



MINISTRY OF EDUCATION

Te Tāhuhu o te Mātauranga

How does achievement at school affect achievement in tertiary education?

This report forms part of a series called *Secondary to tertiary transitions*.

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How does achievement at school affect achievement in tertiary education?

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1 Summary

This study examined the relationship between achievement at school and achievement in tertiary education. We know that how well you do at school makes a difference, both to participation, as well as achievement, in post-school study. Further research in this area is unlikely to challenge this view.

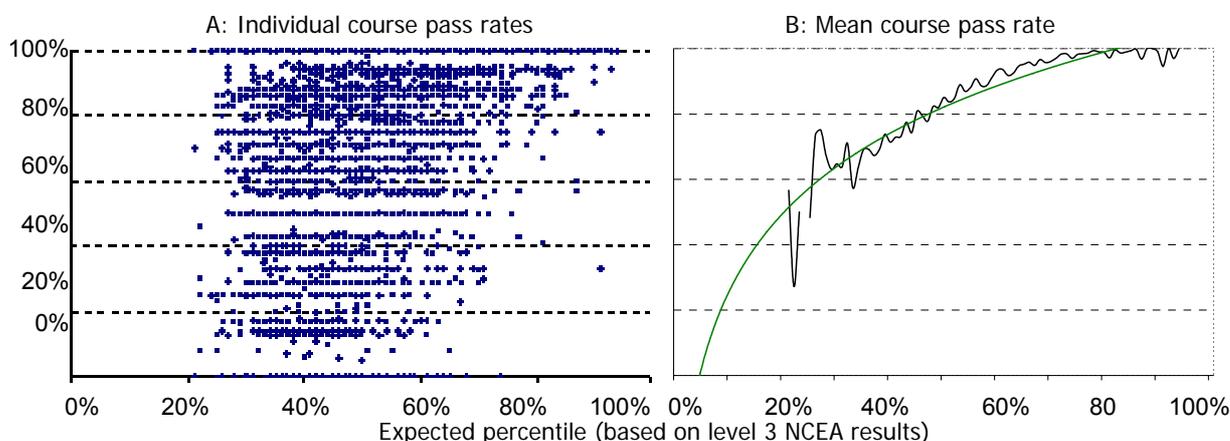
However, with this study we aimed to explore the nature of this relationship, in particular, as it applies to school achievement under the NCEA system. We used two measures of school performance – highest school qualification, and a measure of school achievement known as 'expected percentile' for analysing student's results in NQF achievement standards.¹ We looked at the relationship between these measures and first-year pass rates and drop-out rates. Specifically, we hoped to provide some insights into the following questions:

- How are the characteristics of performance in senior secondary National Qualifications Framework-based qualifications related to achievement in tertiary study?
- How well does expected percentile predict achievement in tertiary study?
- How much influence does school achievement have on tertiary achievement, compared with other school or tertiary study factors, or demographic characteristics?

This report complements the report *Post-school choices* (Ussher 2008) which examined the relationship between school achievement and participation in further study, and which also used expected percentile as a measure for school achievement. Both studies were based on a group of around 53,000 students who left school in 2004.

The study found:

- Support for the relationship between school achievement, using expected percentile as the measurement for school achievement, and first-year pass rates as the measurement for tertiary achievement. The relationship was strongest for those enrolling in degrees, and less so for those enrolling below degree level.
- Expected percentile based on Level 3 results had at best a moderate correlation with *individual* first-year degree pass rates ($r=0.4$), as shown in figure A below. However, expected percentile based on Level 3 results very closely predicted the *mean* first-year degree pass rate for any given set of students with the same expected percentile. In fact, the correlation between Level 3 expected percentile and mean first-year degree pass rate was 0.9. This closeness of fit with the fitted line is shown in figure B below. The mean first-year degree pass rate can be determined almost entirely from expected percentile.



¹ Expected percentile was developed by Michael Johnston at the New Zealand Qualifications Authority and is defined in detail on page 25.

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- Expected percentile accounted for about a quarter of the variance in students' likelihood of passing all their first-year degree courses. This was the factor most significantly correlated with first-year success, from the range of factors tested.
 - Achievement using Level 3 results was a better predictor for first-year degree student pass rates than Level 1 or Level 2 results. On its own, Level 3 results explained about 23 percent of the variance in students' likelihood of passing all their degree courses. However, Level 1 and 2 results also showed a weaker, but statistically significant correlation effect. That is, given two students with the same Level 3 achievement, those with higher Level 1 or Level 2 results were more likely to pass all their first-year degree courses.
 - In terms of first year attrition, expected percentile based on Level 3 results was also a significant predictor. However its impact was much weaker. On its own, expected percentile based on Level 3 results accounted for 5 percent of the variance in first-year attrition in degree study. Level 1 and Level 2 expected percentiles were not statistically significant predictors of first-year degree attrition rates, after controlling for Level 3 results.
 - After expected percentile, field of tertiary study was the next largest predictor for passing all first-year degree courses – with health, education, creative arts students more likely to pass all their first-year degree courses, and business, engineering and science students less likely to pass all. Field of study, however, was not a significant factor in predicting first-year attrition.
 - Students studying full-time for the full year were more likely to pass all their courses than part-time students. Full-time full-year students were also significantly less likely to drop out after their first year.
 - Together, expected percentile, tertiary field of study, and study load were the most predictive factors for passing all first-year degree courses. These three factors on their own accounted for 31 percent of the variance in the data. Together with all other factors, the model accounted for 33 percent, leaving 67 percent of the variance not explained.
 - Alone, expected percentile and study load factors accounted for 11 percent of the variance in students' likelihood of dropping out after the first year. Together with all other factors, the model accounted for 13 percent, leaving 87 percent of the variance not explained.
 - After controlling for expected percentile, highest school qualification still had a statistically significant effect, both for passing all degree courses, and for first-year attrition. Those with UE, but no Level 3 NCEA, were less likely to pass all their courses than those with both Level 3 NCEA and UE. They were also more likely to drop out after their first year. Interestingly, those school leavers with Level 3 NCEA and no UE were more likely to pass all their first-year degree courses than those with Level 3 NCEA and UE, after controlling for expected percentile and other factors used in the model.
 - Around 9 percent of 2004 school leavers enrolling in a degree, did so outside of a university (either at a polytechnic, wānanga, or a private provider). These students were more likely to pass all their first-year courses, once expected percentile and other factors were controlled for. However, students studying outside of a university were also more likely to drop out after their first year.
 - Māori and Pasifika students were less likely to pass all their first-year degree courses than non-Māori, or non-Pasifika students respectively. Māori students were also more likely to drop out of degree study after their first year. The relationship between Level 3 expected percentile and passing all first-year degree courses was stronger for non-Māori than for Māori, suggesting that factors other than school achievement have more influence on tertiary achievement for Māori than for non-Māori.
 - Those doing business or science subjects at school were statistically more likely to pass all their first-year degree courses, after controlling for other factors. Those doing computing at school were less likely to pass all their courses, after controlling for other factors. However,

the magnitude of these effects was small. Studying humanities, arts and crafts, or engineering and technology at school did not influence the likelihood of passing all first-year degree courses.

- School subject was not a significant factor in first-year degree attrition.
- Students from state schools were more likely to pass all their first-year degree courses than students from private schools. However, the magnitude of the effect was small. Students from single-sex schools also had a statistically significant lower likelihood of passing all their first-year degree courses than students from co-ed schools, but this factor made only a marginal contribution. In fact, its effect was largely removed, once the modifying effects of gender, and whether a school was private or not, were controlled for. Whether a school was private or not, or single-sex or not, did not have any significant effect on first-year degree attrition.
- Gender was not a significant factor for predicting whether or not a student passed all their first-year degree courses, but it was a statistically significant factor for first-year attrition. Women were less likely to drop out after their first year than men were, after controlling for school achievement and other factors.
- Years of secondary schooling, age, the decile of the school, and the size of the school were not significant factors in either passing all first-year degree courses, or first-year attrition after controlling for other factors.

Expected percentile provides a useful analytical tool for analysing the relationship between school and tertiary achievement. It explains around a quarter of one's likelihood of passing all courses, and 90 percent of the mean first-year pass rate for degree students. However, its influence on first-year attrition is much smaller, and is secondary to study load, and other factors untested in this study. Initial results using expected percentile also indicate that school performance appears less important for sub-degree-level study, and its influence on workplace-based outcomes is still to be tested. Both these areas remain the subject of useful future research, as does the question of the impact of secondary school performance on longer-term qualification completion and post-study labour market outcomes.

2 Introduction

People who do well at school are more likely to undertake tertiary study, and more likely to succeed in tertiary study. However, while school achievement is a factor, evidence shows that many other factors also influence tertiary achievement to a greater or lesser degree. While school achievement may be generally associated with tertiary achievement, it is by no means deterministic, and there are certainly cases where students with poor school achievement do well at tertiary level, and cases of high achieving school students failing at tertiary level.

Scott and Smart (2005) provides a starting point for some of the literature on this relationship. Pascarella and Terenzini's 2005 large scale review of *How college affects students*, as well as Adelman's longitudinal 'Toolbox' studies (1999 and 2006), and U.S. Department of Education (2002), provide some additional U.S.-based examples, while Birch and Miller (2005, 2006), and Marks (2007) provide some additional Australian-based examples.

Even in New Zealand, a number of good, albeit early studies, have explored this question. As early as 1939, Thomas, Beeby, and Oram examined the University Entrance (UE) Examination in the context of concerns that the standard was too low, and that the prescription of subjects required for UE exerted too much control over the school syllabus – in particular for that majority of students never intending to go on to university. They tested the predictive power of UE marks on later university success. They found a relationship between school and tertiary achievement, but one that 'is not great enough for accurate prediction to be made on the basis of individual University Entrance marks alone'. Further, they found no strong relationship between the subjects undertaken at school and later success at university.

In 1959, in response to concerns that the University Entrance standard (which changed from examination-based to accreditation-based in 1944) was largely responsible for the high failure rate at the University of New Zealand, George Parkyn undertook a thorough investigation of the relationship between school and university achievement. Parkyn correlated various measures of school attainment, including school certificate marks, 6th form assessment rankings, teacher rankings, and intelligence test scores, with various measures of university performance such as number and percent of courses passed, courses grades and degree completion rates.

He found a moderate correlation for full-time, full-year students only, with low correlation for part-time and returning students. Similar results were found for most of the different measures used. He also found not much difference between different school subjects, with the exception of full-time, full-year students who had done mathematics or a foreign language at school, who had a very slight advantage. Adelman's U.S. toolbox study also indicated that a certain level of Mathematics, as well as English attainment at school, aided degree completion.

As with the 1939 study, Parkyn also concluded that school performance mattered moderately, but was by no means able to fully predict tertiary performance. While the relationship was stronger at the top end of performance, even at the low end, just as many passed as failed. He concluded that entrance standard was not the reason for poor university performance. Parkyn followed this study up with another in 1967 which examined what were the other possible factors affecting failure. He found that, while not the whole reason for failure, ability (as measured by school performance) was probably the largest factor, explaining an estimated 29 percent of the variance in course pass rate, with student study load as the second biggest factor. Interestingly, he also went on to suggest that random fluctuations in a student's ability from assessment to assessment, as well as differences in examination and assessment practice may account for as much as 8 percent in the variability of failure rates.

In 1966, Small carried out another fairly extensive investigation of this issue on a small sample of New Zealand university students. He used a combination of administrative data, such as school certificate results, scholastic aptitude, and other test results, along with detailed interview data, including data related to social and psychological factors, health, and study habits as well as extramural activities. He looked at the impact of these factors on course pass rates in the first year. As with previous studies, he found some relationship between academic achievement and tertiary achievement. But, by no means did it account for all the variation. As with Parkyn, he showed that university failure rates could be reduced by raising the threshold for entry, but only at the expense of depriving many students who would otherwise have been successful.

He concludes, 'It appears, therefore, that failure in the first year at university is more closely related to either or both of the two factors, lack of general intellectual ability and lack of school preparation in academic knowledge and skills, ...though the correlation between initial ability and academic performance in the first-year group is nevertheless not high... Less than average standing in ability and attainments could serve as a warning that some failure is likely. However, the converse is not true: competence of an average or above average level appears not to lead to success unless there is a determination to work hard, a willingness to make sacrifices, and a minimum of possible hindrances.' (Small, 1966, page 49).

More recently, a Ministry of Education report showed that highest school qualification was a significant factor in degree completion (Scott and Smart, 2005). Another Ministry of Education report in 2006 looked at the relationship between attainment at school (under the new NCEA) system, rates of transition to tertiary study, and subsequent rates of achievement. It concluded that 'the best predictor of tertiary enrolment behaviour is the highest level of attainment they gain at school', and that level of attainment at school was associated with level of qualification completion in tertiary education (Loader and Dalgety, 2006).

In another Ministry of Education report, Earle (2007) examined factors impacting on Māori achievement in bachelors degree study. The study found that, in order to increase the number of Māori attaining degrees, the most important change would be to increase the number of Māori secondary school students achieving university entrance or better. In terms of a student's likelihood of achieving in tertiary study, failing to achieve university entrance acted as a barrier to participation and therefore achievement at tertiary level.

So, why do another study to examine this relationship? One of the reasons, perhaps, is to reflect the significant changes introduced in 2002 to the way achievement in New Zealand secondary schools is measured. The National Certificate of Educational Achievement (NCEA) was introduced for year 11 students in 2002. It replaced the previous norm-referenced School Certificate examination for year 11 students, the internally assessed Sixth Form Certificate for year 12 students, and the New Zealand University Bursary examination for year 13 students.

NCEA is a standards-based system. Students gain NCEA in 3 levels, typically undertaken over years 11 to 13. NCEA is gained by achieving a certain number of credits in units of learning known as standards. The system is not norm-referenced, so that anyone meeting the requirements of the standard will gain those credits. In the previous examination-based system, results were scaled so that the pass mark approximately reflected the median examination score. See New Zealand Qualifications Authority (NZQA, 2005 and 2007), for a more detailed description of NCEA, and of the changes made to the way school qualifications and achievement are measured.

The new NCEA system, while supported by some, has also been criticised by some. A number of reports have reviewed aspects of the new system, eg Alison (2005), Meyer, McClure, Walkey, McKenzie & Weir (2006, 2007), Hipkins et al (2004), Strachan (2002), Thomas (2007). It is not intended to summarise these here, except to mention discussion of the impact of NCEA on student motivation. While achievement standards are awarded with either 'achieved', 'merit' or 'excellence' to

recognise grades of achievement, the NCEA qualification itself, before 2007, was awarded on the basis of gaining a certain minimum number of credits, regardless of whether standards were 'achieved', 'achieved with merit', or 'achieved with excellence'. The potential de-motivating features of this system were, for example, raised by teachers in Alison (2005), and were subsequently the subject of an extensive research project undertaken by Victoria University (Meyer et al 2006, 2007). They found that the 80 credits minimum did act as a disincentive for some students to study and achieve more. Also, the lack of extra credits for merit and excellence results did not motivate some students to achieve more. They further found that grouping students into 'doing my best' and 'doing just enough' groups provided a strong predictor of school achievement.

In their 2007 follow-up report, Meyer et al also included a survey of just over 100 post-secondary students who had left school in 2005. They concluded: 'The sample ... is small and not representative, but it does show that students with positive motivations as Year 13 students in 2005 are mostly at university and advancing their education in 2006 and 2007. These students also stress that the internal assessment aspects of NCEA prepared them well for university practices.'

In 2004, the University of Auckland began a research programme to look at the link between school achievement and tertiary achievement. This programme called 'Starpath: Project for Tertiary Participation and Success' involved linking the NQF results of a sample of students from Auckland secondary schools with their subsequent course grade data at the University of Auckland. In a 2007 report, they tested a number of measures of school achievement based on credits and grades, and found that school grade point average (based on assigning 0 for 'not achieved', 2 for 'achieved', 3 for 'merit' and 4 for 'excellence' and averaging over externally assessed achievement standards) was reasonably highly correlated ($r = 0.66$) with first-year course grade point average (Shulruf, Hattie and Tumen, 2007).

In addition to exploring the relationship between school achievement and tertiary achievement under the new NCEA system, another reason for this study is the recent government focus on youth transitions. Internationally, New Zealand has one of the lowest retention rates at upper secondary level in the OECD (OECD, 2007), and the levels of 15 to 19 year olds not in education or employment has become an issue of key policy interest. Another OECD report (OECD, 2008) raised issues with the levels of certain sections of New Zealand youth not in education or employment, and highlighted early school leaving as an issue, with only 80 percent enrolled in school after their 16th birthday, compared with 89 percent for the OECD, and with much wider disparities for Māori and Pasifika.

In 2008, the government announced its 'Schools Plus' plan to have every person in education or training until the age of 18. In a discussion document released in March 2008, the Minister of Education says 'Each year about 14,000 young people (around 25 percent of school leavers) are leaving schools without a Level 1 qualification, and many are not going on to any further study or training', and outlines the government's goal of 'All young people are in education, skills, or structured learning, relevant to their needs and abilities, until the age of 18' (Ministry of Education, 2008).

In 2007, the Ministry of Education, in collaboration with the NZQA, began a research programme into the question of transitions from school to tertiary. This team was able to utilise the power of the National Student Number to link NZQA's database containing NQF results with the Ministry of Education's database on tertiary participation and achievement, and the Tertiary Education Commission's database on participation in industry training.

The first report from this research programme was released in November 2007, and looked at the rates at which school leavers undertook tertiary study, including for the first time, transition rates to formal workplace learning (Ussher, 2007). Recently, a second report was published, which looked at how school achievement affected students' choices about post-school study (Ussher, 2008). This report included the use of expected percentile as a measure of school achievement under NCEA, finding a significant relationship between this measure and choices around further study.

This report, *How does achievement at school affect achievement in tertiary education?* is designed as a complement to those reports, with a focus on tertiary achievement instead of participation. Clearly the two are related. Those with low school achievement are less likely to do further study, and therefore, by default, will not achieve in tertiary education. The significance of the influence of school achievement depends on the definition used to measure it, as well as the group being studied. For example, school achievement as measured by level of school qualification, is less of a factor for first-year degree students, than for students as a whole, or for the general population as a whole, since first-year degree students, by and large, all begin with the same level of qualification, and the level of qualification attained has a limited capacity to capture, for example, the range of ability between those just passing and those passing easily. However, school qualification becomes more significant when looking at achievement across all levels of tertiary study, and is very significant as a factor for tertiary qualification attainment in the general population.

Measuring Achievement

There is a need therefore, to look at measures of academic performance at secondary school other than the level of NCEA qualification attained. Alternative measures may allow the academic performance for this group of school leavers to be placed on a continuous scale. There are a number of measures that could potentially be used. A discussion of some of these can be found in Ussher (2008, Appendix C). In line with that report, this study utilises a measure of achievement known as expected percentile. This measure was developed for analysing NQF results by Michael Johnston at NZQA, and is defined in more detail on page 25, and also in Ussher (2008, Appendix C).

The expected percentile measure is calculated for each achievement standard based on the distribution of students' results in that standard. The percentage, and cumulative percentage of students in each of the four possible results, excellence, merit, achieved and not achieved, is first determined. From this an individual's expected percentile is the mean of the percentiles represented by the upper and lower bounds of the result range. An example of these calculations is shown in the table below.

Results distribution of a sample achievement standard taken by 120 students

Result	Students	Percentage	Cumulative percentage	Expected percentile
	A	B	C	$D_i = (C_{i+1} + C_i)/2$
1 Excellence	12	10%	100%	95%
2 Merit	24	20%	90%	80%
3 Achieved	60	50%	70%	45%
4 Not achieved	24	20%	20%	10%

Source: Ussher, 2008, Appendix C.

An average expected percentile is then calculated across all the standards a student has taken. By averaging across standards, the assumption is made that 'not achieved', 'achieved', 'merit' and excellence' results are broadly comparable across standards, fields and domains. This assumption will not always hold for each individual standard, but should broadly hold for the total population groups used in this study. Expected percentiles are calculated separately for Level 1, Level 2, and Level 3 results.

The distinguishing feature of expected percentile is that it provides a relative measure, ie one that is referenced against the performance of all others who did that standard. A student with the same result for particular standards can have different expected percentiles depending on how they did relative to their peers.

Similarly, a number of measures could be used to measure tertiary achievement. One of the more commonly used measures is qualification completion rate, ie the percentage of students who have

completed a degree after a certain period of time, eg 5 or 6 years. Unfortunately the available data currently only permits us to track two years of tertiary study. National tertiary data collections also do not include course grades, credits or points. However, we do have detailed information on course (ie paper) enrolments and completions, and on qualification completions, covering two years of tertiary study for those leaving school in 2004.

The measures chosen then to measure tertiary achievement for this study are:

- course pass rate – defined as the percentage of first year courses that are passed, and
- first-year attrition – defined as whether someone left tertiary education after their first year without any qualification.

Statistics using both of these measures are routinely published on the Ministry of Education's Education Counts website, and the same definitions used there are adopted for this report. Section 5 of this report has full details of the technical definitions of these measures, including error margins associated with pass rate estimates.

Study Aims

So, this study aims to test the relationship between school and tertiary achievement using this measure – expected percentile – and first-year course pass rates, and first-year attrition rates. Specifically, some of the questions the study hopes to address are:

- How are the characteristics of performance in senior secondary NQF-based qualifications related to achievement in tertiary study?
- How well does expected percentile predict achievement in tertiary study?
- How much influence does school achievement have on tertiary achievement, compared with other school or tertiary factors or demographic characteristics?

This study will in most part focus on degree study in tertiary education providers. The interesting questions of school achievement and achievement in sub-degree level study, or in formal workplace learning will remain questions for further research, as will the question of the impact on longer-term qualification completion rates, and on post-study labour market outcomes.

3 The class of 2004

This study looks at students who left school in 2004. The year 2004 is selected since it is the year that NCEA Level 3 was introduced, and so provides the first cohort to have undertaken all three years of the new NCEA system.

Around 55,600 students left school in 2004. However, the sample used in this study includes around 52,800 students or about 95 percent of all 2004 school leavers. The sample excludes those leavers who failed to gain any unit standard credits, or failed to undertake any achievement standards during their secondary years.² For example, the sample excludes students undertaking international examinations, such as Cambridge International Examinations, in lieu of NCEA, although those who also had achievement standards will be included.

Of the 52,800 students in our sample, an estimated 65 percent undertook formal post-secondary learning (either workplace-based or provider-based) over the next two years (Ussher, 2007). However, this study focused just on those 23,400 leavers (or 46 percent) who enrolled with a tertiary education provider in 2005. It excludes those who took a year's break, or who got a job the following year, and undertook workplace-based formal learning. These groups remain areas for further research.

Further, the sample of 23,400 only includes those students who undertook achievement standards, and excludes those whose only credits were from unit standards. Around 1,300 students (or 2.5 percent) of our sample had only unit standard credits. Assuming a similar or lower transition rate to tertiary study, the numbers of these students would have a negligible impact on the overall results.

Therefore, while this sample provides a very high level of coverage of both school leavers and their achievement, it will not reflect the achievement of students who undertook unit standards or non-NQF examinations, in addition to, or instead of, achievement standards.

Table 1: Class of 2004 – highest NQF achievement by years at secondary school

Highest NQF achievement	Students		Years at secondary school		
	Number	Percent	3 or less	4	5 or more
Less than 14 credits	2,000	4%	1,330	380	290
14 - 39 credits	4,170	8%	2,940	720	510
40+ credits, but no qualification	6,370	12%	4,070	1,800	500
Level 1 qualification	3,810	7%	2,300	1,200	310
30+ credits L2 or above	5,820	11%	310	3,570	1,950
Level 2 qualification	8,270	16%	90	4,920	3,260
30+ credits L3 or above without UE	5,380	10%	30	330	5,020
40+ credits L3 or above with UE	1,080	2%	0	30	1,040
Level 3 qualification	15,820	30%	20	130	15,670
Level 4+ qualification	120	0.2%	0	10	110
No UE	37,850	72%	11,090	12,990	13,770
UE	14,980	28%	10	90	14,880
Total (Number)	52,830		11,110	13,080	28,650
Total (Percent)		100%	21%	25%	54%

Note: Totals may not add due to rounding.

Table 1 shows the sample of 2004 school leavers by their highest NQF achievement. Around a quarter left without any NQF qualification, but some of these may have gained other non-NQF qualifications. About 30 percent have a Level 3 qualification or higher, and 28 percent have UE. Just over half, or 54 percent leave after 5 or more years. Of those leaving before 5 years, around a half will undertake some form of tertiary learning over the next two years (see Table 4 below).

² For a description of unit standards and achievement standards see www.nzqa.govt.nz.

Table 2: Class of 2004 – highest NQF achievement by expected percentile

Highest NQF achievement	Students	Median expected percentile			Coverage (% of students)		
		Level 1	Level 2	Level 3	Level 1	Level 2	Level 3
Less than 14 credits	2,000	22%	27%	25%	59%	13%	4%
14 - 39 credits	4,170	25%	29%	30%	86%	17%	6%
40+ credits, but no qualification	6,370	29%	27%	24%	98%	24%	2%
Level 1 qualification	3,810	38%	29%	25%	99%	36%	3%
30+ credits L2 or above	5,820	32%	30%	26%	94%	85%	18%
Level 2 qualification	8,270	40%	36%	28%	98%	95%	29%
30+ credits L3 or above without UE	5,380	41%	36%	33%	94%	91%	85%
40+ credits L3 or above with UE	1,080	50%	42%	39%	94%	83%	98%
Level 3 qualification	15,820	59%	54%	51%	96%	92%	99%
Level 4+ qualification	120	83%	84%	85%	92%	73%	87%
No UE	37,850	34%	33%	32%	93%	62%	28%
UE	14,980	60%	55%	51%	97%	92%	100%
Total	52,830	41%	40%	43%	94%	70%	48%

Notes: Coverage shows the percentage of students who had achievement standard results for a particular NQF Level. Where coverage is low, the corresponding expected percentile may be based on a small number of students, and so should be interpreted with care. Student counts may not add due to rounding.

Table 2 shows the median expected percentile scores by highest NQF achievement. Expected percentile scores based on Level 1, 2 and 3 results respectively are given, and all rise, as expected, with the level of NQF achievement. Level 3 median expected percentiles are generally lower than those for Level 1 and 2. This does not reflect higher achievement at Levels 1 and 2, but rather the fact that more of the poorer performing students have left by Level 3, thereby acting to lower the median. The coverage columns show the percentage of students that the expected percentile is based on. Most students with low NQF achievement will leave before Level 3 and therefore a median Level 3 expected percentile for these students becomes less meaningful.

Table 3: Class of 2004 – years at secondary school by expected percentile

Years at secondary school	Students	Median expected percentile			Coverage (% of students)		
		Level 1	Level 2	Level 3	Level 1	Level 2	Level 3
3 or less	11,100	30%	42%	36%	93%	6%	1%
4	13,080	36%	34%	34%	95%	84%	4%
5 or more	28,650	50%	44%	44%	94%	89%	87%
Total	52,830	41%	40%	43%	94%	70%	48%

Table 3 shows a similar relationship using years at secondary school. Higher achievement is associated with staying longer in school. Expected percentiles for those with Level 2 or 3 credits after 3 years, or those with Level 3 credits after 4 years, are based on small numbers, as shown in the coverage columns. They are likely to contain, for example, a bias towards brighter students.

In his 2007 report, *Tertiary education choices of school leavers*, Ussher presented estimates of the proportion of 2004 school leavers proceeding on to tertiary education over the next two years. This included, for the first time, estimates of those undertaking formal tertiary learning on the job. Table 4 uses data from this study to summarise transitions for the class of 2004.

Table 4: Class of 2004 – percentage enrolled in formal tertiary study 2004-2006

Years at secondary school	Students	No further study	Provider-based			Workplace-based		
			2004	2005	2006	2004	2005	2006
3 or less	11,100	54%	2%	24%	21%	1%	9%	16%
4	13,080	41%	2%	33%	31%	2%	12%	17%
5 or more	28,650	23%	1%	61%	62%	1%	6%	8%
Total	52,830	34%	2%	46%	46%	1%	8%	12%

Note: Each column 2004-2006 shows the percentage of leavers enrolled in that year, regardless of whether they were also enrolled in a previous year. A small number of students leaving school in 2004 were also enrolled in formal tertiary study during 2004.

Students undertaking workplace-based learning are more likely to start indirectly, ie after a year's break from learning. Interestingly, for those spending five or more years at secondary school, the number of students enrolling with a tertiary education provider after a year's break approximately compensates for those who enrolled directly from school and who then left after one year. Around 73 percent of school leavers who spent five or more years at secondary school enrol in further study at a provider in the next two years, and a further three percent undertake formal learning in the workplace.

Table 5 shows the expected percentile using Level 1 results for these same transition groups.

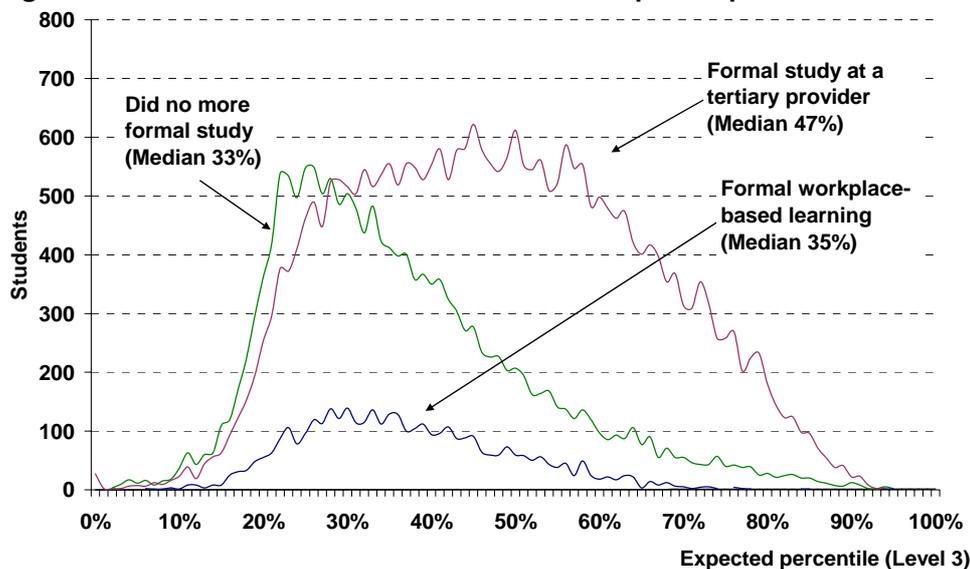
Table 5: Class of 2004 – median Level 1 expected percentile for different transition groups

Years at secondary school	Students	None	Provider-based			Workplace-based		
			2004	2005	2006	2004	2005	2006
3 or less	11,100	30%	26%	30%	31%	29%	33%	32%
4	13,080	33%	34%	38%	40%	36%	37%	37%
5 or more	28,650	39%	43%	54%	56%	47%	43%	42%
Total	52,830	33%	34%	49%	51%	40%	38%	37%

Note: Around 6% of leavers have missing Level 1 expected percentile data and so are not represented in these figures. The expected percentiles for students in both school and tertiary study in 2004 are based on small numbers, so should be treated with caution.

Provider-based students had generally higher school achievement than workplace-based learners. The higher expected percentile for provider-based students in 2006, probably reflects the fact that those with relatively lower school achievement are more likely to have dropped out after their first year. Those not undertaking further study had, as might be expected, the lowest median expected percentile. However the range of achievement across each group varied considerably. Figure 1 below, shows the distribution of school achievement and the degree of overlap amongst these three groups.

Figure 1: Class of 2004 – distribution of Level 1 expected percentile for different transition groups



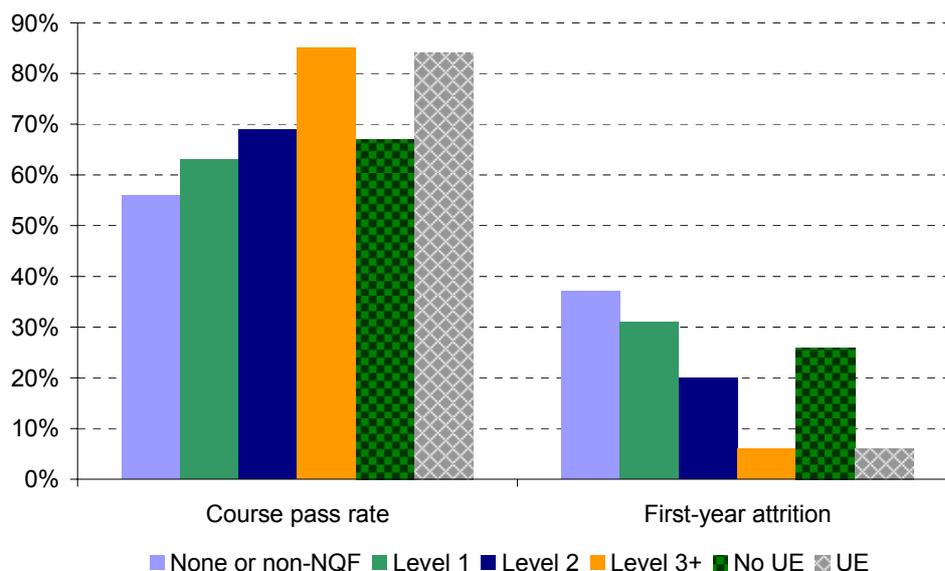
Note: Excludes around 6 percent of 2004 school leavers with no Level 1 expected percentile.

The remainder of this study looks only at those school students who left school in 2004 and enrolled with a tertiary education provider in 2005. This represents around 24,300 students, or 46 percent of the total 52,800 leavers.

4 School achievement and tertiary achievement

To begin looking at the relationship between achievement at school and achievement in tertiary education, Figure 2 below shows the percentage of first-year tertiary courses passed (over any level), and first-year attrition (ie whether they left after one year without any qualification) for different levels of school qualification. Our study group is the approximately 24,300 students who left school in 2004 and enrolled with a tertiary education provider in 2005.

Figure 2: First-year tertiary achievement by level of school qualification



The graph shows the expected relationship between a higher school qualification and higher tertiary achievement. On average, the group passed 75 percent of their first-year tertiary courses, and 17 percent left after the first year with no qualification. This compares with 70 percent and 30 percent, respectively for all students in 2005.

Table 6 below breaks down the above graph into level of tertiary study, and also tabulates expected percentiles, with the percentage of their first-year courses passed, and first-year attrition. The table shows that in addition to level of school qualification, level of tertiary study is associated with higher achievement in tertiary education.

Table 6: School achievement and first-year achievement in tertiary education

Level of tertiary study	Level of school qualification	Students	Expected percentile			Mean pass rate	Median pass rate	First-year attrition
			Level 1	Level 2	Level 3			
Level 1-3 certificate	None or non-NQF	2,170	27%	27%	25%*	54%	50%	41%
	Level 1	1,720	34%	29%	26%	66%	80%	32%
	Level 2	2,100	38%	35%	30%	71%	94%	26%
	Level 3+	410	51%	45%	42%	80%	100%	16%
	No UE	6,120	32%	32%	30%	65%	78%	33%
	UE	270	55%	49%	45%	80%	100%	14%
	Total	6,390	33%	33%	32%	65%	80%	32%
Level 4-7 non-degree	None or non-NQF	650	28%	28%	24%*	54%	50%	32%
	Level 1	1,000	35%	30%	26%	58%	60%	30%
	Level 2	2,820	41%	36%	32%	69%	86%	22%
	Level 3+	1,120	50%	44%	41%	82%	100%	13%
	No UE	4,860	38%	35%	32%	65%	80%	25%
	UE	720	54%	48%	44%	86%	100%	10%
	Total	5,580	40%	36%	35%	68%	86%	23%

Table 6: School achievement and first-year achievement in tertiary education (continued)

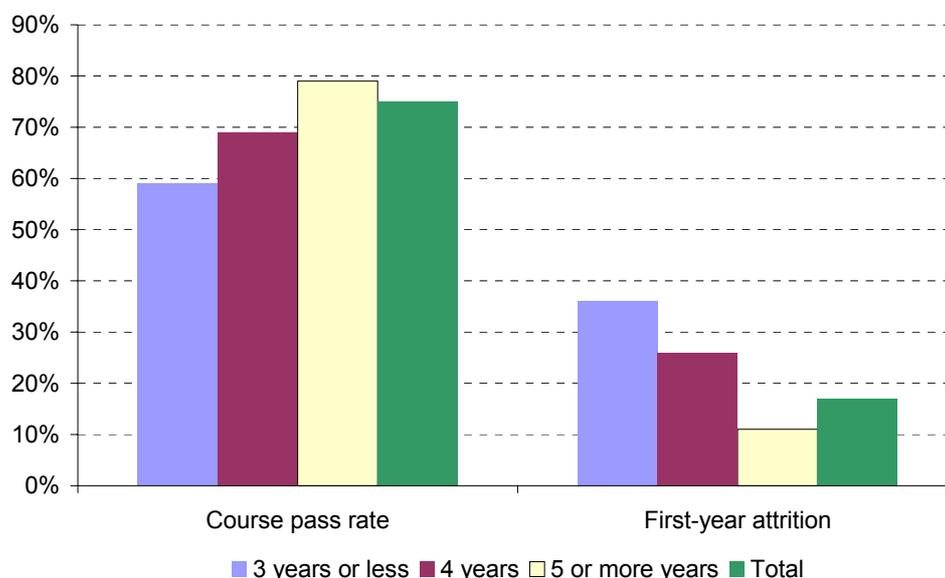
Level of tertiary study	Level of school qualification	Students	Expected percentile			Mean pass rate	Median pass rate	First-year attrition
			Level 1	Level 2	Level 3			
Degree	None or non-NQF	150	59%	55%*	53%*	84%	100%	7%
	Level 1	100	42%*	33%*	27%*	68%	85%	20%
	Level 2	1,770	50%	42%	38%	68%	81%	11%
	Level 3+	10,360	62%	57%	54%	85%	100%	5%
	No UE	1,900	50%	42%	38%	75%	92%	10%
	UE	10,470	61%	57%	53%	84%	100%	5%
	Total	12,370	60%	55%	52%	83%	100%	6%
Total	None or non-NQF	2,960	27%	28%	29%	56%	56%	37%
	Level 1	2,810	34%	30%	26%	63%	75%	31%
	Level 2	6,680	42%	37%	34%	69%	86%	20%
	Level 3+	11,890	60%	55%	52%	85%	100%	6%
	No UE	12,890	37%	35%	33%	67%	83%	26%
	UE	11,460	61%	56%	52%	84%	100%	6%
	Total	24,340	49%	46%	47%	75%	100%	17%

Note: Expected percentiles marked with a * are based on fewer than 100 students. See section 5 for definitions and full details of the methods used. Totals may not add due to rounding.

Expected percentiles rise as expected with each level of school qualification and the level studied in tertiary education. The exception to the pattern occurs with the 'none or non-NQF' group, which for those studying below degree level, is dominated by those with no qualifications, while for those at degree level, has a higher proportion of students with non-NQF qualifications, such as Cambridge International. Unfortunately the current data does not permit us to distinguish these. The relationship is particularly marked for students with UE or Level 3 or higher. The median course pass rate for these students was 100 percent, and the retention rate into 2006 was 95 percent.

Figure 3 below shows the relationship between achievement and years at secondary school for the 24,300 school leavers who enrolled with a tertiary provider in 2005. About 11 percent of students enrolling direct from school have had 3 years or less, while a further 18 percent have had 4 years.

Figure 3: School and tertiary achievement by years of secondary schooling



As expected, students who stay longer at school do better in tertiary education. However, given that achievement at school is strongly related to years at school, how is years at school related to tertiary achievement for students with similar levels of school achievement? This question is explored later in this section. We show that, after controlling for expected percentile, years at school has no additional effect.

Table 7: School and tertiary achievement by years of secondary schooling and level of tertiary study

Level of tertiary study	Years at secondary school	Students	Median expected percentile			Mean course pass rate	Median course pass rate	First-year attrition
			Level 1	Level 2	Level 3			
Level 1-3 certificate	3 or less	2,050	30%	28%*	28%*	59%	65%	38%
	4	2,230	34%	32%	28%*	66%	83%	30%
	5 or more	2,110	36%	33%	32%	70%	91%	28%
	Total	6,390	33%	33%	32%	65%	80%	32%
Level 4-7 non-degree	3 or less	590	33%	32%*	27%*	57%	50%	31%
	4	1,620	40%	36%	32%*	69%	88%	24%
	5 or more	3,380	41%	36%	35%	70%	88%	20%
	Total	5,580	40%	36%	35%	68%	86%	23%
Degree	3 or less	40	43%*	48%*	47%*	85%	100%	14%
	4	450	60%	57%	64%	82%	100%	10%
	5 or more	11,890	60%	55%	52%	83%	100%	6%
	Total	12,370	60%	55%	52%	83%	100%	6%
Total	3 or less	2,670	30%	30%	35%*	59%	63%	36%
	4	4,300	38%	35%	45%	69%	88%	26%
	5 or more	17,370	54%	49%	47%	79%	100%	11%
	Total	24,340	49%	46%	47%	75%	100%	17%

Note: Expected percentiles marked with a * are based on fewer than 100 students. See section 5 for definitions and full details of the methods used. Totals may not add due to rounding.

Level of school qualification gives us very limited ability to explore the relationship between school and tertiary achievement for the school leavers moving on to tertiary study with the same qualification. Of the 24,300 school leavers in this study, 49 percent had NCEA or another NQF qualification at Level 3, and of these almost all (90 percent) enrolled in a bachelors degree. Table 7 below, explores this particular majority group further.

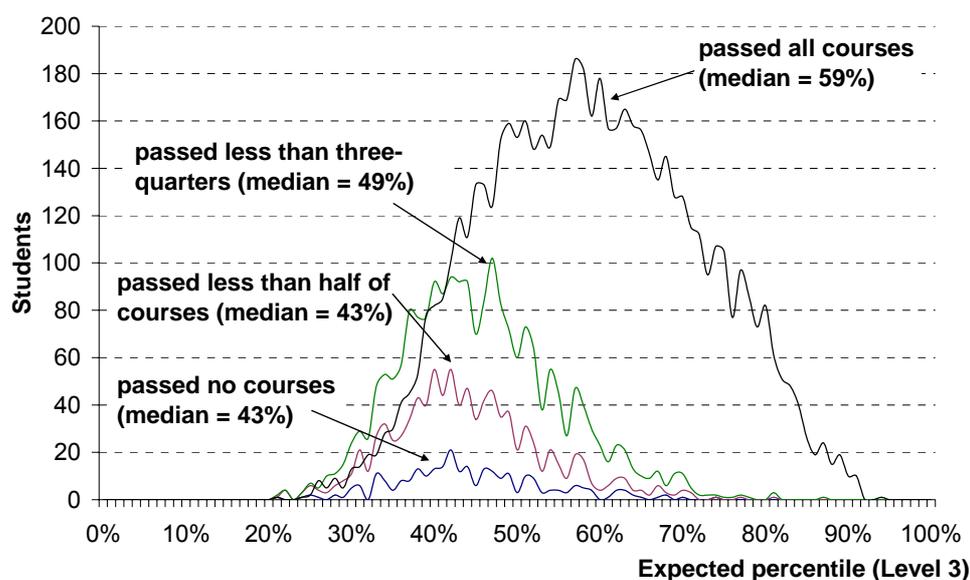
Table 8: Students leaving with a Level 3 school qualification and enrolling in a bachelors degree: Expected percentile by percentage of first-year tertiary courses passed

Level 3 expected percentile	Students		Percentage of tertiary courses passed							Mean
	No.	%	Passed none	0 -<25%	25-<50%	50-<75%	75-<100%	Passed all	Total	
<20%	0	0%								
20-29%	140	1%	8%	10%	12%	20%	23%	26%	100%	63%
30-39%	1,210	12%	7%	5%	13%	22%	22%	32%	100%	68%
40-49%	2,750	26%	4%	3%	8%	16%	23%	45%	100%	78%
50-59%	2,730	26%	2%	1%	4%	11%	22%	61%	100%	88%
60-69%	1,950	19%	1%	0%	1%	5%	14%	79%	100%	94%
70-79%	1,110	11%	0%	0%	1%	1%	8%	89%	100%	98%
80-89%	430	4%	0%	0%	0%	1%	7%	91%	100%	99%
>90%	30	0%	0%	0%	3%	0%	10%	87%	100%	97%
Total	10,360	100%	3%	2%	5%	11%	19%	61%	100%	85%
Median Level 3 expected percentile			43%	43%	43%	46%	50%	59%	54%	

Note: Excludes around 1% of students for whom expected percentile or pass rate information is not available. Totals may not add due to rounding.

There is a clear pattern of association of higher school achievement with higher tertiary achievement. So far, the use of expected percentiles as a measure of school achievement does appear to provide a tool for analysing the relationship not otherwise possible with level of qualification alone. To explore this relationship further, Figure 4 below plots the distribution of students by expected percentile for different tertiary achievement groups.

Figure 4: Students leaving with a Level 3 school qualification and enrolling in a bachelors degree: Distribution by expected percentile for different tertiary achievement groups



Note: Excludes around 1 percent of students, for whom expected percentile or pass rate information is not available.

The shift to the right for differently performing tertiary groups indicates the moderate extent of the relationship between Level 3 expected percentile and percentage of courses passed for this group. Students passing all their courses (57 percent of all students) were more likely to have higher Level 3 expected percentile scores (median 59 percent). However, there was a reasonable degree of overlap for this group, with some 30 percent of the bottom 20 percent of students passing all their courses.

However, while it is true that many with low achievement at school passed all their first-year courses, those with high achievement at school seldom did poorly at tertiary level. In fact, nine out of 10 of the top third performing students at school, (those with achievement scores of 60 percent or over) passed all their first-year tertiary courses. Less than 4 percent of those in the top 50 percent, in terms of expected percentile, failed more than half of their first-year courses, compared with 21 percent for the bottom 50 percent. This is summarised in the table below.

Table 9: First-year tertiary achievement by Level 3 expected percentile for students leaving with a Level 3 school qualification and enrolling in a bachelors degree

Level 3 expected percentile	Students		Average courses enrolled in	Mean course pass rate	% who passed all courses	% who passed no courses	First-year attrition
	No.	%					
<20%	0	0%					
20-29%	140	1%	7.9	63%	25%	8%	9%
30-39%	1,210	12%	7.4	68%	31%	6%	9%
40-49%	2,750	27%	7.3	78%	45%	4%	7%
50-59%	2,730	26%	7.2	88%	60%	2%	5%
60-69%	1,950	19%	7.4	94%	78%	1%	3%
70-79%	1,110	11%	7.4	98%	88%	0%	3%
80-89%	430	4%	7.5	99%	91%	0%	2%
>90%	30	0%	8.0	97%	87%	0%	3%
Total	10,360	100%	7.3	85%	60%	3%	5%

Note: Excludes around 1 percent of students, for whom expected percentile or pass rate information is not available. Totals may not add due to rounding.

As mentioned in the introduction, NCEA has been criticised by some as not motivating some students to achieve to their potential, or to do just enough to gain their qualification, or University Entrance. In Meyer et al, 2006, for example, they go on to show that students 'doing just enough' often end up doing not as well as they expected at school. Level 3 NCEA is the majority qualification held by those going on to degree-level study, requiring 60 or more credits at Level 3, in addition to 20 or more credits at Level 2. However, for those wanting to do just enough, University Entrance requires 42 credits at Level 3, provided that some of these credits are from a prescribed list of approved subjects, and certain minimum levels of literacy and numeracy are met.

The group of students going on to degree study with UE and not NCEA Level 3 is relatively small, just 5 percent of the cohort. While it is not really possible to distinguish which of these did their best compared with those that did just enough, it is useful to look at their subsequent tertiary achievement.

Table 10: Tertiary achievement for different groups of degree students

	Level 3 or higher with UE	Level 3 or higher without UE	Less than Level 3 with UE	Less than Level 3 without UE	Total
Number of school leavers	13,908	2,032	1,076	35,813	52,829
Number enrolling in tertiary study the following year	10,739	1,152	717	11,733	24,341
Of these, number enrolling at degree level	9,855	507	616	1,396	12,374
For degree students only:					
Average number of courses enrolled	7.3	7.3	6.9	6.8	7.3
Average percent of courses passed	86%	81%	61%	73%	83%
Percent passing all their courses	60%	55%	25%	44%	56%
Percent failing all courses	3%	5%	12%	10%	4%
First-year attrition rate	5%	9%	12%	10%	6%

Note: Totals may not add due to rounding.

Students with UE as their highest achievement passed significantly fewer courses and had twice the drop-out rate of degree students with Level 3 NCEA. It is not possible with the available data to distinguish within this group, those who did their best at school compared with who did just enough. However, the results do perhaps suggest that, if motivation rather than ability was a significant factor leading to some students gaining UE rather than Level 3 NCEA, then factors other than ability also adversely affected their subsequent tertiary performance.

About 4 percent of school leavers going on to degree study had Level 3 NCEA but not UE. This group for the most part undertook their degree study outside of a university. This group had a slightly lower average pass rate than those with both Level 3 NCEA and UE and higher first-year attrition. However, later in this section, we show that, after controlling for differences in achievement, study load and other demographic and study-related factors, students studying at degree level outside of a university were more likely to pass all their courses than those at university. However, even after controlling for these other factors, students studying at degree level outside of a university were still more likely to drop out after their first year.

A standard method used to measure the degree of linear association between two continuous factors is the Pearson Correlation coefficient. A value of 0 means they are not linearly related, a value of 1 means both are completely related. Table 11 shows a low association between expected percentile scores and the percentage of courses passed for study below degree level.

Table 11: Correlation coefficients between expected percentile and course pass rate

Highest level of school qualification	Level of tertiary study	Students	Correlation of expected percentile (ExP) with course pass rate		
			Level 1 ExP	Level 2 ExP	Level 3 ExP
None or non-NQF	Level 1-3 certificate	2,170	0.08		
	Level 4-7 non-degree	650	0.11		
	Degree	150	0.37		
	Total	2,960	0.14		
Level 1	Level 1-3 certificate	1,720	0.10		
	Level 4-7 non-degree	1,000	0.11		
	Degree	100	0.34		
	Total	2,810	0.13		
Level 2	Level 1-3 certificate	2,090	0.11	0.07	
	Level 4-7 non-degree	2,820	0.17	0.13	
	Degree	1,770	0.27	0.29	
	Total	6,680	0.16	0.16	
Level 3	Level 1-3 certificate	410	0.02	0.02	0.06
	Level 4-7 non-degree	1,120	0.15	0.13	0.14
	Degree	10,360	0.34	0.36	0.39
	Total	11,890	0.31	0.31	0.34
Total	Level 1-3 certificate	6,390	0.17	0.11	0.15
	Level 4-7 non-degree	5,580	0.23	0.19	0.18
	Degree	12,370	0.37	0.38	0.41
No UE		12,890	0.20	0.14	0.12
UE		11,460	0.33	0.33	0.37
Total		24,340	0.36	0.34	0.37

Note: Totals may not add due to rounding.

For degree level, the level of association is largest but still moderately small at around 0.4. While there is some relationship, there is a reasonable amount of variance. In other words, while there is a moderate relationship, expected percentile alone, cannot fully predict tertiary performance for many students. This is very much in line with the findings from other historical studies discussed in the introduction.

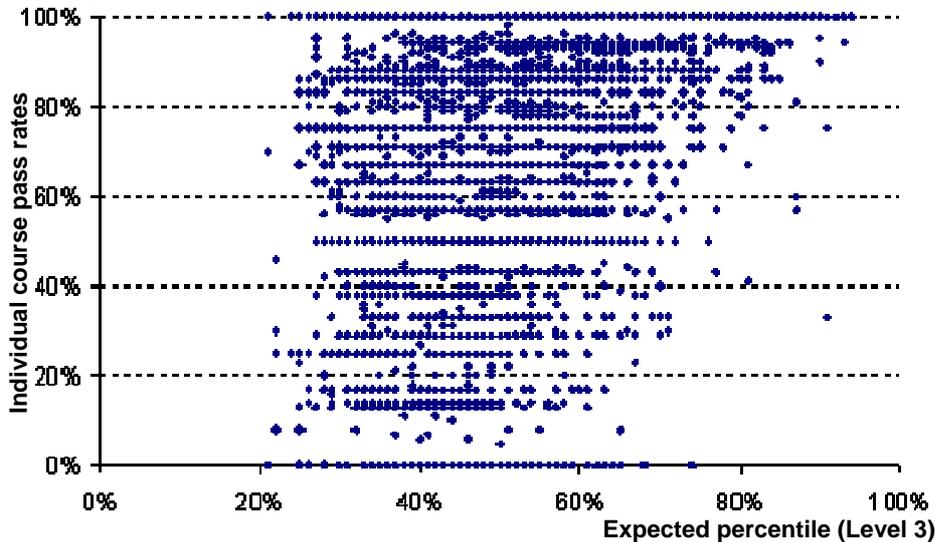
However, these historical studies focused on degree study at university only. The lower relationship between school achievement and course pass rates for non-degree-level students suggests that other factors are more at play here. A model described later in this section can be used to show that for non-degree students, study load had almost as much influence as expected percentile.³ While study load and expected percentile had the largest effect of the factors tested, they were however, only able to explain 9 percent of the variance in students' likelihood of passing all their sub-degree courses.

The relationship for degree students was highest using their expected percentile based on Level 3 results. Later in this section, we confirm that Level 3 expected percentile does have the highest explanatory power in terms of predicting pass rates, accounting for 23 percent of the variance in students' likelihood of passing all their degree courses.

³ Full details of these results are not presented in this report.

Those enrolling in degrees at universities require a minimum level of achievement, through the University Entrance requirement, and so the range of their school achievement is confined to a smaller higher band than that of all school leavers. A scatter plot of the distribution of pass rates (as seen in Figure 5 below) will therefore tend to show more variability and less of a relationship than if all leavers were included.

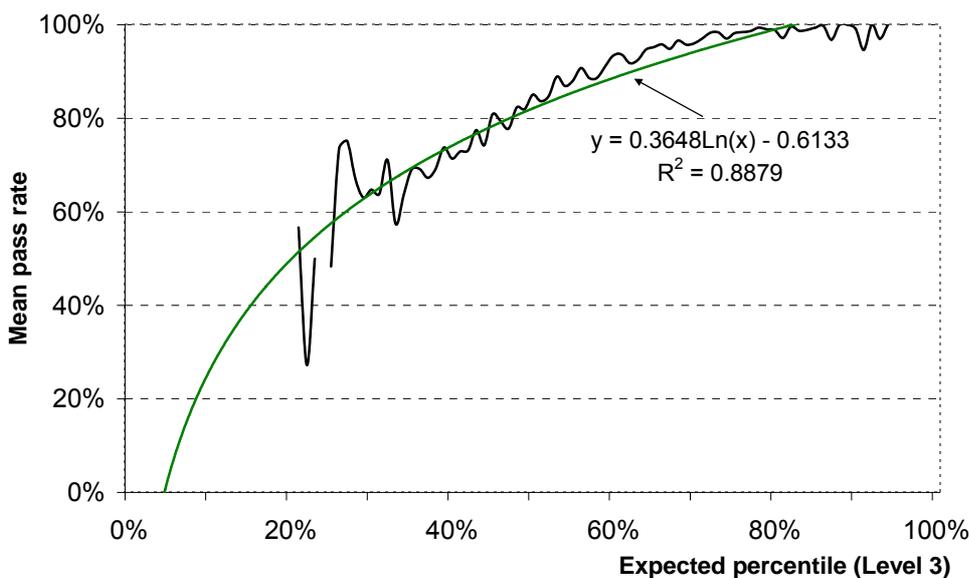
Figure 5: 2004 school leavers enrolling in degrees: expected percentile (Level 3) versus percentage of courses passed



Note: Excludes around 200 students who enrolled in only 1 or 2 courses during the year, and a further 120 for whom no expected percentile or pass rate information is available.

However, while the variance is high amongst individual students, this variance reduces significantly once pass rates are averaged for students with the same expected percentile. This is shown in Figure 6 below. The very high degree of correlation of around 90% suggests that the mean first-year tertiary pass rate for 2004 school leavers enrolling directly in degrees can be determined almost entirely from their Level 3 expected percentile results.

Figure 6: 2004 school leavers enrolling in degrees: expected percentile (Level 3) by average first-year course pass rate



Note: Excludes around 200 students who enrolled in only 1 or 2 courses during the year, and a further 120 for whom no expected percentile or pass rate information is available.

Logistic regression models allow us to more formally isolate and measure the effects of individual factors on tertiary achievement. They allow us to answer questions about how much a particular factor would influence tertiary achievement, if other factors were held constant.

Much has been written on the factors influencing tertiary achievement, and this report does not intend to summarise this literature here. For those interested, the reader is referred to, for example, Scott and Smart, 2005, or Prebble et al, 2005 for a review of the literature on this topic. However, what is known from this research is that school achievement does play a significant role in tertiary achievement and that generally, statistical models can explain only a small amount (eg 15-30 percent) of the variance in tertiary achievement. Results can vary considerably, depending on the factors used, the size and nature of samples used, and the different definitions used for both the dependent and independent variables.

National administrative data sources such as the ones used in this study have a distinct advantage in that they cover nearly all students, and therefore there is less potential sample bias and more statistical power. However, they are often limited in their ability to measure less tangible, but no less influential, factors affecting achievement. In this study, for example, we are not able to capture the key effects of factors such as motivation and commitment, or parental influences.

In this study, we modelled two outcomes; the likelihood of passing all first-year courses, and the likelihood of dropping out after one year. The model is tested for degree students only, and is based on a sample of 10,400 students who left school in 2004 and enrolled in a degree in 2005.

The following variables are included in the model:

- Expected percentile (based on Level 3 results) A continuous variable from 0 to 100
- Expected percentile (based on Level 2 results) A continuous variable from 0 to 100
- Expected percentile (based on Level 1 results) A continuous variable from 0 to 100
- Highest level school qualification Level 3 or higher with UE, Level 3 or higher without UE
UE and no Level 3, other
- Years of secondary schooling 3 or less, 4, 5 or more
- Gender Male, Female
- Age (at 31 December 2004) 15, 16, 17, 18, 19 plus
- Ethnic group 4 Variables; whether Māori or not, Pasifika or not, Asian or not, European or not
- School subject Humanities, Science, Arts & Crafts, Business, Engineering & Technology, Computing & IT
- Whether school is co-ed or single sex Yes or no
- Whether school is public (including state integrated) or private Yes or no
- School roll Grouped into bands of 500, inclusive of all levels taught
- School decile Grouped into 4 groups, low, medium, high and unknown
- Tertiary field of study One of 8 groups – based on broad NZSCED groups
- Whether enrolled at a university or not Yes or no
- Whether full-time or not Where full-time is full-time for a full academic year.
- Number of courses enrolled in 1 to 10 or more

Details of the model specification and the regression results are contained in section 5 of this report. The main findings are summarised below.

A third of the variance in students' likelihood of passing all their first-year degree courses was explained by the model. Two-thirds of the variance was not explained. In terms of predicting first-year attrition, the model had less power, accounting for 13 percent of the variance in drop-out rates, with 87 percent not explained by the model.

The effects of each of the three levels of expected percentile, as well as highest school qualification, were tested individually and in combination. In terms of the likelihood of passing all first-year degree courses, expected percentile based on Level 3 results had the greatest influence. On its own it accounted for 23 percent of the variance. However, expected percentiles based on Level 1 and Level 2 results were still statistically significant, but their effect was less, and together all three levels of expected percentile accounted for 25 percent of the total variance in passing all courses.

In terms of first year attrition, expected percentile based on level 3 results was also a significant predictor, however its impact was much less. On its own, expected percentile based on Level 3 results accounted for 5 percent of the variance in first-year attrition in degree study. Unlike passing all courses, Level 1 and Level 2 expected percentiles had no statistically significant effect on first-year degree attrition rates, after controlling for other factors.

After controlling for expected percentile, highest qualification level still had a statistically significant effect, both for passing all degree courses, and for first-year attrition. Those with UE, but no Level 3 NCEA, had less likelihood of passing all courses than those with both Level 3 NCEA and UE, and more likelihood of dropping out after their first year. By contrast, and after controlling for all other factors, students with Level 3 NCEA, but no UE, were more likely to pass all their courses than those with both Level 3 NCEA and UE. This raises some interesting questions around reasons why this might be so. It will be interesting to see if the effect is also present for later cohorts of school leavers. There was no statistically significant difference in first-year attrition rates, however, between these two groups.

There was also no statistically significant difference in either passing all courses or first-year attrition rates between those students with UE and Level 3 NCEA, and those students with neither UE nor Level 3 NCEA. School leavers enrolling directly in degree study without UE or Level 3 NCEA are likely to comprise many of those who undertook non-NQF exams such as Cambridge International, along with some Level 3 achievement standards. However, it was not possible with the available data to determine who did not sit NCEA, or to include those non-NCEA students who did no Level 3 achievement standards.

In terms of a student's likelihood of passing all first-year degree courses, the second most predictive factor in the model was tertiary field of study. Those studying education degrees were more likely to pass all their courses, followed in order by creative arts, health, humanities, commerce, engineering and science. This is broadly consistent with Scott and Smart, (2005), which was based on all degree students, rather than those coming directly from school. Field of study, however, was not a significant factor in predicting first-year attrition, all other things being equal.

Whether a student was studying full-time, and the number of courses enrolled in, were also significant factors, for both passing all courses, as well as first-year attrition. In terms of passing all courses, these measures of study load alone, contributed the third largest amount to total amount that could be explained by the model, almost as much as tertiary field of study. However, both these factors together, were able to explain less than by using expected percentile alone. For two full-time students, all other things being equal, those enrolled in fewer courses were more likely to pass all their first-year degree courses.

For first-year attrition, study load had the largest effect of the factors used, although it accounted for just 6 percent of the variance in the data. Together with expected percentile, study load factors accounted for 11 percent of the total variance in the data. For two full-time students, all other things being equal, those enrolled in fewer courses were more likely to drop out after their first year.

Previous research (Scott and Smart, 2005) found that studying full-time was the most significant factor in terms of degree completion in the model they used. The contrast between passing all first-year degree courses and first-year attrition, in terms of the influence of study load factors, perhaps

suggests that commitment-related factors take on a more important role in terms of qualification success, while academic ability or preparation have a greater role in terms of course success.

Alone, expected percentile, tertiary field of study, and study load factors accounted for 31 percent of the variance in students' likelihood of passing all their first-year degree courses. Together with all other factors, the model accounted for 33 percent.

Alone, expected percentile and study load factors accounted for 11 percent of the variance in students' likelihood of dropping out after the first year. Together with all other factors, the model accounted for 13 percent.

Around 9 percent of 2004 school leavers who enrolled in a degree, did so outside of a university (either at a polytechnic, wānanga, or private provider). In actual, or unadjusted data, university students had similar degree course pass rates as other types of provider, and lower first-year attrition. However, after controlling for other factors, those enrolled outside of a university were more likely than university students to pass all their courses. By contrast, non-university degree-level students were also more likely to fail all their courses, and to drop out after one year, once other factors were controlled for. The reasons for this contrast raise questions for further research, but may, perhaps reflect employment- or vocationally-motivated differences between the two groups, or differences in commitment or adjustment.

Māori and Pasifika students were less likely to pass all their first-year degree courses than non-Māori, or non-Pasifika students respectively. Māori students were also more likely to drop out of degree study after their first year.

In a separate forthcoming study, Earle (2008) tests the relationship between expected percentile and tertiary achievement separately for Māori and non-Māori. He finds that the relationship between Level 3 expected percentile and passing all first-year degree courses was stronger for non-Māori than for Māori, suggesting that factors other than school achievement have more influence on tertiary achievement for Māori than for non-Māori.

The models tested the effects of the six groups of school subjects, sciences, humanities, business, arts and crafts, computing and information technology, and engineering and technology. Those doing business or sciences were statistically more likely to pass all their first-year degree courses, than those not doing those subjects. However, the magnitude of the effect was weak. Those doing computing at school were statistically less likely to pass all their courses, but again, the effect was weak. No other fields were significant factors for passing all courses, and school subject was not a significant factor in first-year attrition.

Students from state schools were more likely to pass all their first-year degree courses than students from private schools. However, the magnitude of the effect was small. Students from single-sex schools also had a statistically significant lower likelihood of passing all their first-year degree courses than students from co-ed schools, but this factor made only a marginal contribution. In fact, its effect is largely removed, after controlling for the modifying effects of gender, and whether a school was private or not, as these factors are strongly correlated with each other. Whether a school was private or not, or single-sex or not, did not have any significant effect for first-year attrition.⁴

Gender was not a significant factor for predicting whether a student passed all their first-year degree courses, but it was a statistically significant factor for first-year attrition. Women were less likely to drop out after their first year than men were, after controlling for school achievement and other factors. Again, this is consistent with Scott and Smart (2005), which looked at degree completion, and raises

⁴ These factors were not significant for first-year attrition at the 5 percent confidence level, but students from single-sex schools had a slightly higher likelihood of dropping out after their first year, at the 10 percent level of confidence.

additional research questions about why this might be so. Unfortunately, data was not available to include employment, or motivational and commitment factors in the model.

Years of secondary schooling, age, the decile of the school, and the size of the school were not significant factors in either passing all first-year degree courses, or first-year attrition after controlling for other factors.

5 Data, definitions and methods

Data

The data in this study comes from two sources: the New Zealand Qualifications Authority's administrative data on National Qualifications Framework (NQF) achievement, and the Ministry of Education's Single Data Return survey of tertiary education providers, run three times a year. The national student number provides a unique key by which data from both these sources may be linked.

This sample includes around 52,800 students or an estimated 95 percent of an estimated total of 55,600 school leavers in 2004. The sample excludes those leavers who failed to gain any unit standard credits, or failed to undertake any achievement standards during their secondary years. For example, the sample excludes students who sat international examinations, such as International Baccalaureate or Cambridge International Examinations, in lieu of NCEA.

The tertiary data covers all students enrolled with tertiary education providers who receive tuition subsidies from the government or who have courses that attract student loans or student allowances. Course level enrolments and completions for the year 2005 are used for pass rates, while 2006 enrolments and completions data is also used to measure first-year attrition.

For full details of this linked dataset, how a leaver is defined, and other associated definitions refer to Ussher, (2007, 2008). Some of the following definitions have been taken from these sources, as well as from Chapter 3 of Scott (2006).

Expected percentile

For this study we have used a measure of school achievement known as expected percentile. This measure was developed for analysing National Qualifications Framework results by Michael Johnston at the New Zealand Qualifications Authority. The reader is referred to Ussher (2008, Appendix C) for more detail on how expected percentile is defined.

The expected percentile measure is calculated for each achievement standard based on the distribution of students' results in that standard. The percentage, and cumulative percentage of students in each of the four possible results, excellence, merit, achieved and not achieved is first determined. From this an individual's expected percentile is the mean of the percentiles represented by the upper and lower bounds of the result range. An example of these calculations is shown in the table below.

Results distribution of a sample achievement standard taken by 120 students

Result	Students	Percentage	Cumulative percentage	Expected percentile
	A	B	C	$D_i = (C_{i+1} + C_i)/2$
1 Excellence	12	10%	100%	95
2 Merit	24	20%	90%	80
3 Achieved	60	50%	70%	45
4 Not achieved	24	20%	20%	10

Source: Ussher, 2008, Appendix C.

The expected percentile for each of a student's achievement standards is averaged to form the expected percentile for the student. This average is not weighted by credit value, or other attributes of the standard. A simple arithmetic mean is used, on the basis that relative performance in a standard should not necessarily vary with credit value. Similarly, the average expected percentile is not weighted by number of students taking the standard. By averaging across standards, the assumption is also made that 'not achieved', 'achieved', 'merit', and 'excellence' results are broadly comparable

across standards, fields and domains. These assumptions will not always hold for each individual standard, but should broadly hold for the total population groups used in this study.

Expected percentiles are calculated separately for Level 1, Level 2, and Level 3 results.

Expected percentiles are based on both internally and externally assessed achievement standards. Unit standards are not included since only one result, 'achieved' is collected. Prior to 2008, 'not achieved' results were also not collected for internally assessed achievement standards. Therefore a student's overall expected percentile will be over estimated, if they did not achieve any internally-assessed achievement standards. Similarly, achievement will not reflect performance in non-NQF examinations, such as Cambridge International Examinations.

The distinguishing feature of expected percentile is that it provides a relative measure, ie one that is referenced against the performance of all the other students who did that standard. A student with the same result for particular standards can have different expected percentiles depending on how they did relative to their peers.

This study, in general, uses the median to express the aggregate expected percentile for groups of students. The median expected percentile is the midpoint value, or the expected percentile at which half of the students have a value above and half have a value below.

Highest school qualification

The highest school qualification for school leavers is determined using the NQF dataset and therefore includes only NQF qualifications that school leavers have gained. For the purposes of this study, school qualification is categorised into four groups, Level 1 (including NCEA, or other Level 1 NQF qualification), Level 2, Level 3, and other. This 'other' category is strictly those with no recorded NQF qualifications, but with some credits (at any level). Some of these students may be poorer achieving students, but some may be high achieving students, who have obtained alternative non-NQF qualifications.

A number of New Zealand secondary schools offer alternative qualifications to those offered on the NQF. These qualifications include the Cambridge International Examinations and the International Baccalaureate. The use of NQF qualification for these students is therefore likely to under-report their highest school qualification. However, these students made up just 2 percent of all school leavers in 2004, and so their impact on the aggregated groups used in this study is very small, and unlikely to alter the study findings.

In this study, University Entrance (UE) is also used, along with NCEA or other NQF qualifications, as a measure of school achievement. Although no longer a qualification, University Entrance represents an additional standard of achievement that is measured on the National Qualifications Framework. University Entrance requires 42 credits at Level 3, provided that some of these credits are from a prescribed list of approved subjects, and certain minimum levels of literacy and numeracy are met. Level 3 NCEA requires 60 or more credits at Level 3, in addition to 20 or more credits at Level 2.

Course

The term 'course' used in this report, refers to a distinct module, paper, or unit of study that forms part of a larger programme of study that may or may not lead towards a recognised qualification. This is different from other countries, such as Australia or Britain, where the term 'course' is commonly used to refer to a programme of study or to a qualification.

Course pass (or completion) rate

The course pass rate for a student is the percentage of courses started in a year that are successfully completed or passed. Rates for aggregated groups are the average of pass rates for each student in that group.

This report limits its analysis to those enrolments for which course completion data is required to be collected. Completion data is collected for all formally-assessed courses of more than a week's equivalent full-time duration, except those relating to training opportunities, youth training, skill enhancement, industry training, and students in formal qualifications in private training establishments that receive no funding assistance from government. Course completion information is available for over 99 percent of the students used in this study.

Pass rates presented in this study are point estimates, and contain a margin of error. These errors vary for different subgroups but an approximate guide for different subgroups used in this study are:

Level of tertiary study	mean pass rate	± margin of error
Level 1-3 certificate courses	65%	6%
Level 5-7 non-degree courses	68%	5%
Bachelors degree courses	83%	<0.5%
Total	75%	3%

These errors reflect the fact that the outcome for a number of enrolments is not always able to be determined. This occurs when, for example, the course is not yet complete, or when students are still being assessed. Unknown outcomes also occur when the completion result is known but is missing in the data or not otherwise able to be matched to its enrolment. The upper rate bound assumes all students with unknown outcomes to have passed. Similarly, the lower rate bound assumes all students with unknown outcomes to have failed. The pass rate is then taken as the mid point between these upper and lower bounds.

First-year attrition

This is the percentage of 2005 first-year students who did not gain a qualification and who did not re-enrol in 2006. For the purposes of this study, this definition ignores a number of these who will return in subsequent years, and eventually gain a qualification.

Regression Model

The study uses logistic regression to model two outcomes, the probability that someone passes all their courses, and the probability someone drops out after the first year. Both of these have just two outcomes, yes or no. The dependent variable in each model is the logit of the probability these events will occur, the logit being defined as the natural logarithm of (probability of passing all courses divided by [1 – probability of passing all courses]). The logit transformation provides a dependent variable with a value between 0 and 1.

The target population used was all 2004 leavers who enrolled directly in a bachelors degree in 2005. Initial testing showed potentially significant different influences for sub-degree students, and it was decided to limit this initial study to bachelors students only. All such degree students were included regardless of how many years schooling they had.

All the possible independent variables provided by the dataset were included in the model. However, the model accounted for only 33 percent of the variance in passing all courses, and 13 percent in first-year attrition as measured by the Pseudo R-Square value. Just 6 of these variables (the three expected percentile factors, courses, full-time status and field of tertiary study) accounted for the large majority of total variance explained by the model (31 percent and 11 percent respectively). The

majority of the variance in both dependent variables was explained by factors not in this model (for example, motivation- or commitment-related, institutional, financial or labour market factors).

The logistic regression equations took the form:

$$(A) \quad \ln[pa/(1-pa)] = \beta_0 + \sum_{i=1}^{25} \beta_i \times \omega_i \qquad (B) \quad \ln[fya/(1-fya)] = \alpha_0 + \sum_{i=1}^{25} \alpha_i \times \omega_i$$

where pa was the probability of the student passing all their first-year courses, and fya was the probability of the student dropping out after their first year.

$i = 1$ to 25, identified each of the different variables used to model pa and fya .

β_i and α_i are constant coefficients estimated by the model.

ω_i represented the 25 different factors used in the model, as described in section 4.

A table of the summary model statistics is provided in the following table.

Regression results

	Passing all courses		First-year attrition	
n used ie non-missing (from n total)	10,423 (12,217)		10,423 (12,217)	
Pseudo R ²	0.3312		0.1304	
-2 Log likelihood	14,237		4,135	
	Coefficient	Odds ratio	Coefficient	Odds ratio
Constant	4.21***		2.16	
Expected percentile				
Based on Level 3 results	5.33***	205.86***	-1.80***	0.17***
Based on Level 2 results	1.59***	4.89***	-0.87	0.42
Based on Level 1 results	2.35***	10.53***	-0.64	0.54
Full-time full-year (reference=no)				
Yes	1.29***	3.64***	-1.30***	0.27***
Courses (reference =10 or more)				
1	2.05***	7.71***	1.15***	3.17***
2	1.76***	5.82***	0.88***	2.42***
3	0.79***	2.20***	0.59**	1.80**
4	1.01***	2.76***	0.69***	1.99***
5	0.41**	1.50**	0.62**	1.87**
6	0.52***	1.68***	0.39*	1.47*
7	0.47***	1.60***	0.24	1.27
8	0.39***	1.47***	0.18	1.19
9	-0.21	0.81	-0.01	0.99
Tertiary field of study (reference = Society and Culture)				
Arts	1.00***	2.73***	0.04	1.04
Business	-0.34***	0.71***	-0.14	0.87
Education	1.21***	3.36***	0.18	1.19
Engineering	-0.36***	0.70***	0.13	1.02
Health	0.49***	1.63***	0.02	1.03
Science	-0.43***	0.65***	-0.14	0.91
Other	-0.07	0.93	-0.09	0.87
Highest school qualification (reference = Level 3 or higher and UE)				
Level 3 or higher and no UE	0.32***	1.40***	-0.15	0.86
UE and no level 3 or higher	-0.43***	0.65***	0.45***	1.57***
No UE and no level 3 or higher	-0.00	1.00	0.07	0.93
Enrolled at a university (reference=no)				
Yes	-0.64***	0.53***	-0.43***	0.65***
Gender (reference = female)				
Male	-0.01	0.99	0.22**	1.24**
Ethnic group (ref=no for each group)				
European	-0.03	0.97	0.30	1.35*
Māori	-0.42***	0.66***	0.40**	1.49**
Pasifika	-0.54***	0.58***	0.21	1.24
Asian	-0.14	0.87	-0.17	0.85
Age	-0.09*	0.92*	-0.11	0.89
Years at secondary school (ref=5)				
3	1.27	3.57	0.51	1.67
4	0.46	0.63	-0.46	0.64
School subject (ref= no for each group)				
Humanities	0.03	1.03	-0.09	0.92
Sciences	0.20***	1.22***	-0.04	0.96
Business	0.18***	1.20***	-0.05	0.95
Computing and IT	-0.23***	0.80***	0.13	1.13
Engineering and technology	-0.03	0.97	-0.19	0.83
Arts and Crafts	0.00	1.00	0.15	1.16
Private school (ref=No)				
Yes	-0.18**	0.83**	0.07	1.08
Single-sex school (ref=No)				
Yes	-0.15***	0.86***	-0.18*	0.84*
School decile (ref=Low)				
Medium	0.06	1.06	-0.19	0.83
High	-0.04	0.97	-0.25	0.78
School roll (ref=500 or less)				
Between 501 and 1,000	0.00	1.00	-0.05	0.95
Between 1,001 and 1,500	0.04	0.96	0.02	1.02
Between 1,501 and 2,000	-0.01	0.99	-0.42	0.66
Over 2,000	-0.05	0.95	-0.02	0.98

Note: *** significant at the 1 percent level ** significant at the 5 percent level * significant at the 10 percent level.

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MINISTRY OF EDUCATION

Te Tāhuhu o te Mātauranga