattern is also evident across all disciplines in non-Go8 universities (Figure 13 to Figure 16; see also Appendix Table 49 to Table 52).

⁹ The ‘no ATAR’ group includes students who did not use an ATAR as a basis for admission to university. Previous research shows that the ‘no ATAR’ group contains students with a mix of abilities; some of these receive high ATARs, while others receive low ATARs or no ATAR. Reflecting this, Bachelor students with ‘no ATAR’ have a Bachelor completion rate that falls between those with ATARs below 70 and those with ATARs of 70 and above (Norton et al, 2019, 18-20).

¹⁰ Pass rates for first year physics students at Go8 institutions who had an ATAR or 95 or above but no senior secondary mathematics/Essential Mathematics only are not reported due to the low number of students with these characteristics (Figure 16; Table 52).

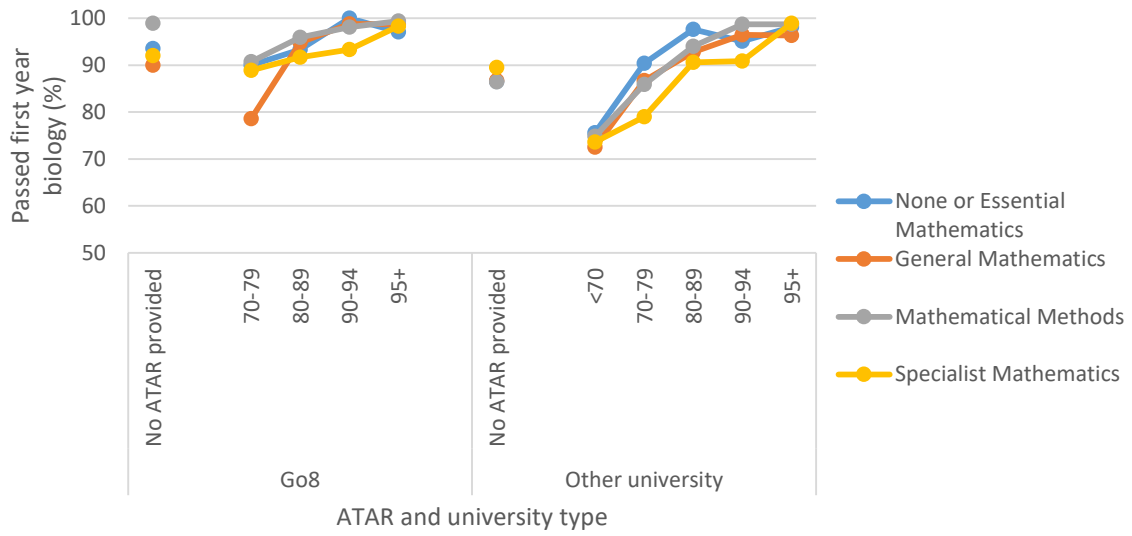


Figure 13 First year biology pass rates, by ATAR band, selected senior secondary subjects and university group

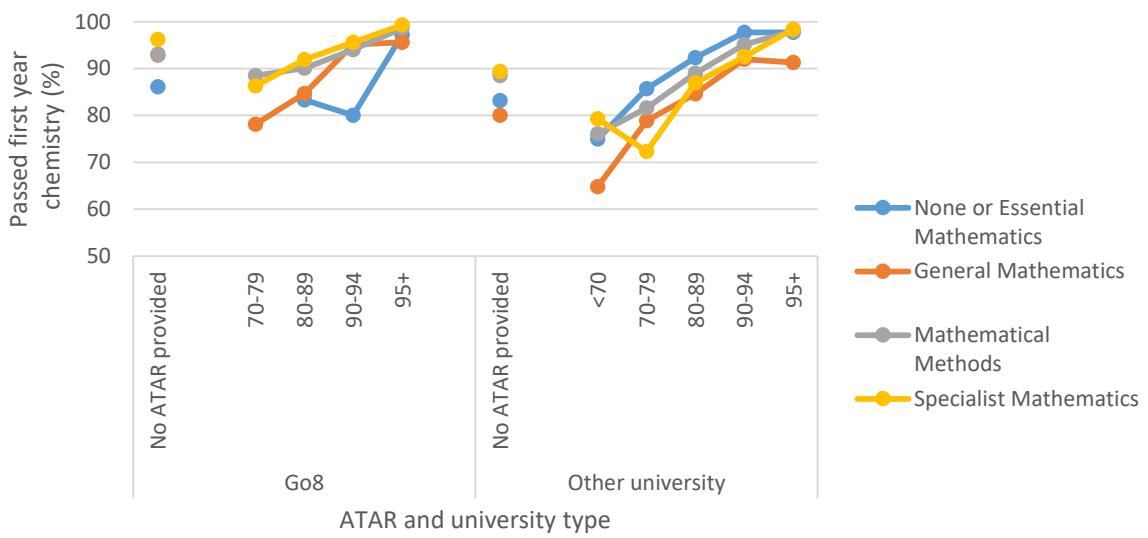


Figure 14 First year chemistry pass rates, by ATAR band, selected senior secondary subjects and university group

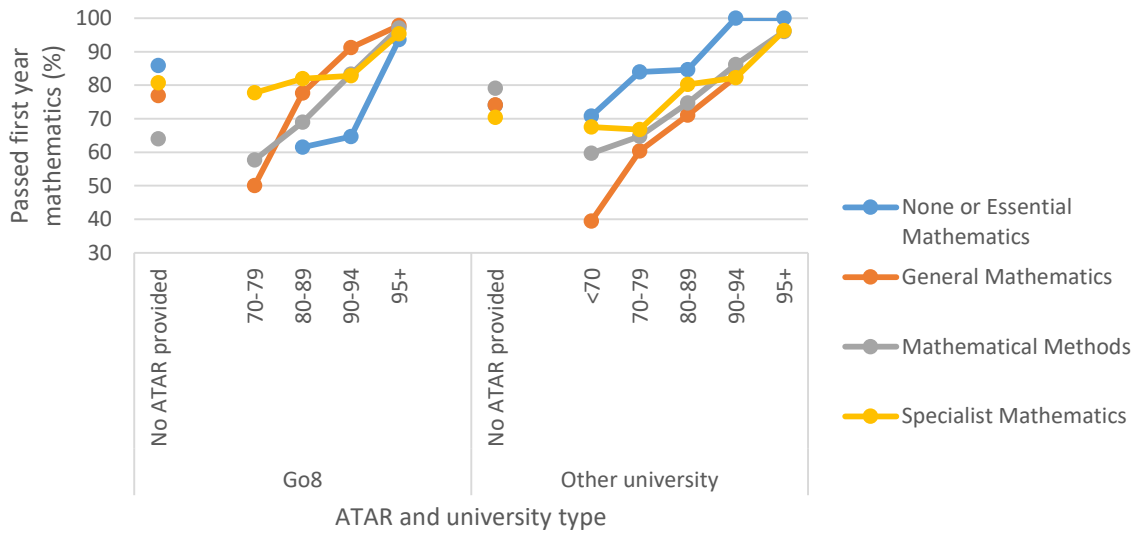


Figure 15 First year mathematics pass rates, by ATAR band, selected senior secondary subjects and university group

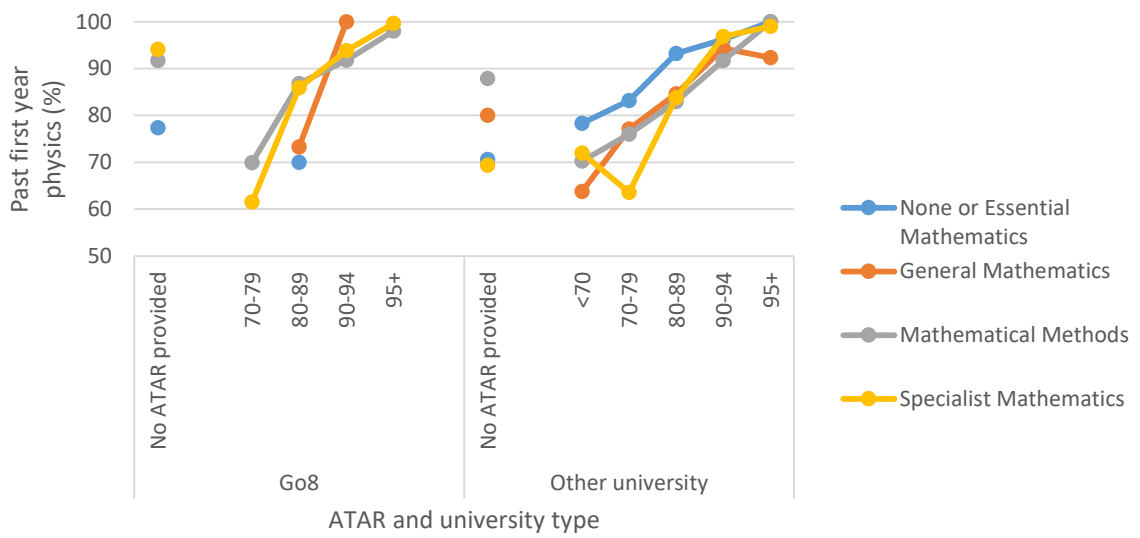


Figure 16 First year physics pass rates, by ATAR band, selected senior secondary subjects and university group

Summary

This study examined the mathematics backgrounds and first year subject outcomes of domestic undergraduate students who had undertaken study in biology, chemistry, mathematics or physics in a range of Australian universities. Within each university discipline and university group examined in this study, the most common highest level of mathematics that had been undertaken when the students were in senior secondary school was Mathematical Methods (the second highest level of senior secondary mathematics in the Australian curriculum). However, students' mathematical background varied by the type of university attended. For example, first year students at Go8 universities were more likely than students at other universities to have studied higher level mathematics when in senior secondary school.

The first sections of the report focused on the first year pass rates of students who had undertaken General Mathematics, Mathematical Methods or Specialist Mathematics while in school. While there are some nuanced differences between disciplines and between university types, a number of broad patterns in first year subject outcomes do emerge among these students:

- The highest level of mathematics undertaken in senior secondary school is related to overall first year pass rates in biology, chemistry, mathematics, and physics.
- Senior secondary school mathematics results are also related to first year pass rates.
- Students who were in the highest attainment band for General Mathematics in senior secondary school had very high first year pass rates in the disciplines considered (82% to 96%), as did those in the highest achievement band for Mathematical Methods or Specialist Mathematics (93% to 100%).
- Furthermore, students who were in the top two attainment bands for General Mathematics have similar or higher first year pass rates than students with borderline performance in Mathematical Methods or Specialist Mathematics.
- However, some groups experience relatively low first year pass rates. Of particular note in this regard are mathematics students who enter university with sound or lower achievement in General Mathematics, as well as Go8 mathematics students who enter with low/very low achievement in Mathematical Methods. At least half of each of these groups did not pass first year mathematics (although it should be noted that relatively few students were in each of these categories). Physics students with these characteristics also experienced relatively low pass rates (below 65%).

Multivariate modelling allowed an exploration of whether mathematics background is related to first year subject outcomes after taking into account ATAR, senior secondary background in a corresponding science discipline and other student characteristics. For Go8 institutions, the multivariate modelling helped to broadly confirm the results discussed above, with students' mathematical background remaining related to first year subject outcomes in each of the four disciplines examined, after controlling for these factors. This was also the case for first year biology, chemistry and mathematics (but not physics) subject outcomes at non-Go8 institutions. Some nuanced differences within discipline groups and university types were evident. The magnitude of the relationships and the specific aspects of mathematics background that are related to increased or decreased likelihood of passing varies across disciplines and institution groups.

In the final section of the report attention turned to the group of first year students who had not undertaken General Mathematics, Mathematical Methods or Specialist Mathematics in senior secondary school.

At Go8 institutions:

- In each of the disciplines examined, the proportion of students who had not completed General Mathematics or above in school was very low (2%-4%).
- First year pass rates for this group were similar or slightly lower than the pass rates for students whose highest level of senior secondary mathematics was General Mathematics.

At non-Go8 institutions:

- Between 17% and 28% of first year students had not completed General Mathematics or above in secondary school.
- Somewhat counter-intuitively, first year pass rates for this group were higher than the pass rate for students who had undertaken General Mathematics or above in school.
- More nuanced analysis showed that the first year pass rates for students without General Mathematics or above were *higher* than the pass rates of students with sound or low achievement in General Mathematics, Mathematical Methods or Specialist Mathematics. However, the pass rates for students without General Mathematics or above were *lower* than those of students with very high achievement in Mathematical Methods or Specialist Mathematics.

Finally, students who had not undertaken General Mathematics or higher level mathematics in secondary school contain a mix of high and low achievers (as measured by ATAR). In both Go8 and non-Go8 universities, very high achieving secondary school students (i.e. ATAR of 95 and above) who do not undertake General Mathematics or higher level mathematics in Year 12 tend to have very high first year pass rates, similar to students who had undertaken Mathematical Methods or Specialist Mathematics and attained high ATARs.

Discussion

There has been much debate about prerequisites for university mathematics and science courses. This study focused on success in first year biology, chemistry, mathematics and physics subjects, measured by pass rates.

Overall, our findings show that majority of first year students – including those who did not undertake General Mathematics, Mathematical Methods or Specialist Mathematics in Year 12 – do pass their first year biology, chemistry, mathematics and physics subjects, suggesting that universities are not admitting students under false pretences. Some groups do, however, perform better than others and this has implications for school subject choice, university admissions policies, and the support services provided to first year students.

The *level* of mathematics undertaken in senior secondary school counts, but so does Year 12 mathematics *performance*. Those who were strong performers in Year 12 mathematics (irrespective of the level of mathematics undertaken) have very high first year pass rates. Furthermore, students who were strong performers in General Mathematics achieve higher first year pass rates than students with marginal performance in Mathematical Methods or Specialist Mathematics. This is consistent with previous research based on chemistry, physics and mathematics students at one Go8 university (Nicholas et al, 2015), but differs from other findings based on chemistry students at a non-Go8 university (Armstrong et al, 2014).

The mathematical background of students upon entry to university is related to their first year subject outcomes even after taking into account students' science backgrounds and school attainment (measured by ATAR). In Go8 institutions, this was observed across each of the four disciplines examined in this study, while in non-Go8 institutions it was observed in three of the four disciplines.

Previous research has suggested that some (high performing) students avoid higher level mathematics subjects in senior secondary school in order to maximise their ATAR score. While we cannot directly address this issue, our findings demonstrate that the group of students who had not undertaken General Mathematics, Mathematical Methods or Specialist Mathematics do contain a mix of academic abilities (as measured by ATAR). Within this group, virtually all of those with a very high ATAR pass their first year subjects.

Of the disciplines examined in this report, mathematics and physics are the most mathematically intensive. The performance of first year students in these disciplines requires further comment. First year students with sound achievement or lower in General Mathematics and Go8 students with low/very low achievement in Mathematical Methods may require additional academic support on enrolment, as they experience particularly low first year mathematics and physics pass rates.

There are a number of caveats that should be considered when interpreting the results of this study. Importantly, we did not measure participation in bridging courses and other types of academic support currently provided by universities, which may be mitigating some of the effects of not entering university with a strong mathematics background. In addition, we did not take into account the type or difficulty of the first year subjects undertaken – essentially with the ACDS working group choosing all relevant subjects that were not judged to be 'catch-up' subjects for students who had not undertaken corresponding school subjects. It may be the case that students with lower levels of secondary mathematics and/or weak secondary mathematics grades are not entering the types of first year subjects which give access to majors/advanced study within the discipline in later years.

Finally, due to the difficulties of equating subject results across universities, we used pass rates rather than grades as our measure of success. Consequently, we are unable to assess the extent to which students with a weak mathematics background who pass first year subjects are just scraping through or achieving strong passes.

Further research, focusing on student pathways beyond first year could be considered in order to further explore the extent to which students with weak mathematics backgrounds are able to achieve strong passes in university mathematics and science subjects and progress to advanced study within their discipline. University case studies could also be considered, and would enable an exploration of the types of academic support currently provided by universities, which may mitigate the effects of entering university with a weak mathematics background. Furthermore, while complex and potentially providing more nuance than necessary, a study examining the actual grades of students at university within science disciplines (rather than pass/fail alone) and the relationship with secondary school outcomes could be considered in the future.

References

Armstrong, B., Fielding, M., Kirk, S. & Ramagge, J. (2014). Factors affecting success in CHEM101 at UOW, *Australian Mathematical Society Gazette*, 41, 91-98.

Australian Curriculum, Assessment and Reporting Authority (ACARA). (n.d.). Senior secondary curriculum: Mathematics. Retrieved from <https://www.australiancurriculum.edu.au/senior-secondary-curriculum/mathematics/>

Centre for Education Statistics and Evaluation. (2017). *Why aren't students studying higher level maths? How ATAR scaling may affect maths uptake*. Sydney: Department of Education. Retrieved from <https://www.cese.nsw.gov.au/publications-filter/why-aren-t-students-studying-higher-level-maths>

Department of Education and Training. *Higher Education Statistics Data Cube (uCube)*, accessed 26 June 2019 from <http://highereducationstatistics.education.gov.au/>

Hine, G. (2016). Investigating declining enrolments in secondary mathematics. In White, B., Chinnappan, M. & Trenholm, S. (eds.). *Opening up mathematics education research* (Proceedings of the 39th annual conference of the Mathematics Education Research Group of Australasia), pp. 287–294. Adelaide: MERGA. Retrieved from <https://www2.merga.net.au/documents/Hine.pdf>

Hine, G. (2017). Exploring reasons why Australian senior secondary students do not enrol in higher-level mathematics courses. In Downton, A., Livy, S. & Hall, J. (eds.), *40 years on: We are still learning!* (Proceedings of the 40th Annual Conference of the Mathematics Education Research Group of Australasia) (pp.309-316). Melbourne: MERGA. Retrieved from https://www2.merga.net.au/documents/Hine_Full_RP_FINAL.pdf

Kennedy, J., Lyons, T. & Quinn, F. (2014). The continuing decline of science and mathematics enrolments in Australian high schools. *Teaching Science*. 60(2), 34-46.

Koshy, P. (2018). *Equity Student Participation in Australian Higher Education 2012-2017*, Perth: National Centre for Student Equity in Higher Education, Curtin University, retrieved from https://www.ncsehe.edu.au/wp-content/uploads/2018/12/Equity-Student-Briefing-Note_2017-18_Final.pdf

Mathematical Association of New South Wales. (2014). Report on the MANSW 2013 Secondary Mathematics Teacher Survey. Retrieved from <https://www.mansw.nsw.edu.au/documents/item/70>

Norton, A., Cherastidtham, I., & Mackey, W. (2019). *Risks and rewards: When is vocational education a good alternative to higher education?* Grattan Institute.

Nicholas, J., Poladian, L., Mack, J. & Wilson, R. (2015). Mathematics preparation for university: entry, pathways and impact on performance in first year science and mathematics subjects. *International Journal of Innovation in Science and Mathematics Education*, 23(1), 37-51.

Pitt, D.G.W. (2015). On the scaling of NSW HSC marks in mathematics and encouraging higher participation in calculus-based courses. *Australian Journal of Education*, 59(1), 65-81.

Appendix: Supplementary tables

Table 4 Senior secondary subject levels, by state and territory

	Essential Mathematics	General Mathematics	Mathematical Methods	Specialist Mathematics
ACT	Essential Mathematics (A/M)	Mathematical Applications (T) Further Mathematics (T)	Mathematical Methods (T) Specialist Methods (T) Type 2	Specialist Mathematics (T)
NSW	Mathematics General 1 Mathematics Life Skills	Mathematics General 2 Mathematics (“2 Unit” Mathematics)	Mathematics Extension 1 (“3 Unit” Mathematics)	Mathematics Extension 2 (“4 Unit” Mathematics)
Qld	Functional Mathematics Prevocational Mathematics Numeracy: A Short Course Senior Syllabus	Mathematics A	Mathematics B	Mathematics C
SA/NT	Mathematics Pathways Mathematical applications	Mathematical Methods	Mathematical Studies	Specialist Mathematics
Tas	Everyday Maths Essential Skills – Maths Workplace Maths	Mathematics Applied General Mathematics	Mathematics Methods	Mathematics Specialised
Vic	Foundation Mathematics (Units 1 and 2)	Further Mathematics (Units 3 and 4)	Mathematical Methods (Units 3 and 4)	Specialist Mathematics (Units 3 and 4)
WA	Mathematics Essential Mathematics Foundation Mathematics Preliminary	Mathematics 2AB Mathematics 2CD Mathematical Applications	Mathematics 3AB Mathematics 3CD Mathematics Methods	Mathematics: Specialist 3AB Mathematics: Specialist 3CD Mathematics: Specialist
IB	-	Mathematics Studies SL	Mathematics SL	Mathematics HL Further Mathematics HL

Tables relating to Figure 1

Table 5 First year biology students, by selected senior secondary subjects and university group

University group	Senior secondary mathematics (Highest level)				Senior secondary biology	
	None or Essential Mathematics	General Mathematics	Mathematical Methods	Specialist Mathematics	Yes	No
Number						
Group of Eight	268	834	3,426	1,213	3,497	2,245
Other	1,190	1,271	1,993	403	3,513	1,344
Total	1,458	2,105	5,419	1,616	7,010	3,589
Per cent						
Group of Eight	4.7	14.5	59.7	21.1	60.9	39.1
Other	24.5	26.2	41.0	8.3	72.3	27.7
Total	13.8	19.9	51.1	15.2	66.1	33.9

Notes: Based on students who undertook a first year biology subject (n=10,599).

Table 6 First year chemistry students, by selected senior secondary subjects and university group

University group	Senior secondary mathematics (Highest level)				Senior secondary chemistry	
	None or Essential Mathematics	General Mathematics	Mathematical Methods	Specialist Mathematics	Yes	No
Number						
Group of Eight	233	690	3,286	1,422	4,492	1,140
Other	1,348	1,311	2,209	592	3,366	2,094
Total	1,581	2,001	5,495	2,014	7,858	3,234
Per cent						
Group of Eight	4.1	12.3	58.4	25.3	79.8	20.2
Other	24.7	24.0	40.5	10.8	61.7	38.4
Total	14.3	18.0	49.5	18.2	70.8	29.2

Notes: Based on students who undertook completed a first year chemistry subject (n=11,092).

Table 7 First year mathematics students, by selected senior secondary subjects and university group

University group	Senior secondary mathematics (Highest level)			
	None or Essential Mathematics	General Mathematics	Mathematical Methods	Specialist Mathematics
Number				
Group of Eight	256	526	1,873	1,666
Other	578	421	1,529	778
Total	834	947	3,402	2,444
Per cent				
Group of Eight	5.9	12.2	43.4	38.6
Other	17.5	12.7	46.3	23.5
Total	10.9	12.4	44.6	32.0

Notes: Based on students who undertook a first year mathematics subject (n=7,627).

Table 8 First year physics students, by selected senior secondary subjects and university group

University group	Senior secondary mathematics (Highest level)				Senior secondary physics	
	None or Essential Mathematics	General Mathematics	Mathematical Methods	Specialist Mathematics	Yes	No
Number						
Group of Eight	50	108	1,344	1,209	1,339	1,373
Other	759	587	896	506	1,296	1,452
Total	809	695	2,240	1,715	2,635	2,825
Per cent						
Group of Eight	1.8	4.0	49.6	44.6	49.4	50.6
Other	27.6	21.4	32.6	18.4	47.2	52.8
Total	14.8	12.7	41.0	31.4	48.3	51.7

Notes: Based on students who undertook a first year physics subject (n=5,460).

Tables relating to Figure 2 - Figure 5

Table 9 Percentage of students passing a first year university biology subject, by senior secondary subject participation and university group

Selected senior secondary subjects	Percentage passing first year biology subject		
	Group of Eight (n=5,742)	Other university (n=4,857)	Total (n=10,599)
School mathematics (highest level)			
None or Essential Mathematics	94.4	92.6	92.9
General Mathematics	94.0	86.6	89.6
Mathematical Methods	97.0	87.6	93.5
Specialist Mathematics	94.5	86.9	92.6
School mathematics (all participation)			
General Mathematics	94.8	84.9	90.6
Mathematical Methods	96.3	87.5	93.3
Specialist Mathematics	94.5	86.9	92.6
School biology			
Yes	97.0	90.0	93.5
No	94.1	84.5	90.5
Overall pass rate	95.9	88.5	93.5

Notes: Based on students who undertook a first year biology subject.

Table 10 Percentage of students passing a first year university chemistry subject, by senior secondary subject participation and university group

Selected senior secondary subjects	Percentage passing first year chemistry subject		
	Group of Eight (n=5,632)	Other university (n=5,460)	Total (n=11,092)
School mathematics (highest level)			
None or Essential Mathematics	86.3	86.7	86.6
General Mathematics	87.4	79.1	82.0
Mathematical Methods	93.0	84.9	89.8
Specialist Mathematics	95.5	85.6	92.6
School mathematics (all participation)			
General Mathematics	91.1	79.7	86.1
Mathematical Methods	93.7	85.1	90.5
Specialist Mathematics	95.5	85.6	92.6
School chemistry			
Yes	93.5	87.3	90.9
No	89.5	78.7	82.5
Overall pass rate	92.7	84.0	88.4

Notes: Based on students who undertook a first year chemistry subject.

Table 11 Percentage of students passing a first year university mathematics subject, by senior secondary subject participation and university group

Selected senior secondary subjects	Percentage passing first year mathematics subject		
	Group of Eight (n=4,323)	Other university (n=3,306)	Total (n=7,629)
School mathematics (highest level)			
None or Essential Mathematics	82.8	81.5	81.9
General Mathematics	82.7	58.9	72.1
Mathematical Methods	78.7	71.3	75.4
Specialist Mathematics	87.3	78.0	84.4
School mathematics (all participation)			
General Mathematics	82.1	68.2	78.1
Mathematical Methods	82.7	73.6	79.1
Specialist Mathematics	87.3	78.0	84.4
Overall pass rate	82.8	73.1	78.6

Notes: Based on students who undertook a first year mathematics subject.

Table 12 Percentage of students passing a first year university physics subject, by senior secondary subject participation and university group

Selected senior secondary subjects	Percentage passing first year physics subject		
	Group of Eight (n=2,712)	Other university (n=2,748)	Total (n=5,460)
School mathematics (highest level)			
None or Essential Mathematics	74.0	86.7	85.9
General Mathematics	77.8	79.2	79.0
Mathematical Methods	89.8	79.9	85.9
Specialist Mathematics	92.6	81.2	89.2
School mathematics (all participation)			
General Mathematics	88.5	80.5	84.8
Mathematical Methods	91.2	80.5	87.4
Specialist Mathematics	92.6	81.2	89.2
School physics			
Yes	90.3	80.9	85.7
No	90.2	82.8	86.4
Overall pass rate	90.3	81.9	86.0

Notes: Based on students who undertook a first year physics subject.

Tables relating to Figure 6 - Figure 9 (sample sizes)

Table 13 Senior secondary science results, by university group

	Very high	High	Sound	Low/ very low	Not studied	Total
Number						
Biology						
Go8	583	1,965	939	5	2,245	5,737
Other	272	1,705	1,112	85	1,199	4,373
Total	855	3,670	2,051	90	3,444	10,110
Chemistry						
Go8	373	1,666	2,380	71	1,140	5,630
Other	214	1,388	1,134	246	1,925	4,907
Total	587	3,054	3,514	317	3,065	10,537
Physics						
Go8	152	722	455	8	1,373	2,710
Other	92	592	497	58	1,415	2,654
Total	244	1,314	952	66	2,788	5,364
Row per cent						
Biology						
Go8	10.2	34.3	16.4	0.1	39.1	100.0
Other	6.2	39.0	25.4	1.9	27.4	100.0
Total	8.5	36.3	20.3	0.9	34.1	100.0
Chemistry						
Go8	6.6	29.6	42.3	1.3	20.3	100.0
Other	4.4	28.3	23.1	5.0	39.2	100.0
Total	5.6	29.0	33.4	3.0	29.1	100.0
Physics						
Go8	5.6	26.6	16.8	0.3	50.7	100.0
Other	3.5	22.3	18.7	2.2	53.3	100.0
Total	4.6	24.5	17.8	1.2	52.0	100.0

Notes: Based on students who undertook a first year subject in the specified discipline. Excludes students whose results were missing or uncodeable.

Table 14 University biology students: Senior secondary mathematics results, by university group

	Very high	High	Sound	Low/ very low	Total participated
<i>Number</i>					
No math or Essential Mathematics					
Go8	-	-	-	-	268
Other	-	-	-	-	947
Total	-	-	-	-	1,215
General Mathematics					
Go8	139	568	124	*	834
Other	135	584	366	100	1,185
Total	274	1,152	490	103	2,019
Mathematical Methods					
Go8	82	806	2,393	140	3,421
Other	71	433	1,026	297	1,827
Total	153	1,239	3,419	437	5,248
Specialist Mathematics					
Go8	109	255	730	113	1,207
Other	76	70	141	81	368
Total	185	325	871	194	1,575
<i>Row per cent</i>					
No math or Essential Mathematics					
Go8	-	-	-	-	100.0
Other	-	-	-	-	100.0
Total	-	-	-	-	100.0
General Mathematics					
Go8	16.7	68.1	14.9	*	100.0
Other	11.4	49.3	30.9	8.4	100.0
Total	13.6	57.1	24.3	5.1	100.0
Mathematical Methods					
Go8	2.4	23.6	70.0	4.1	100.0
Other	3.9	23.7	56.2	16.3	100.0
Total	2.9	23.6	65.2	8.3	100.0
Specialist Mathematics					
Go8	9.0	21.1	60.5	9.4	100.0
Other	20.7	19.0	38.3	22.0	100.0
Total	11.8	20.6	55.3	12.3	100.0

Notes: Based on university students who undertook a first year biology subject. Excludes students whose results were missing or uncodeable.

* The number of students in this category is less than 5.

Table 15 University chemistry students: Senior secondary mathematics results, by university group

	Very high	High	Sound	Low/ very low	Total participated
<i>Number</i>					
No mathematics or Essential Mathematics					
Go8	-	-	-	-	233
Other	-	-	-	-	1,126
Total	-	-	-	-	1,359
General Mathematics					
Go8	121	490	76	*	690
Other	137	609	345	107	1,198
Total	258	1,099	421	110	1,888
Mathematical Methods					
Go8	93	880	2,208	103	3,284
Other	99	532	1,111	288	2,030
Total	192	1,412	3,319	391	5,314
Specialist Mathematics					
Go8	129	337	838	112	1,416
Other	106	121	197	91	515
Total	235	458	1,035	203	1,931
<i>Row per cent</i>					
No mathematics or Essential Mathematics					
Go8	-	-	-	-	100.0
Other	-	-	-	-	100.0
Total	-	-	-	-	100.0
General Mathematics					
Go8	17.5	71.0	11.0	*	100.0
Other	11.4	50.8	28.8	8.9	100.0
Total	13.7	58.2	22.3	5.8	100.0
Mathematical Methods					
Go8	2.8	26.8	67.2	3.1	100.0
Other	4.9	26.2	54.7	14.2	100.0
Total	3.6	26.6	62.5	7.4	100.0
Specialist Mathematics					
Go8	9.1	23.8	59.2	7.9	100.0
Other	20.6	23.5	38.3	17.7	100.0
Total	12.2	23.7	53.6	10.5	100.0

Notes: Based on university students who undertook a first year chemistry subject. Excludes students whose results were missing or uncodeable.

* The number of students in this category is less than 5.

Table 16 University mathematics students: Senior secondary mathematics results, by university group

	Very high	High	Sound	Low/ very low	Total participated
<i>Number</i>					
No mathematics or Essential Mathematics					
Go8	-	-	-	-	256
Other	-	-	-	-	558
Total	-	-	-	-	814
General Mathematics					
Go8	106	398	22	0	526
Other	24	116	175	52	367
Total	130	514	197	52	893
Mathematical Methods					
Go8	161	760	919	32	1,872
Other	67	373	827	165	1,432
Total	228	1,133	1,746	197	3,304
Specialist Mathematics					
Go8	161	402	1,009	89	1,662
Other	115	207	277	82	681
Total	276	609	1,286	171	2,343
<i>Row per cent</i>					
No mathematics or Essential Mathematics					
Go8	-	-	-	-	100.0
Other	-	-	-	-	100.0
Total	-	-	-	-	100.0
General Mathematics					
Go8	20.2	75.7	4.2	0.0	100.0
Other	6.5	31.6	47.7	14.2	100.0
Total	14.6	57.6	22.1	5.8	100.0
Mathematical Methods					
Go8	8.6	40.6	49.1	1.7	100.0
Other	4.7	26.1	57.8	11.5	100.0
Total	6.9	34.3	52.9	6.0	100.0
Specialist Mathematics					
Go8	9.69	24.2	60.75	5.36	100.0
Other	16.9	30.4	40.7	12.0	100.0
Total	11.8	26.0	54.9	7.3	100.0

Notes: Based on university students who undertook a first year mathematics subject. Excludes students whose results were missing or uncodeable.

Table 17 University physics students: Senior secondary mathematics results, by university group

	Very high	High	Sound	Low/ very low	Total participated
<i>Number</i>					
No mathematics or Essential Mathematics					
Go8	-	-	-	-	50
Other	-	-	-	-	755
Total	-	-	-	-	805
General Mathematics					
Go8	23	82	*	*	107
Other	71	358	90	22	541
Total	94	440	92	22	648
Mathematical Methods					
Go8	68	431	830	15	1,344
Other	41	279	431	102	853
Total	109	710	1,261	117	2,197
Specialist Mathematics					
Go8	90	280	781	58	1,209
Other	96	139	167	56	458
Total	186	419	948	114	1,667
<i>Row per cent</i>					
No mathematics or Essential Mathematics					
Go8	-	-	-	-	100.0
Other	-	-	-	-	100.0
Total	-	-	-	-	100.0
General Mathematics					
Go8	21.5	76.6	*	*	100.0
Other	13.1	66.2	16.6	4.1	100.0
Total	14.5	67.9	14.2	3.4	100.0
Mathematical Methods					
Go8	5.1	32.1	61.8	1.1	100.0
Other	4.8	32.7	50.5	12.0	100.0
Total	5.0	32.3	57.4	5.3	100.0
Specialist Mathematics					
Go8	7.4	23.2	64.6	4.8	
Other	21.0	30.4	36.5	12.2	100.0
Total	11.2	25.1	56.9	6.8	100.0

Notes: Based on university students who undertook a first year physics subject. Excludes students whose results were missing or uncodeable.

* The number of students in this category is less than 5.

Tables relating to Figure 6 - Figure 9 (pass rates)

Table 18 First year biology performance (% passed), by senior secondary subject participation and achievement band

Senior secondary subject	Very high	High	Sound	Low/ very low	Not studied
Group of Eight (n=5,730)[#]					
Mathematics (highest level)					
No maths or Essential Mathematics	-	-	-	-	94.4
General Mathematics	95.7	94.4	91.1	*	
Mathematical Methods	100.0	97.2	97.0	95.7	
Specialist Mathematics	99.1	96.5	93.8	89.4	
Biology	98.1	96.9	96.7	*	94.1
Other university (n=4,327)[#]					
Mathematics (highest level)					
No maths or Essential Mathematics	-	-	-	-	92.8
General Mathematics	95.6	91.3	77.6	75.0	
Mathematical Methods	98.6	95.8	85.0	79.1	
Specialist Mathematics	100.0	91.4	81.6	82.7	
Biology	97.8	93.4	85.1	57.7	83.6
Total (n=10,057)[#]					
Mathematics (highest level)					
No maths or Essential Mathematics	-	-	-	-	93.2
General Mathematics	95.6	92.8	81.0	74.8	
Mathematical Methods	99.4	96.7	93.4	84.4	
Specialist Mathematics	99.5	95.4	91.9	86.6	
Biology	98.0	95.3	90.4	60.0	90.5

Notes: Based on students who undertook a first year biology subject. Excludes students whose senior secondary subject results were missing or uncodeable.

For the size of the various subgroups, refer to Table 13 and Table 14.

* Result not reported as the number of students with this level of senior secondary mathematics and school mathematics results is less than 5

Table 19 First year chemistry performance (% passed), by senior secondary subject participation and achievement band

Senior secondary subject	Very high	High	Sound	Low/ very low	Not studied
Group of Eight (n=5,623)[#]					
Mathematics (highest level)					
No maths or Essential Mathematics	-	-	-	-	86.3
General Mathematics	93.4	88.6	73.7	*	
Mathematical Methods	97.9	96.9	91.6	85.4	
Specialist Mathematics	100.0	99.1	94.3	88.4	
Chemistry	97.9	96.1	90.9	94.4	89.5
Other university (n=4,869)[#]					
Mathematics (highest level)					
No maths or Essential Mathematics	-	-	-	-	88.5
General Mathematics	87.6	80.8	72.2	68.2	
Mathematical Methods	98.0	94.0	79.6	83.0	
Specialist Mathematics	100.0	86.8	81.7	81.3	
Chemistry	98.6	92.9	80.2	82.5	78.5
Total (n=10,492)[#]					
Mathematics (highest level)					
No maths or Essential Mathematics	-	-	-	-	88.1
General Mathematics	90.3	84.3	72.5	66.4	
Mathematical Methods	97.9	95.8	87.6	83.6	
Specialist Mathematics	100.0	95.9	91.9	85.2	
Chemistry	98.1	94.7	87.5	85.2	82.6

Notes: Based on students who undertook a first year chemistry subject. Excludes students whose senior secondary subject results were missing or uncodeable.

For the size of the various subgroups, refer to Table 13 and Table 15.

* Result not reported as the number of students with this level of senior secondary mathematics and school mathematics results is less than 5

Table 20 First year mathematics performance (% passed), by senior secondary subject participation and achievement band

Senior secondary subject	Very high	High	Sound	Low/ very low	Not studied
Group of Eight (n=4,316)[#]					
Mathematics (highest level)					
No maths or Essential Mathematics	-	-	-	-	82.1
General Mathematics	91.5	82.2	50.0	*	
Mathematical Methods	98.8	89.0	67.7	50.0	
Specialist Mathematics	99.4	95.5	84.1	66.3	
Other university (n=3,038)[#]					
Mathematics (highest level)					
No maths or Essential Mathematics	-	-	-	-	81.7
General Mathematics	83.3	67.2	49.7	38.5	
Mathematical Methods	95.5	79.9	64.2	77.0	
Specialist Mathematics	93.0	78.3	72.2	79.3	
Total (n=7,354)[#]					
Mathematics (highest level)					
No maths or Essential Mathematics	-	-	-	-	82.1
General Mathematics	90.0	78.8	49.8	38.5	
Mathematical Methods	97.8	86.0	66.0	72.6	
Specialist Mathematics	96.7	89.7	81.6	72.5	

Notes: Based on students who undertook a first year mathematics subject. Excludes students whose senior secondary subject results were missing or uncodeable.

For the size of the various subgroups, refer to Table 13 and Table 16.

* Result not reported as the number of students with this level of senior secondary mathematics and school mathematics results is less than 5

Table 21 First year physics performance (% passed), by senior secondary subject participation and achievement band

Senior secondary subject	Very high	High	Sound	Low/ very low	Not studied
Group of Eight (n=2,710)[#]					
Mathematics (highest level)					
No maths or Essential Mathematics	-	-	-	-	74.0
General Mathematics	82.6	75.6	*	*	
Mathematical Methods	95.6	94.0	87.7	60.0	
Specialist Mathematics	100.0	96.1	91.8	74.1	
Physics	98.7	91.0	86.6	75.0	90.2
Other university (n=2,607)[#]					
Mathematics (highest level)					
No maths or Essential Mathematics	-	-	-	-	86.9
General Mathematics	94.4	82.1	63.3	63.6	
Mathematical Methods	92.7	82.4	75.6	87.3	
Specialist Mathematics	97.9	86.3	70.1	80.4	
Physics	96.7	85.5	72.6	72.4	82.8
Total (n=5,317)[#]					
Mathematics (highest level)					
No maths or Essential Mathematics	-	-	-	-	86.1
General Mathematics	91.5	80.9	64.1	63.6	
Mathematical Methods	94.5	89.4	83.6	83.8	
Specialist Mathematics	98.9	92.8	88.0	77.2	
Physics	98.0	88.5	79.3	72.7	86.5

Notes: Based on students who undertook a first year physics subject. Excludes students whose senior secondary subject results were missing or uncodeable.

For the size of the various subgroups, refer to Table 13 and Table 17.

* Result not reported as the number of students with this level of senior secondary mathematics and school mathematics results is less than 5.

First year biology in Go8 universities, by school mathematics (highest level and achievement band) and ATAR

Table 22 Number of Go8 first year biology students, by senior secondary mathematics (highest level and achievement band), participation in senior secondary biology and ATAR

ATAR	All students		Senior secondary mathematics achievement band							
			Very high		High		Sound		Low/ very low	
	Year 12 biol	No Year 12 biol	Year 12 biol	No Year 12 biol	Year 12 biol	No Year 12 biol	Year 12 biol	No Year 12 biol	Year 12 biol	No Year 12 biol
General Mathematics (n=834)										
95+	55	23	21	15	33	7	*	*	*	*
90-94	129	39	38	13	82	24	9	*	*	*
80-89	323	157	29	20	241	104	52	33	*	*
70-79	55	43	*	*	35	32	16	10	*	*
<70	*	*	*	*	*	*	*	*	*	*
No ATAR	8	*	*	*	8	*	*	*	*	*
Total	570	264	91	48	399	169	78	46	*	*
Mathematical Methods (n=3421)										
95+	492	211	29	39	252	114	211	57	*	*
90-94	698	249	6	*	184	80	502	163	6	5
80-89	933	537	*	*	89	58	803	430	38	49
70-79	95	116	*	*	*	*	79	87	13	28
<70	*	*	*	*	*	*	*	*	*	*
No ATAR	60	29	*	*	12	13	46	14	*	*
Total	2278	1143	40	42	540	266	1641	752	57	83
Specialist Mathematics (n=1207)										
95+	209	251	24	80	88	106	97	65	*	*
90-94	157	139	*	*	13	23	137	111	7	*
80-89	194	188	*	*	8	8	143	148	43	32
70-79	19	25	*	*	*	*	7	12	12	13
<70	*	*	*	*	*	*	*	*	*	*
No ATAR	8	17	*	*	*	6	*	6	*	*
Total	587	620	24	85	112	143	388	342	63	50

Note: Based on Go8 university students who undertook a first year biology subject. Excludes students whose senior secondary school mathematics results were missing or uncodeable.

* The number of students in this category is less than 5.

Table 23 Go8 first year biology pass rates, by senior secondary mathematics (highest level and achievement band), participation in senior secondary biology and ATAR

ATAR	All students		Senior secondary mathematics achievement band							
			Very high		High		Sound		Low/ very low	
	Year 12 biol	No Year 12 biol	Year 12 biol	No Year 12 biol	Year 12 biol	No Year 12 biol	Year 12 biol	No Year 12 biol	Year 12 biol	No Year 12 biol
General Mathematics										
95+	100.0	95.7	100.0	93.3	100.0	100.0	*	*	*	*
90-94	98.5	100.0	94.7	100.0	100.0	100.0	100.0	*	*	*
80-89	94.7	94.9	96.6	90.0	95.0	95.2	92.3	97.0	*	*
70-79	85.5	69.8	*	*	82.9	75.0	87.5	60.0	*	*
<70	*	*	*	*	*	*	*	*	*	*
No ATAR	87.5	*	*	*	87.5	*	*	*	*	*
Total	95.1	91.7	96.7	93.8	95.2	92.3	92.3	89.1	*	*
Mathematical Methods										
95+	99.4	99.5	100.0	100.0	99.2	99.1	99.5	100.0	*	*
90-94	99.4	94.4	100.0	*	98.4	95.0	99.8	93.9	100.0	100.0
80-89	96.9	94.2	*	*	94.4	89.7	97.1	94.9	97.4	93.9
70-79	84.2	96.6	*	*	*	*	83.5	96.6	92.3	96.4
<70	*	*	*	*	*	*	*	*	*	*
No ATAR	98.3	100.0	*	*	91.7	100.0	100.0	100.0	*	*
Total	97.7	95.6	100.0	100.0	97.8	95.9	97.7	95.4	96.5	95.2
Specialist Mathematics										
95+	98.6	98.0	100.0	98.8	98.9	98.1	97.9	96.9	*	*
90-94	97.5	88.5	*	*	100.0	95.7	97.8	87.4	85.7	*
80-89	96.4	86.7	*	*	75.0	87.5	97.2	87.2	97.7	84.4
70-79	89.5	88.0	*	*	*	*	100.0	91.7	83.3	84.6
<70	*	*	*	*	*	*	*	*	*	*
No ATAR	87.5	94.1	*	*	66.7	83.3	100.0	100.0	*	*
Total	97.1	91.9	100.0	98.8	96.4	96.5	97.7	89.5	93.7	84.0

Note: Based on Go8 university students who undertook a first year biology subject. Excludes students whose senior secondary school mathematics results were missing or uncodeable.

* Results not reported as the number of students with this level of senior secondary mathematics, senior secondary mathematics achievement band and ATAR is less than 5.

First year biology in non-Go8 universities, by school mathematics (highest level and achievement band) and ATAR

Table 24 Number of non-Go8 first year biology students, by senior secondary mathematics (highest level and achievement band), participation in senior secondary biology and ATAR

ATAR	All students		Senior secondary mathematics achievement band							
			Very high		High		Sound		Low/ very low	
	Year 12 biol	No Year 12 biol	Year 12 biol	No Year 12 biol	Year 12 biol	No Year 12 biol	Year 12 biol	No Year 12 biol	Year 12 biol	No Year 12 biol
General Mathematics (n= 1185)										
95+	23	*	9	*	12	*	*	*	*	*
90-94	74	9	32	5	23	*	16	*	*	*
80-89	278	48	44	11	160	22	60	13	14	*
70-79	392	81	20	*	227	50	114	20	31	7
<70	213	55	*	*	59	23	116	20	34	8
No ATAR	7	*	*	*	*	*	*	*	*	*
Total	987	198	109	26	485	99	311	55	82	18
Mathematical Methods (n= 1827)										
95+	110	27	37	12	55	13	16	*	*	*
90-94	113	35	8	*	60	22	39	8	6	*
80-89	338	122	7	*	122	47	173	64	36	9
70-79	395	123	*	*	66	25	265	80	64	17
<70	340	111	*	*	15	*	219	77	106	33
No ATAR	77	36	*	*	6	*	55	28	16	7
Total	1373	454	52	19	324	109	767	259	230	67
Specialist Mathematics (n= 368)										
95+	40	49	30	39	8	8	*	*	*	*
90-94	13	8	*	*	5	*	*	*	*	*
80-89	50	29	*	*	16	10	28	16	*	*
70-79	35	41	*	*	*	6	21	19	10	16
<70	42	29	*	*	*	*	14	17	25	12
No ATAR	17	15	*	*	*	*	8	6	5	5
Total	197	171	36	40	39	31	77	64	45	36

Note: Based on non-Go8 university students who undertook a first year biology subject. Excludes students whose senior secondary school mathematics results were missing or uncodeable.

* The number of students in this category is less than 5.

Table 25 Non-Go8 first year biology pass rates, by senior secondary mathematics (highest level and achievement band), participation in senior secondary biology and ATAR

ATAR	All students		Senior secondary mathematics achievement band							
			Very high		High		Sound		Low/ very low	
	Year 12 biol	No Year 12 biol	Year 12 biol	No Year 12 biol	Year 12 biol	No Year 12 biol	Year 12 biol	No Year 12 biol	Year 12 biol	No Year 12 biol
General Mathematics										
95+	95.7	*	100.0	*	100.0	*	*	*	*	*
90-94	96.0	100.0	96.9	100.0	100.0	*	87.5	*	*	*
80-89	93.5	89.6	97.7	90.9	95.0	90.9	86.7	84.6	92.9	*
70-79	88.8	79.0	100.0	*	91.6	88.0	83.3	55.0	80.7	85.7
<70	75.1	61.8	*	*	86.4	65.2	72.4	60.0	64.7	50.0
No ATAR	85.7	*	*	*	*	*	*	*	*	*
Total	87.8	77.8	97.3	88.5	92.8	83.8	79.7	65.5	76.8	66.7
Mathematical Methods										
95+	98.2	100.0	97.3	100.0	100.0	100.0	100.0	*	*	*
90-94	95.9	88.5	100.0	*	100.0	100.0	94.9	100.0	100.0	*
80-89	87.3	81.3	100.0	*	97.5	91.5	96.0	84.4	88.9	100.0
70-79	77.7	65.8	*	*	93.9	84.0	88.3	81.3	76.6	76.5
<70	93.5	69.4	*	*	86.7	*	74.9	70.1	82.1	54.6
No ATAR	98.2	100.0	*	*	83.3	*	96.4	71.4	87.5	57.1
Total	89.2	80.8	98.1	100.0	96.9	92.7	87.4	78.0	82.6	67.2
Specialist Mathematics										
95+	97.5	100.0	100.0	100.0	100.0	100.0	*	*	*	*
90-94	92.3	100.0	*	*	80.0	*	*	*	*	*
80-89	94.0	86.2	*	*	93.8	90.0	92.9	87.5	*	*
70-79	82.9	78.1	*	*	*	83.3	76.2	68.4	90.0	87.5
<70	76.2	69.0	*	*	*	*	85.7	58.8	76.0	83.3
No ATAR	94.1	86.7	*	*	*	*	87.5	100.0	100.0	60.0
Total	88.8	86.0	100.0	100.0	89.7	93.6	85.7	76.6	84.4	80.6

Note: Based on non-Go8 university students who undertook a first year biology subject. Excludes students whose senior secondary school mathematics results were missing or uncodeable.

* Results not reported as the number of students with this level of senior secondary mathematics, senior secondary mathematics achievement band and ATAR is less than 5.

First year chemistry in Go8 universities, by school mathematics (highest level and achievement band) and ATAR

Table 26 Number of Go8 first year chemistry students, by senior secondary mathematics (highest level and achievement band), participation in senior secondary chemistry and ATAR

ATAR	All students		Senior secondary mathematics achievement band							
			Very high		High		Sound		Low/ very low	
	Year 12 chem	No Year 12 chem	Year 12 chem	No Year 12 chem	Year 12 chem	No Year 12 chem	Year 12 chem	No Year 12 chem	Year 12 chem	No Year 12 chem
General Mathematics (n=690)										
95+	45	23	15	15	29	8	*	*	*	*
90-94	91	52	30	16	60	31	*	5	*	*
80-89	251	141	30	13	182	113	38	15	*	*
70-79	41	32	*	*	28	25	10	6	*	*
<70	*	*	*	*	*	*	*	*	*	*
No ATAR	6	8	*	*	6	8	*	*	*	*
Total	434	256	76	45	305	185	50	26	*	*
Mathematical Methods (n=3284)										
95+	619	85	64	12	355	35	199	38	*	*
90-94	808	124	8	*	262	27	533	94	5	*
80-89	1150	219	*	*	141	30	956	175	50	12
70-79	146	46	*	*	7	*	115	36	24	9
<70	*	*	*	*	*	*	*	*	*	*
No ATAR	70	17	*	*	17	5	51	11	*	*
Total	2793	491	77	16	782	98	1854	354	80	23
Specialist Mathematics (n=1416)										
95+	471	67	100	20	223	31	148	16	*	*
90-94	326	33	*	*	45	8	268	23	10	*
80-89	368	76	*	*	16	6	290	60	62	10
70-79	36	13	*	*	*	*	15	6	21	7
<70	*	*	*	*	*	*	*	*	*	*
No ATAR	17	9	*	*	7	*	7	5	*	*
Total	1218	198	105	24	291	46	728	110	94	18

Note: Based on Go8 university students who undertook a first year chemistry subject. Excludes students whose senior secondary school mathematics results were missing or uncodeable.

* The number of students in this category is less than 5.

Table 27 Go8 first year chemistry pass rates, by senior secondary mathematics (highest level and achievement band), participation in senior secondary chemistry and ATAR

ATAR	All students		Senior secondary mathematics achievement band							
			Very high		High		Sound		Low/ very low	
	Year 12 chem	No Year 12 chem	Year 12 chem	No Year 12 chem	Year 12 chem	No Year 12 chem	Year 12 chem	No Year 12 chem	Year 12 chem	No Year 12 chem
General Mathematics										
95+	95.6	95.7	100.0	93.3	93.1	100.0	*	*	*	*
90-94	95.6	94.2	100.0	87.5	93.3	100.0	*	80.0	*	*
80-89	90.4	74.5	93.3	76.9	93.4	77.0	76.3	53.3	*	*
70-79	85.4	68.8	*	*	89.3	68.0	90.0	66.7	*	*
<70	*	*	*	*	*	*	*	*	*	*
No ATAR	100.0	87.5	*	*	100.0	87.5	*	*	*	*
Total	91.7	80.1	97.4	86.7	93.1	81.1	80.0	61.5	*	*
Mathematical Methods										
95+	98.4	100.0	100.0	100.0	98.6	100.0	98.0	100.0	*	*
90-94	93.9	94.4	87.5	*	97.7	96.3	92.1	93.6	100.0	*
80-89	90.2	90.0	*	*	94.3	83.3	89.8	92.6	86.0	75.0
70-79	87.7	91.3	*	*	85.7	*	88.7	88.9	83.3	100.0
<70	*	*	*	*	*	*	*	*	*	*
No ATAR	92.9	94.1	*	*	100.0	80.0	90.2	100.0	*	*
Total	93.0	93.1	98.7	93.8	97.4	92.9	91.3	93.5	85.0	87.0
Specialist Mathematics										
95+	99.2	100.0	100.0	100.0	100.0	100.0	97.3	100.0	*	*
90-94	95.1	100.0	*	*	97.8	100.0	94.8	100.0	90.0	*
80-89	91.9	92.1	*	*	93.8	83.3	92.4	91.7	88.7	100.0
70-79	83.3	92.3	*	*	*	*	86.7	83.3	81.0	100.0
<70	*	*	*	*	*	*	*	*	*	*
No ATAR	94.1	100.0	*	*	100.0	*	100.0	100.0	*	*
Total	95.3	96.5	100.0	100.0	99.3	97.8	94.2	94.6	86.2	100.0

Note: Based on Go8 university students who undertook a first year chemistry subject. Excludes students whose senior secondary school mathematics results were missing or uncodeable.

* Results not reported as the number of students with this level of senior secondary mathematics, senior secondary mathematics achievement band and ATAR is less than 5.

First year chemistry in non-Go8 universities, by school mathematics (highest level and achievement band) and ATAR

Table 28 Number of non-Go8 first year chemistry students, by senior secondary mathematics (highest level and achievement band), participation in senior secondary chemistry and ATAR

ATAR	All students		Senior secondary mathematics achievement band							
			Very high		High		Sound		Low/ very low	
	Year 12 chem	No Year 12 chem	Year 12 chem	No Year 12 chem	Year 12 chem	No Year 12 chem	Year 12 chem	No Year 12 chem	Year 12 chem	No Year 12 chem
General Mathematics (n= 1198)										
95+	*	17	*	9	*	6	*	*	*	*
90-94	30	43	18	18	8	13	*	11	*	*
80-89	132	205	35	26	70	119	23	47	4	13
70-79	173	321	9	14	108	197	45	83	11	27
<70	88	172	*	5	28	52	50	75	10	40
No ATAR	6	8	*	*	*	*	*	*	*	*
Total	432	766	64	73	218	391	124	221	26	81
Mathematical Methods (n= 2030)										
95+	117	18	56	*	49	12	9	*	*	*
90-94	115	42	18	*	67	22	24	17	6	*
80-89	407	114	11	*	174	45	191	54	31	12
70-79	485	162	*	*	96	37	336	98	52	27
<70	338	119	*	*	15	*	227	76	96	39
No ATAR	95	18	*	*	10	*	64	13	18	*
Total	1557	473	89	10	411	121	851	260	206	82
Specialist Mathematics (n= 515)										
95+	116	5	83	*	27	*	5	*	*	*
90-94	48	*	12	*	21	*	13	*	*	*
80-89	102	16	6	*	34	6	53	8	9	*
70-79	97	17	*	*	17	*	52	9	28	5
<70	63	11	*	*	*	*	33	*	29	7
No ATAR	34	*	*	*	7	*	18	*	8	*
Total	460	55	102	*	107	14	174	23	77	14

Note: Based on non-Go8 university students who undertook a first year chemistry subject. Excludes students whose senior secondary school mathematics results were missing or uncodeable.

* The number of students in this category is less than 5.

Table 29 Non-Go8 first year chemistry pass rates, by senior secondary mathematics (highest level and achievement band), participation in senior secondary chemistry and ATAR

ATAR	All students		Senior secondary mathematics achievement band							
			Very high		High		Sound		Low/ very low	
	Year 12 chem	No Year 12 chem	Year 12 chem	No Year 12 chem	Year 12 chem	No Year 12 chem	Year 12 chem	No Year 12 chem	Year 12 chem	No Year 12 chem
General Mathematics										
95+	*	88.2	*	88.9	*	100.0	*	*	*	*
90-94	93.3	90.7	100.0	88.9	87.5	84.6	*	100.0	*	*
80-89	93.9	79.0	88.6	84.6	97.1	83.2	91.3	68.1	100.0	69.2
70-79	87.9	73.2	77.8	85.7	91.7	71.1	82.2	74.7	81.8	77.8
<70	70.5	60.5	*	60.0	82.1	65.4	66.0	60.0	60.0	55.0
No ATAR	100.0	50.0	*	*	*	*	*	*	*	*
Total	86.8	73.0	90.6	84.9	92.2	74.4	77.4	69.2	76.9	65.4
Mathematical Methods										
95+	98.3	94.4	100.0	*	98.0	100.0	88.9	*	*	*
90-94	95.7	92.9	94.4	*	97.0	100.0	91.7	82.4	100.0	*
80-89	88.2	91.2	90.9	*	95.4	93.3	82.2	88.9	83.9	91.7
70-79	82.9	78.4	*	*	90.6	91.9	80.1	74.5	86.5	74.1
<70	78.1	69.8	*	*	80.0	*	76.7	65.8	81.3	79.5
No ATAR	87.4	94.4	*	*	90.0	*	85.9	100.0	88.9	*
Total	85.6	81.8	97.8	100.0	94.2	93.4	80.5	76.5	84.5	79.3
Specialist Mathematics										
95+	98.3	100.0	100.0	*	96.3	*	80.0	*	*	*
90-94	93.8	*	100.0	*	85.7	*	100.0	*	*	*
80-89	86.3	81.3	100.0	*	94.1	83.3	79.3	75.0	88.9	*
70-79	74.2	76.5	*	*	64.7	*	80.8	77.8	67.9	60.0
<70	79.4	81.8	*	*	*	*	75.8	*	86.2	85.7
No ATAR	91.2	*	*	*	85.7	*	88.9	*	100.0	*
Total	87.0	83.6	100.0	*	86.9	85.7	81.6	82.6	81.8	78.6

Note: Based on non-Go8 university students who undertook a first year chemistry subject. Excludes students whose senior secondary school mathematics results were missing or uncodeable.
 * Results not reported as the number of students with this level of senior secondary mathematics, senior secondary mathematics achievement band and ATAR is less than 5.

First year mathematics in Go8 universities, by school mathematics (highest level and achievement band) and ATAR

Table 30 Number of Go8 first year mathematics students, by senior secondary mathematics (highest level and achievement band), and ATAR

ATAR	All students	Senior secondary mathematics achievement band			
		Very high	High	Sound	Low/ very low
General Mathematics (n=526)					
95+	92	45	47	*	*
90-94	125	32	90	*	*
80-89	264	28	222	14	*
70-79	32	*	27	5	*
<70	*	*	*	*	*
No ATAR	13	*	12	*	*
Total	526	106	398	22	*
Mathematical Methods (n=1872)					
95+	454	130	272	52	*
90-94	479	18	266	192	*
80-89	785	8	196	565	16
70-79	104	*	8	83	13
<70	*	*	*	*	*
No ATAR	50	5	18	27	*
Total	1872	161	760	919	32
Specialist Mathematics (n=1661)					
95+	661	156	300	205	*
90-94	405	*	67	332	*
80-89	511	*	26	426	58
70-79	53	*	*	29	24
<70	*	*	*	*	*
No ATAR	31	*	9	17	*
Total	1661	161	402	1009	89

Note: Based on Go8 university students who undertook a first year mathematics subject. Excludes students whose senior secondary school mathematics results were missing or uncodeable.

* The number of students in this category is less than 5.

Table 31 Go8 first year mathematics pass rates, by senior secondary mathematics (highest level and achievement band), and ATAR

ATAR	All students	Senior secondary mathematics achievement band				
		Very high	High	Sound	Low/ very low	
General Mathematics						
95+	97.8	100.0	95.7	*	*	
90-94	91.2	90.6	93.3	*	*	
80-89	77.7	78.6	78.8	57.1	*	
70-79	50.0	*	51.9	40.0	*	
<70	*	*	*	*	*	
No ATAR	76.9	*	75.0	*	*	
Total	82.7	91.5	82.2	50.0	*	
Mathematical Methods						
95+	97.1	99.2	97.1	92.3	*	
90-94	83.3	94.4	92.1	69.8	*	
80-89	68.9	100.0	76.5	66.0	62.5	
70-79	57.7	*	62.5	62.7	23.1	
<70	*	*	*	*	*	
No ATAR	64.0	100.0	66.7	55.6	*	
Total	78.7	98.8	89.0	67.7	50.0	
Specialist Mathematics						
95+	95.3	99.4	97.3	89.3	*	
90-94	82.7	*	92.5	80.4	*	
80-89	82.2	*	88.5	84.0	65.5	
70-79	79.3	*	*	89.7	66.7	
<70	*	*	*	*	*	
No ATAR	80.7	*	77.8	88.2	33.3	
Total	87.4	99.4	95.5	84.1	66.3	

Note: Based on Go8 university students who undertook a first year mathematics subject. Excludes students whose senior secondary school mathematics results were missing or uncodeable.

* Results not reported as the number of students with this level of senior secondary mathematics, senior secondary mathematics achievement band and ATAR is less than 5.

First year mathematics in non-Go8 universities, by school mathematics (highest level and achievement band) and ATAR

Table 32 Number of non-Go8 first year mathematics students, by senior secondary mathematics (highest level and achievement band), and ATAR

ATAR	All students	Senior secondary mathematics achievement band			
		Very high	High	Sound	Low/ very low
General Mathematics (n=367)					
95+	5	*	*	*	*
90-94	17	*	7	7	*
80-89	70	11	22	32	5
70-79	135	7	51	62	15
<70	121	*	26	62	31
No ATAR	19	*	8	10	*
Total	367	24	116	175	52
Mathematical Methods (n=1432)					
95+	95	32	48	13	*
90-94	99	14	46	35	*
80-89	343	17	141	166	19
70-79	516	*	113	349	53
<70	257	*	14	176	67
No ATAR	122	*	11	88	20
Total	1432	67	373	827	165
Specialist Mathematics (n=681)					
95+	131	75	44	11	*
90-94	85	24	38	23	*
80-89	168	7	81	74	6
70-79	167	*	28	107	31
<70	70	*	5	30	34
No ATAR	60	7	11	32	10
Total	681	115	207	277	82

Note: Based on non-Go8 university students who undertook a first year mathematics subject. Excludes students whose senior secondary school mathematics results were missing or uncodeable.

* The number of students in this category is less than 5.

Table 33 Non-Go8 first year mathematics pass rates, by senior secondary mathematics (highest level and achievement band), and ATAR

ATAR	All students	Senior secondary mathematics achievement band				
		Very high	High	Sound	Low/ very low	
General Mathematics						
95+	80.0	*	*	*	*	
90-94	82.4	*	71.4	85.7	*	
80-89	68.6	90.9	81.8	59.4	20.0	
70-79	61.5	85.7	68.6	54.8	53.3	
<70	36.4	*	46.2	35.5	32.3	
No ATAR	63.2	*	75.0	50.0	*	
Total	55.9	83.3	67.2	49.7	38.5	
Mathematical Methods						
95+	96.8	100.0	93.8	100.0	*	
90-94	84.9	100.0	93.5	65.7	*	
80-89	74.6	88.2	75.2	71.1	89.5	
70-79	64.7	*	74.3	59.9	75.5	
<70	60.7	*	64.3	56.8	70.2	
No ATAR	80.3	*	100.0	77.3	85.0	
Total	71.2	95.5	79.9	64.2	77.0	
Specialist Mathematics						
95+	96.2	100.0	90.9	90.9	*	
90-94	81.2	83.3	81.6	78.3	*	
80-89	80.4	85.7	81.5	77.0	100.0	
70-79	67.7	*	50.0	71.0	74.2	
<70	70.0	*	80.0	63.3	73.5	
No ATAR	70.0	71.4	63.6	62.5	100.0	
Total	78.4	93.0	78.3	72.2	79.3	

Note: Based on non-Go8 university students who undertook a first year mathematics subject. Excludes students whose senior secondary school mathematics results were missing or uncodeable.
 * Results not reported as the number of students with this level of senior secondary mathematics, senior secondary mathematics achievement band and ATAR is less than 5.

First year physics in Go8 universities, by school mathematics (highest level and achievement band) and ATAR

Table 34 Number of Go8 first year physics students, by senior secondary mathematics (highest level and achievement band), participation in senior secondary physics and ATAR

ATAR	All students		Senior secondary mathematics achievement band							
			Very high		High		Sound		Low/ very low	
	Year 12 phys	No Year 12 phys	Year 12 phys	No Year 12 phys	Year 12 phys	No Year 12 phys	Year 12 phys	No Year 12 phys	Year 12 phys	No Year 12 phys
General Mathematics (n=107)										
95+	*	*	*	*	*	*	*	*	*	*
90-94	14	*	*	*	11	*	*	*	*	*
80-89	52	23	9	6	41	17	*	*	*	*
70-79	7	*	*	*	7	*	*	*	*	*
<70	*	*	*	*	*	*	*	*	*	*
No ATAR	*	*	*	*	*	*	*	*	*	*
Total	75	32	14	9	59	23	*	*	*	*
Mathematical Methods (n=1344)										
95+	100	198	27	21	61	112	12	65	*	*
90-94	148	242	6	*	72	80	69	159	*	*
80-89	260	277	6	*	66	25	184	247	*	*
70-79	55	28	*	*	6	*	45	24	*	*
<70	*	*	*	*	*	*	*	*	*	*
No ATAR	19	17	*	*	5	*	13	12	*	*
Total	582	762	40	28	210	221	323	507	9	6
Specialist Mathematics (n=1209)										
95+	197	244	27	59	90	117	80	68	*	*
90-94	197	125	*	*	29	20	164	100	*	*
80-89	249	154	*	*	16	5	214	131	18	18
70-79	20	6	*	*	*	*	8	*	12	*
<70	*	*	*	*	*	*	*	*	*	*
No ATAR	14	*	*	*	*	*	10	*	*	*
Total	677	532	29	61	138	142	476	305	34	24

Note: Based on Go8 university students who undertook a first year physics subject. Excludes students whose senior secondary school mathematics results were missing or uncodeable.

* The number of students in this category is less than 5.

Table 35 Go8 first year physics pass rates, by senior secondary mathematics (highest level and achievement band), participation in senior secondary physics and ATAR

ATAR	All students		Senior secondary mathematics achievement band							
			Very high		High		Sound		Low/ very low	
	Year 12 phys	No Year 12 phys	Year 12 phys	No Year 12 phys	Year 12 phys	No Year 12 phys	Year 12 phys	No Year 12 phys	Year 12 phys	No Year 12 phys
General Mathematics										
95+	*	*	*	*	*	*	*	*	*	*
90-94	100.0	*	*	*	100.0	*	*	*	*	*
80-89	69.2	82.6	77.8	66.7	65.9	88.2	*	*	*	*
70-79	71.4	*	*	*	71.4	*	*	*	*	*
<70	*	*	*	*	*	*	*	*	*	*
No ATAR	*	*	*	*	*	*	*	*	*	*
Total	76.0	81.3	85.7	77.8	72.9	82.6	*	*	*	*
Mathematical Methods										
95+	98.0	98.0	100.0	100.0	96.7	98.2	100.0	96.9	*	*
90-94	94.6	90.1	83.3	*	98.6	92.5	91.3	88.7	*	*
80-89	89.2	84.5	100.0	*	86.4	92.0	90.8	85.0	*	*
70-79	70.9	67.9	*	*	50.0	*	73.3	66.7	*	*
<70	*	*	*	*	*	*	*	*	*	*
No ATAR	89.5	94.1	*	*	80.0	*	92.3	91.7	*	*
Total	90.4	89.4	97.5	92.9	92.4	95.5	88.9	87.0	66.7	50.0
Specialist Mathematics										
95+	99.5	99.6	100.0	100.0	98.9	99.2	100.0	100.0	*	*
90-94	95.4	91.2	*	*	96.6	85.0	95.7	92.0	*	*
80-89	85.5	86.4	*	*	68.8	100.0	87.4	86.3	77.8	83.3
70-79	60.0	66.7	*	*	*	*	62.5	*	58.3	*
<70	*	*	*	*	*	*	*	*	*	*
No ATAR	92.9	*	*	*	*	*	90.0	*	*	*
Total	91.9	93.4	100.0	100.0	94.9	97.2	92.0	91.5	70.6	79.2

Note: Based on Go8 university students who undertook a first year physics subject. Excludes students whose senior secondary school mathematics results were missing or uncodeable.

* Results not reported as the number of students with this level of senior secondary mathematics, senior secondary mathematics achievement band and ATAR is less than 5.

First year physics in non-Go8 universities, by school mathematics (highest level and achievement band) and ATAR

Table 36 Number of non-Go8 first year physics students, by senior secondary mathematics (highest level and achievement band), participation in senior secondary physics and ATAR

ATAR	All students		Senior secondary mathematics achievement band							
			Very high		High		Sound		Low/ very low	
	Year 12 phys	No Year 12 phys	Year 12 phys	No Year 12 phys	Year 12 phys	No Year 12 phys	Year 12 phys	No Year 12 phys	Year 12 phys	No Year 12 phys
General Mathematics (n=541)										
95+	*	9	*	5	*	*	*	*	*	*
90-94	*	30	*	17	*	11	*	*	*	*
80-89	9	155	*	31	5	108	*	14	*	*
70-79	49	222	8	*	35	185	5	30	*	*
<70	16	45	*	*	*	8	13	21	*	16
No ATAR	*	*	*	*	*	*	*	*	*	*
Total	78	463	14	57	43	315	20	70	*	21
Mathematical Methods (n=853)										
95+	20	19	10	5	8	12	*	*	*	*
90-94	32	26	6	*	15	18	11	6	*	*
80-89	144	83	11	*	77	34	53	35	*	10
70-79	200	129	*	*	55	39	130	71	14	19
<70	99	39	*	*	5	*	70	19	24	17
No ATAR	36	26	*	*	10	*	16	16	8	6
Total	531	322	30	11	170	109	282	149	49	53
Specialist Mathematics (n=458)										
95+	82	12	56	7	20	*	5	*	*	*
90-94	56	6	22	*	27	*	7	*	*	*
80-89	97	14	*	*	56	*	34	7	*	*
70-79	96	22	*	*	13	5	63	12	20	5
<70	38	*	*	*	*	*	18	*	17	*
No ATAR	27	5	*	*	5	*	14	*	*	*
Total	396	62	85	11	124	15	141	26	46	10

Note: Based on non-Go8 university students who undertook a first year physics subject. Excludes students whose senior secondary school mathematics results were missing or uncodeable.

* The number of students in this category is less than 5.

Table 37 Non-Go8 first year physics pass rates, by senior secondary mathematics (highest level and achievement band), participation in senior secondary physics and ATAR

ATAR	All students		Senior secondary mathematics achievement band							
			Very high		High		Sound		Low/ very low	
	Year 12 phys	No Year 12 phys	Year 12 phys	No Year 12 phys	Year 12 phys	No Year 12 phys	Year 12 phys	No Year 12 phys	Year 12 phys	No Year 12 phys
General Mathematics										
95+	*	88.9	*	100.0	*	*	*	*	*	*
90-94	*	96.7	*	100.0	*	100.0	*	*	*	*
80-89	88.9	86.5	*	90.3	100.0	90.7	*	57.1	*	*
70-79	83.7	76.1	100.0	*	80.0	76.2	80.0	73.3	*	*
<70	81.3	55.6	*	*	*	75.0	84.6	42.9	*	62.5
No ATAR	*	*	*	*	*	*	*	*	*	*
Total	84.6	79.1	100.0	93.0	81.4	82.2	80.0	58.6	100.0	61.9
Mathematical Methods										
95+	100.0	100.0	100.0	100.0	100.0	100.0	*	*	*	*
90-94	90.6	92.3	100.0	*	100.0	100.0	72.7	66.7	*	*
80-89	81.9	84.3	90.9	*	81.8	79.4	79.3	91.4	*	90.0
70-79	72.0	82.2	*	*	74.6	79.5	68.5	81.7	92.9	89.5
<70	73.7	66.7	*	*	60.0	*	71.4	63.2	83.3	70.6
No ATAR	83.3	92.3	*	*	80.0	*	75.0	93.8	100.0	100.0
Total	78.0	83.5	96.7	81.8	81.2	84.4	72.0	82.6	89.8	84.9
Specialist Mathematics										
95+	100.0	91.7	100.0	100.0	100.0	*	100.0	*	*	*
90-94	96.4	100.0	100.0	*	96.3	*	85.7	*	*	*
80-89	85.6	71.4	*	*	85.7	*	82.4	57.1	*	*
70-79	65.6	68.2	*	*	76.9	60.0	61.9	66.7	70.0	80.0
<70	73.7	*	*	*	*	*	77.8	*	76.5	*
No ATAR	63.0	100.0	*	*	40.0	*	57.1	*	*	*
Total	82.6	79.0	98.8	90.9	86.3	86.7	70.9	65.4	78.3	90.0

Note: Based on non-Go8 university students who undertook a first year physics subject. Excludes students whose senior secondary school mathematics results were missing or uncodeable.

* Results not reported as the number of students with this level of senior secondary mathematics, senior secondary mathematics achievement band and ATAR is less than 5.

Tables relating to logistic regression analysis of first year subject outcomes.

Table 38 First year biology logistic regression models: Odds ratio estimates and Wald confidence limits

	Odds ratio	95% Wald confidence limits	
Go8 institutions^a			
Senior secondary mathematics			
Essential mathematics/no maths vs Mathematical Methods (S)	0.766	0.365	1.691
General Mathematics (S/L/LV) vs Mathematical Methods (S)	0.377	0.195	0.781
General Mathematics (H/VH) vs Mathematical Methods (S)	0.733	0.442	1.233
Mathematical Methods (L/LV) vs Mathematical Methods (S)	1.045	0.463	2.810
Mathematical Methods (H/VH) vs Mathematical Methods (S)	0.809	0.486	1.390
Specialist Mathematics (L/LV) vs Mathematical Methods (S)	0.412	0.221	0.832
Specialist Mathematics (S/H/VH) vs Mathematical Methods (S)	0.515	0.349	0.763
Senior secondary biology			
S/L/VL achievement vs No biology	1.658	1.105	2.554
H/VH achievement vs No biology	2.109	1.540	2.910
Non-Go8 institutions^b			
Senior secondary mathematics			
Essential mathematics/no maths vs Mathematical Methods (S)	1.661	1.142	2.417
General Mathematics (S/L/LV) vs Mathematical Methods (S)	0.616	0.447	0.850
General Mathematics (H/VH) vs Mathematical Methods (S)	1.508	1.035	2.195
Mathematical Methods (L/LV) vs Mathematical Methods (S)	0.776	0.540	1.114
Mathematical Methods (H/VH) vs Mathematical Methods (S)	2.227	1.312	3.781
Specialist Mathematics (L/LV) vs Mathematical Methods (S)	1.121	0.583	2.155
Specialist Mathematics (S/H/VH) vs Mathematical Methods (S)	1.073	0.683	1.684
Senior secondary biology			
Biology (L/VL achievement) vs No biology	0.429	0.255	0.722
Biology (S achievement) vs No biology	1.926	1.476	2.513
Biology (H/VH achievement) vs No biology	2.820	2.132	3.729

Notes: Based on university students who undertook a first year biology subject. Excludes students whose results were missing or uncodeable.

a. Go8 model controlled for ATAR and university attended.

b. Non-Go8 model controlled for ATAR, university attended, year commenced degree and gender.

Table 39 First year chemistry logistic regression models: Odds ratio estimates and Wald confidence limits

	Odds ratio	95% Wald confidence limits	
Go8 institutions^a			
Senior secondary mathematics			
Essential mathematics/no maths vs Mathematical Methods (S)	0.370	0.198	0.692
General Mathematics (S/L/LV) vs Mathematical Methods (S)	0.164	0.093	0.288
General Mathematics (H/VH) vs Mathematical Methods (S)	0.572	0.368	0.889
Mathematical Methods (L/LV) vs Mathematical Methods (S)	0.442	0.240	0.814
Mathematical Methods (H/VH) vs Mathematical Methods (S)	1.329	0.859	2.055
Specialist Mathematics (L/LV) vs Mathematical Methods (S)	0.903	0.490	1.662
Specialist Mathematics (S/H/VH) vs Mathematical Methods (S)	1.487	1.070	2.065
Senior secondary chemistry			
Chemistry (L/VL) vs No chemistry	1.518	0.527	4.369
Chemistry (S) vs No chemistry	0.879	0.651	1.186
Chemistry (H/VH) vs No chemistry	2.146	1.548	2.975
Non-Go8 institutions^a			
Senior secondary mathematics			
Essential mathematics/no maths vs Mathematical Methods (S)	1.461	1.076	1.982
General Mathematics (L/LV) vs Mathematical Methods (S)	0.551	0.334	0.910
General Mathematics (S) vs Mathematical Methods (S)	0.687	0.498	0.947
General Mathematics (H/VH) vs Mathematical Methods (S)	1.144	0.840	1.558
Mathematical Methods (L/LV) vs Mathematical Methods (S)	1.053	0.715	1.550
Mathematical Methods (H/VH) vs Mathematical Methods (S)	3.178	2.102	4.806
Specialist Mathematics (L/LV) vs Mathematical Methods (S)	1.024	0.537	1.955
Specialist Mathematics (S) vs Mathematical Methods (S)	1.005	0.659	1.534
Specialist Mathematics (H/VH) vs Mathematical Methods (S)	1.823	1.003	3.312
Senior secondary chemistry			
Chemistry (L/VL) vs No chemistry	1.469	0.984	2.193
Chemistry (S) vs No chemistry	1.701	1.351	2.142
Chemistry (H/VH) vs No chemistry	3.523	2.702	4.594

Notes: Based on university students who undertook a first year chemistry subject. Excludes students whose results were missing or uncodeable.

a. Models controlled for ATAR, university attended and year commenced degree.

Table 40 First year mathematics logistic regression models: Odds ratio estimates and Wald confidence limits

	Odds ratio	95% Wald confidence limits	
Go8 institutions^a			
Senior secondary mathematics			
Essential mathematics/no maths vs Mathematical Methods (S)	1.100	0.657	1.844
General Mathematics (S/L/LV) vs Mathematical Methods (S)	0.359	0.146	0.887
General Mathematics (H/VH) vs Mathematical Methods (S)	1.493	1.024	2.176
Mathematical Methods (L/LV) vs Mathematical Methods (S)	0.322	0.152	0.681
Mathematical Methods (H/VH) vs Mathematical Methods (S)	2.876	2.131	3.882
Specialist Mathematics (L/LV) vs Mathematical Methods (S)	1.225	0.750	1.999
Specialist Mathematics (S/H/VH) vs Mathematical Methods (S)	3.116	2.474	3.924
Non-Go8 institutions^b			
Senior secondary mathematics			
Essential mathematics/no maths vs Mathematical Methods (S)	1.687	1.246	2.285
General Mathematics (S/L/LV) vs Mathematical Methods (S)	0.641	0.456	0.902
General Mathematics (H/VH) vs Mathematical Methods (S)	1.316	0.844	2.051
Mathematical Methods (L/LV) vs Mathematical Methods (S)	1.470	0.952	2.269
Mathematical Methods (H/VH) vs Mathematical Methods (S)	2.137	1.526	2.992
Specialist Mathematics (L/LV) vs Mathematical Methods (S)	2.268	1.243	4.139
Specialist Mathematics (S) vs Mathematical Methods (S)	1.704	1.219	2.382
Specialist Mathematics (H/VH) vs Mathematical Methods (S)	2.797	1.841	4.251

Notes: Based on university students who undertook a first year mathematics subject. Excludes students whose results were missing or uncodeable.

a. Go8 model controlled for ATAR, university attended and year commenced degree.

b Non-Go8 model controlled for ATAR, university attended and gender.

Table 41 First year physics logistic regression models: Odds ratio estimates and Wald confidence limits

	Odds ratio	95% Wald confidence limits	
Go8 institutions^a			
Senior secondary mathematics			
Essential mathematics/no maths vs Mathematical Methods (S)	0.800	0.307	2.085
General Mathematics (H/VH) vs Mathematical Methods (S)	0.997	0.533	1.864
Mathematical Methods (L/LV) vs Mathematical Methods (S)	0.368	0.121	1.116
Mathematical Methods (H/VH) vs Mathematical Methods (S)	1.790	1.082	2.959
Specialist Mathematics (L/LV) vs Mathematical Methods (S)	0.548	0.285	1.052
Specialist Mathematics (S/H/VH) vs Mathematical Methods (S)	1.442	1.020	2.039
Senior secondary physics			
Physics (S/L/VL) achievement vs No physics	0.995	0.695	1.426
Physics (H/VH) achievement vs No physics	1.888	1.300	2.741
Non-Go8 institutions^b			
Senior secondary physics			
Physics (S/L/VL) vs No physics	1.030	0.765	1.386
Physics (H/VH) vs No physics	1.781	1.299	2.443

Notes: Based on university students who undertook a first year physics subject. Excludes students whose results were missing or uncodeable.

- a. Go8 Model controlled for ATAR, university attended and year commenced degree. No Go8 physics students had low/very low achievement in General Mathematics, and only 2 had sound achievement in General Mathematics. These categories were omitted from the multivariate model.
- b. Non-Go8 model controlled for ATAR, university attended, year commenced degree and gender. Senior secondary mathematics did not meet the 0.05 significance level for entry into the model.

Tables relating to Figure 12

Table 42 Highest level of senior secondary mathematics undertaken and achievement band, by ATAR (Go8 universities), column per cent

ATAR	Senior secondary mathematics				
	Highest level	Achievement band			
		Very high	High	Sound	Low/ very low
No mathematics or Essential Mathematics (n=447)					
95+	15.7	-	-	-	-
90-94	7.4	-	-	-	-
80-89	18.6	-	-	-	-
70-79	2.5	-	-	-	-
<70	0	-	-	-	-
No ATAR	55.9	-	-	-	-
General Mathematics (n=1,195)					
95+	13.0	33.2	9.5	*	*
90-94	21.1	31.9	20.3	9.7	*
80-89	53.8	31.4	57.5	67.7	*
70-79	9.9	2.2	9.8	20.7	*
<70	-	-	-	-	-
No ATAR	2.3	*	3.0	*	*
Mathematical Methods (n=4,768)					
95+	22.2	80.7	44.0	10.1	*
90-94	27.6	9.9	33.8	27.3	7.1
80-89	41.8	5.5	18.8	53.1	60.0
70-79	5.8	*	0.8	6.9	31.2
<70	-	-	-	-	-
No ATAR	2.6	4.0	2.6	2.6	*
Specialist Mathematics (n=2,815)					
95+	42.5	96.1	76.5	21.1	0.0
90-94	24.8	1.8	15.8	35.1	9.4
80-89	28.1	*	5.4	39.7	64.9
70-79	3.0	0.0	0.0	2.7	23.4
<70	-	-	-	-	-
No ATAR	1.7	1.5	2.3	1.4	*

Notes: Based on students who attended a G08 university and undertook a first year biology, chemistry, mathematics, or physics subject. Excludes students whose senior secondary subject mathematics results were missing or uncodeable.

* Result not reported as the number of students with this level of senior secondary mathematics and ATAR is less than 5

Table 43 Highest level of senior secondary mathematics undertaken and achievement band, by ATAR (other universities)

ATAR	Senior secondary mathematics					
	All students in mathematics level	Achievement band				Low/ very low
		Very high	High	Sound		
No mathematics or Essential Mathematics (n=1,435)						
95+	4.4	-	-	-	-	-
90-94	7.3	-	-	-	-	-
80-89	29.8	-	-	-	-	-
70-79	38.0	-	-	-	-	-
<70	7.3	-	-	-	-	-
No ATAR	13.4	-	-	-	-	-
General Mathematics (n=1,597)						
95+	2.0	9.3	1.9	*	*	*
90-94	6.5	24.2	5.0	4.6		*
80-89	25.7	42.2	29.6	19.7	13.0	
70-79	39.9	18.0	46.8	38.3	36.1	
<70	24.2	5.6	14.9	34.8	47.3	
No ATAR	1.7	*	1.8	2.0		*
Mathematical Methods (n=3,076)						
95+	7.8	57.7	14.2	2.0		*
90-94	8.3	20.1	15.5	5.2	2.1	
80-89	25.9	16.8	38.7	23.1	14.6	
70-79	31.2	*	24.3	37.8	28.7	
<70	20.5	*	3.5	24.6	45.8	
No ATAR	6.3	4.0	3.8	7.4	7.8	
Specialist Mathematics (n=1,057)						
95+	21.4	71.4	21.4	3.7		*
90-94	12.1	18.0	19.0	8.1		*
80-89	24.3	5.3	37.6	28.7	12.2	
70-79	22.8	*	13.6	35.5	37.2	
<70	11.5	*	2.37	13.48	39.19	
No ATAR	7.9	3.9	6.1	10.5	9.5	

Notes: Based on students who attended a non-Go8 university and undertook a first year biology, chemistry, mathematics, or physics subject. Excludes students whose senior secondary subject mathematics results were missing or uncodeable.

* Result not reported as the number of students with this level of senior secondary mathematics and ATAR is less than 5

Table 44 Highest level of senior secondary mathematics undertaken and achievement band, by ATAR (all universities)

ATAR	Senior secondary mathematics				
	Highest level	Achievement band			
		Very high	High	Sound	Low/ very low
No mathematics or Essential Mathematics (n=1,882)					
95+	7.1	-	-	-	-
90-94	7.3	-	-	-	-
80-89	27.1	-	-	-	-
70-79	29.5	-	-	-	-
<70	5.5	-	-	-	-
No ATAR	23.5	-	-	-	-
General Mathematics (n=2,792)					
95+	6.7	23.3	5.9	0.9	0.0
90-94	12.8	28.7	13.1	5.7	2.9
80-89	37.8	35.9	44.3	30.4	13.8
70-79	27.0	8.8	27.3	34.4	36.2
<70	13.8	2.3	7.1	27.1	46.0
No ATAR	1.9	*	2.4	1.6	*
Mathematical Methods (n=7,844)					
95+	16.6	70.9	32.6	7.2	1.3
90-94	20.0	14.3	26.8	19.4	3.6
80-89	35.5	10.3	26.4	42.3	28.5
70-79	15.8	*	9.8	18.0	29.4
<70	8.0	*	1.4	8.9	31.8
No ATAR	4.0	4.0	3.1	4.3	5.4
Specialist Mathematics (n=3,872)					
95+	36.8	86.7	60.1	17.6	*
90-94	21.3	7.9	16.8	29.6	5.6
80-89	27.0	2.4	15.0	37.5	40.4
70-79	8.4	*	4.0	9.3	29.8
<70	3.2	*	0.7	2.7	18.2
No ATAR	3.4	2.4	3.4	3.3	5.6

Notes: Based on students who undertook a first year biology, chemistry, mathematics, or physics subject.
 Excludes students whose senior secondary subject mathematics results were missing or uncodeable.
 * Result not reported as the number of students with this level of senior secondary mathematics and ATAR is less than 5

Tables relating to Figure 13 to Figure 16 (sample sizes)

Table 45 University biology students: ATAR and highest level of senior secondary school mathematics, by university group (n)

ATAR band	All first year biology students	Senior secondary mathematics (highest level)				Senior secondary biology	
		None or Essential Mathematics	General Mathematics	Mathematical Methods	Specialist Mathematics	Yes	No
Group of Eight (n=5,742)							
95+	1,276	34	78	703	461	763	513
90-94	1,438	25	168	947	298	998	440
80-89	2,396	60	480	1,472	384	1,483	913
70-79	367	10	98	214	45	175	192
<70	*	0	0	*	0	0	*
No ATAR provided	264	139	10	89	25	78	186
Total	5,742	268	834	3,426	1,213	3,497	2,245
Other universities (n= 4,444)							
95+	321	53	27	152	89	204	117
90-94	342	82	85	153	22	263	79
80-89	1,237	337	345	470	85	937	300
70-79	1,439	345	482	531	81	1,102	337
<70	838	41	269	456	72	619	219
No ATAR provided	267	89	15	125	38	120	147
Total	4,444	947	1,223	1,887	387	3,245	1,199
Total (n= 10,186)							
95+	1,597	87	105	855	550	967	630
90-94	1,780	107	253	1,100	320	1,261	519
80-89	3,633	397	825	1,942	469	2,420	1,213
70-79	1,806	355	580	745	126	1,277	529
<70	839	41	269	457	72	619	220
No ATAR provided	531	228	25	214	63	198	333
Total	10,186	1,215	2,057	5,313	1,600	6,742	3,444

Notes: Based on students who undertook a first year biology subject.

Table 46 University chemistry students: ATAR and highest level of senior secondary school mathematics, by university group (n)

ATAR band	All first year chemistry students	Senior secondary mathematics (highest level)				Senior secondary chemistry	
		None or Essential Mathematics	General Mathematics	Mathematical Methods	Specialist Mathematics	Yes	No
Group of Eight (n=5,632)							
95+	1,347	36	68	704	539	1,145	202
90-94	1,456	20	143	932	361	1,232	224
80-89	2,250	42	392	1,371	445	1,792	458
70-79	322	6	73	192	51	228	94
<70	0	0	0	0	0	0	0
No ATAR provided	257	129	14	87	26	95	162
Total	5,632	233	690	3,286	1,422	4,492	1,140
Other universities (n=5,053)							
95+	346	43	23	153	127	274	72
90-94	378	88	75	162	53	247	131
80-89	1400	377	357	536	130	889	511
70-79	1769	461	516	662	130	1,039	730
<70	882	68	267	465	82	522	360
No ATAR provided	278	89	20	122	47	157	121
Total	5053	1,126	1,258	2,100	569	3,128	1,925
Total (n=10,685)							
95+	1693	79	91	857	666	1,419	274
90-94	1834	108	218	1,094	414	1,479	355
80-89	3650	419	749	1,907	575	2,681	969
70-79	2091	467	589	854	181	1,267	824
<70	882	68	267	465	82	522	360
No ATAR provided	535	218	34	209	73	252	283
Total	10685	1,359	1,948	5,386	1,991	7,620	3,065

Notes: Based on students who undertook a first year chemistry subject.

Table 47 University mathematics students: ATAR and highest level of senior secondary school mathematics, by university group (n)

ATAR band	All first year math students	Senior secondary mathematics (highest level)			
		None or Essential Mathematics	General Mathematics	Mathematical Methods	Specialist Mathematics
Group of Eight (n= 4,323)					
95+	1,255	47	92	454	662
90-94	1,028	17	125	479	407
80-89	1,588	26	264	786	512
70-79	193	*	32	104	54
<70	0	0	0	0	0
No ATAR provided	259	163	13	50	31
Total	4,323	256	526	1,873	1,666
Other universities (n= 3,218)					
95+	257	15	6	100	136
90-94	248	32	17	109	90
80-89	718	104	76	356	182
70-79	1,092	219	149	531	193
<70	548	65	132	268	83
No ATAR provided	355	123	27	134	71
Total	3,218	558	407	1,498	755
Total (n= 7,541)					
95+	1,512	62	98	554	798
90-94	1,276	49	142	588	497
80-89	2,306	130	340	1,142	694
70-79	1,285	222	181	635	247
<70	548	65	132	268	83
No ATAR provided	614	286	40	184	102
Total	7,541	814	933	3,371	2,421

Notes: Based on students who undertook a first year mathematics subject.

Table 48 University physics students: ATAR and highest level of senior secondary school mathematics, by university group (n)

ATAR band	All first year physics students	Senior secondary mathematics (highest level)				Senior secondary physics	
		None or Essential Mathematics	General Mathematics	Mathematical Methods	Specialist Mathematics	Yes	No
Group of Eight (n=2,712)							
95+	746	*	*	298	441	298	448
90-94	732	*	17	390	322	359	373
80-89	1025	10	75	537	403	564	461
70-79	120	*	9	83	26	82	38
<70	0	0	0	0	0	0	0
No ATAR provided	89	31	*	36	17	36	53
Total	2712	50	108	1,344	1,209	1,339	1,373
Other universities (n=2,710)							
95+	172	22	13	40	97	110	62
90-94	211	53	35	60	63	109	102
80-89	758	236	175	230	117	312	446
70-79	1118	364	288	337	129	518	600
<70	310	46	69	145	50	178	132
No ATAR provided	141	34	5	66	36	68	73
Total	2710	755	585	878	492	1,295	1,415
Total (n=5,422)							
95+	918	26	16	338	538	408	510
90-94	943	56	52	450	385	468	475
80-89	1783	246	250	767	520	876	907
70-79	1238	366	297	420	155	600	638
<70	310	46	69	145	50	178	132
No ATAR provided	230	65	9	102	53	104	126
Total	5422	805	693	2,222	1,701	2,634	2,788

Notes: Based on students who undertook a first year physics subject.

Tables relating to Figure 13 - Figure 16 (pass rates)

Table 49 First year biology pass rates, by ATAR band, selected senior secondary subjects and university group

ATAR band	All first year biology students	Senior secondary mathematics (highest level)				Senior secondary biology	
		None or Essential Mathematics	General Mathematics	Mathematical Methods	Specialist Mathematics	Yes	No
Group of Eight (n= 5,742)[#] (overall first year biology pass rate = 95.9)							
95+	98.9	97.1	98.7	99.4	98.3	99.1	98.6
90-94	97.2	100.0	98.8	98.1	93.3	99.0	93.2
80-89	94.9	93.3	94.8	95.9	91.7	96.2	92.9
70-79	87.2	90.0	78.6	90.7	88.9	85.1	89.1
<70	*	-	-	*	-	-	*
No ATAR provided	95.1	93.5	90.0	98.9	92.0	94.9	95.2
Total	95.9	94.4	94.0	97.0	94.5	97.0	94.1
Other universities (n= 4,444)[#] (overall first year biology pass rate = 88.5)							
95+	98.4	98.1	96.3	98.7	98.9	98.0	99.2
90-94	96.8	95.1	96.5	98.7	90.9	96.6	97.5
80-89	94.4	97.6	92.8	94.0	90.6	95.9	89.7
70-79	86.9	90.4	86.7	85.9	79.0	88.6	81.3
<70	74.0	75.6	72.5	74.8	73.6	76.7	66.2
No ATAR provided	86.9	86.5	86.7	86.4	89.5	92.5	82.3
Total	88.1	92.6	86.6	87.6	86.9	90.0	84.5
Total (n= 10,186)[#] (overall first year biology pass rate = 92.5)							
95+	98.8	97.7	98.1	99.3	98.4	98.9	98.7
90-94	97.1	96.3	98.0	98.2	93.1	98.5	93.8
80-89	94.7	97.0	93.9	95.4	91.5	96.1	92.1
70-79	86.9	90.4	85.3	87.3	82.5	88.1	84.1
<70	74.0	75.6	72.5	74.8	73.6	76.7	66.4
No ATAR provided	91.0	90.8	88.0	91.6	90.5	93.4	89.5
Total	92.5	92.9	89.6	93.5	92.6	93.5	90.5

Notes: Based on students who undertook a first year biology subject. No ATAR includes cases where an ATAR was not provided as well as students who did not obtain an ATAR.

[#] For the size of the various subgroups, refer to Table 45.

* Result not reported as the number of students with this senior secondary subject and ATAR is less than 5

Table 50 First year chemistry pass rates, by ATAR band, selected senior secondary subjects and university group

ATAR band	All first year chemistry students	Senior secondary mathematics (Highest level)				Senior secondary chemistry	
		None or Essential Mathematics	General Mathematics	Mathematical Methods	Specialist Mathematics	Yes	No
Group of Eight (n=5,632)[#] (overall first year chemistry pass rate = 92.7)							
95+	98.7	97.2	95.6	98.6	99.3	98.5	99.5
90-94	94.3	80.0	95.1	94.0	95.6	94.3	94.2
80-89	89.4	83.3	84.7	90.1	91.9	90.5	84.9
70-79	85.4	*	78.1	88.5	86.3	86.8	81.9
<70	-	-	-	-	-	-	-
No ATAR provided	89.9	86.1	92.9	93.1	96.2	93.7	87.7
Total	92.7	86.3	87.4	93.0	95.5	93.5	89.5
Other universities (n=5,053)[#] (overall first year chemistry pass rate = 84.0)							
95+	97.7	97.7	91.3	98.0	98.4	98.5	94.4
90-94	94.7	97.7	92.0	95.1	92.5	95.1	93.9
80-89	88.6	92.3	84.6	89.0	86.9	91.1	84.2
70-79	81.2	85.7	78.9	81.6	72.3	85.4	75.2
<70	72.9	75.0	64.8	76.1	79.3	77.0	66.9
No ATAR provided	86.3	83.2	80.0	88.5	89.4	89.2	82.6
Total	84.2	86.7	79.1	84.9	85.6	87.3	78.7
Total (n=10,685)[#] (overall first year chemistry pass rate = 88.4)							
95+	98.5	97.5	94.5	98.5	99.1	98.5	98.2
90-94	94.4	94.4	94.0	94.2	95.2	94.5	94.1
80-89	89.1	91.4	84.7	89.8	90.8	90.7	84.5
70-79	81.8	85.4	78.8	83.1	76.2	85.6	76.0
<70	72.9	75.0	64.8	76.1	79.3	77.0	66.9
No ATAR provided	88.0	84.9	85.3	90.4	91.8	90.9	85.5
Total	88.7	86.6	82.0	89.8	92.6	90.9	82.5

Notes: Based on students who undertook a first year chemistry subject. No ATAR includes cases where an ATAR was not provided as well as students who did not obtain an ATAR.

For the size of the various subgroups, refer to Table 46.

* Result not reported as the number of students with this senior secondary subject and ATAR is less than 5

Table 51 First year mathematics pass rates, by ATAR band, selected senior secondary subjects and university group

ATAR band	All first year mathematics students	Senior secondary mathematics (Highest level)			
		None or Essential Mathematics	General Mathematics	Mathematical Methods	Specialist Mathematics
Group of Eight (n=4,323)[#] (overall first year mathematics pass rate = 82.8)					
95+	96.1	93.6	97.8	97.1	95.3
90-94	83.8	64.7	91.2	83.3	82.8
80-89	74.5	61.5	77.7	69.0	82.0
70-79	61.7	*	50.0	57.7	77.8
<70	-	-	-	-	-
No ATAR provided	80.7	85.9	76.9	64.0	80.7
Total	82.8	83.0	82.7	78.7	87.3
Other universities (n=3,218)[#] (overall first year mathematics pass rate = 73.1)					
95+	96.1	100.0	*	96.0	96.3
90-94	86.3	100.0	82.4	86.2	82.2
80-89	77.2	84.6	71.1	74.7	80.2
70-79	68.4	84.0	60.4	64.8	66.8
<70	57.3	70.8	39.4	59.7	67.5
No ATAR provided	75.2	74.0	74.1	79.1	70.4
Total	72.8	81.5	58.9	71.3	78.0
Total (n=7,541)[#] (overall first year mathematics pass rate = 78.6)					
95+	96.1	95.2	96.9	96.9	95.5
90-94	84.3	87.8	90.1	83.8	82.7
80-89	75.3	80.0	76.2	70.8	81.6
70-79	67.4	83.3	58.6	63.6	69.2
<70	57.3	70.8	39.4	59.7	67.5
No ATAR provided	77.5	80.8	75.0	75.0	73.5
Total	78.5	81.9	72.1	75.4	84.4

Notes: Based on students who undertook a first year mathematics subject. No ATAR includes cases where an ATAR was not provided as well as students who did not obtain an ATAR.

For the size of the various subgroups, refer to Table 47.

* Result not reported as the number of students with this senior secondary subject and ATAR is less than 5

Table 52 First year physics pass rates, by ATAR band, selected senior secondary subjects and university group

ATAR band	All first year physics students	Senior secondary mathematics (Highest level)				Senior secondary physics	
		None or Essential Mathematics	General Mathematics	Mathematical Methods	Specialist Mathematics	Yes	No
Group of Eight (n=2,712)[#] (overall first year physics pass rate = 90.3)							
95+	98.9	*	*	98.0	99.6	99.0	98.9
90-94	92.6	*	100.0	91.8	93.8	95.3	90.1
80-89	85.3	70.0	73.3	86.8	85.9	85.6	84.8
70-79	66.7	*	*	69.9	61.5	68.3	63.2
<70	-	-	-	-	-	-	-
No ATAR provided	87.6	77.4	*	91.7	94.1	91.4	84.9
Total	90.3	74.5	77.6	89.8	92.6	90.3	90.2
Other universities (n=2,710)[#] (overall first year physics pass rate = 81.9)							
95+	98.8	100.0	92.3	100.0	99.0	100.0	96.8
90-94	94.8	96.2	94.3	91.7	96.8	95.4	94.1
80-89	86.7	93.2	84.6	83.0	83.8	85.9	87.2
70-79	77.2	83.2	77.1	76.0	63.6	73.9	80.0
<70	70.3	78.3	63.8	70.3	72.0	73.0	66.7
No ATAR provided	78.7	70.6	80.0	87.9	69.4	76.5	80.8
Total	81.9	86.7	79.2	79.9	81.2	80.9	82.8
Total (n=5,422)[#] (overall first year physics pass rate = 86.0)							
95+	98.9	100.0	93.8	98.2	99.4	99.3	98.6
90-94	93.1	92.9	96.2	91.8	94.3	95.3	91.0
80-89	85.9	92.3	81.2	85.7	85.4	85.7	86.0
70-79	76.2	83.1	76.4	74.8	63.2	73.2	79.0
<70	70.3	78.3	63.8	70.3	72.0	73.0	66.7
No ATAR provided	82.2	73.9	88.9	89.2	77.4	81.6	82.5
Total	86.1	85.9	79.0	85.9	89.2	85.7	86.4

Notes: Based on students who undertook a first year physics subject. No ATAR includes cases where an ATAR was not provided as well as students who did not obtain an ATAR.

For the size of the various subgroups, refer to Table 48.

* Result not reported as the number of students with this senior secondary subject and ATAR is less than 5