RESEARCH INNOVATION AND EXPANSION FUND

Against the odds

Influences on the post-school success of 'low performers'

SUE THOMSON
KYLIE HILLMAN

Longitudinal Surveys of Australian Youth

NCVER

Against the odds: influences on the post-school success of 'low performers'

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Sue Thomson
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Australian Council for Educational Research

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About the research

Against the odds: influences on the post-school success of 'low performers'

Sue Thomson and Kylie Hillman, Australian Council for Educational Research

The link between academic performance and labour market outcomes is well established. People who are low academic performers are more likely to leave school early, limiting their access to higher occupational status jobs and therefore higher earnings, or placing them at greater risk of unemployment or underemployment.

But does poor performance in a test of literacy necessarily compromise later success? Using the 2003 cohort of the Longitudinal Surveys of Australian Youth (LSAY), Thomson and Hillman examine this question. 'Success' in this context encompasses satisfaction with life, together with the extent to which young people are fully occupied with education, employment or a combination of these.

The researchers have extrapolated from the Programme for International Student Assessment (PISA) results of the 2003 LSAY cohort to consider how those with poor numeracy (the main focus of the 2003 PISA test) cope during their transitions from school.

Key messages

- Academic under-achievement is not the end of the road for most students, with almost three-quarters of those who were 'low performers' at age 15 years going on to make a successful transition into full-time work or study (or a combination of these).
- Motivation is a key determinant of students' later outcomes, with those who see the value of study such as mathematics for their future success more likely to achieve this success.
- Ensuring that the school experience is a positive one for low-performing students may be a challenging task, but can be worth the effort, with positive impacts on young people's lives at the time they are at school, and, it appears, once they have left school.
- Low-performing students from socioeconomically disadvantaged households are less likely to be successful than their more affluent counterparts, suggesting that the degree to which parents can help their children may be a factor.
- Having some sort of career or strategic plan, such as aspiring to do an apprenticeship, is particularly important for determining later success in life.

Tom Karmel
Managing Director, NCVER

Informing policy and practice in Australia's training system …

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Executive summary

The Organisation for Economic Cooperation and Development (OECD) has defined a baseline standard of literacy in terms of its Programme for International Student Assessment (PISA). Students not achieving this baseline literacy, it is argued, are at serious risk of not being able to adequately participate in the twenty-first-century workforce and contribute as productive citizens. The Australian Ministerial Council on Education, Employment, Training and Youth Affairs (MCEETYA[1]) determined that 'the national standards … should be set at a "proficient" standard, rather than a "minimum" standard' (Ministerial Council on Education, Employment, Training and Youth Affairs 2006, p.4), and set the key performance measure at a slightly higher level than the OECD's baseline.

But how well does a student's achievement in PISA predict their subsequent success in life? The definition of 'success' used in this project included satisfaction with life, as well as whether young people were fully occupied with education, employment or a combination of these activities. Those who were fully engaged and happy with their lives were designated as having a 'successful outcome'.

Students who are high achievers at school generally have successful post-school outcomes, and, conversely, low achievers do less well and are more likely to leave school early. This study does not compare outcomes for high and low achievers, but instead focuses on students who are low achievers at school, but who have successful post-school outcomes. This is of interest to policy-makers because, if we can identify factors, particularly at the school level, which contribute to this success, resources and assistance can be allocated towards improving post-school outcomes for those who do less well at school, and who are most at risk of unsuccessful youth transitions.

The Australian PISA sample for 2003 became a commencing cohort for the Longitudinal Surveys of Australian Youth (LSAY—known as the Y03 cohort). In this PISA assessment the major focus was mathematical literacy, while reading and scientific literacy were assessed as minor domains. Mathematical literacy places its primary emphasis on real-world problems and on the mathematical knowledge and competencies that are likely to be useful for dealing effectively with those problems. The sample of students chosen for this study were the 3238 students who did not achieve at least proficiency level 3 in mathematics in the PISA 2003 assessment, where level 1 is the lowest proficiency and level 6 is the highest proficiency. This group represented just under a third of the Y03 cohort.

The main activities of the low-achieving sample were identified for each of the subsequent years they remained in LSAY. As is the case for most young people in Australia, the majority remained at secondary school and in subsequent interviews indicated that they had completed Year 12 and had been awarded the appropriate qualification for their state. From there, more than one-third of them moved into employment—part-time or full-time—while under one-third went onto tertiary education at a university, TAFE (technical and further education) institution or some other facility.

[1] The Ministerial Council on Education, Employment, Training and Youth Affairs and the Ministerial Council for Vocational and Technical Education (MCVTE) were superseded by the Ministerial Council for Education, Early Childhood Development and Youth Affairs (MCEECDYA) on 1 July 2009.

For those who left secondary school early without completing their qualification, more entered the labour force than an apprenticeship or traineeship. Around one in six of these young people had attempted to enter the labour force early, although with varying degrees of success—close to 5% were still looking for work, while the proportion who were in part-time work was slightly larger than the proportion who had found full-time employment.

As has been found in other research using the LSAY data from previous cohorts, what happens in the immediate post-school years can have important consequences for young people. An overwhelming proportion of those who find a job or commence further study continue in those activities. For those who find it hard to secure a place in work or study, the future is less certain, although, even among these, most establish a foothold after a further year. This finding emphasises the importance of this period in the lives of young people, particularly those who have a history of low achievement, and reinforces the need for support and information for all young people in relation to the pathways and opportunities that are available to them upon leaving school.

In 2007, most of this group of young people, many of whom may have been expected to be experiencing difficulties, given their low achievement, were doing relatively well. Around 40% of those who were contacted in 2007 were in some form of further study or training; just over 30% were in full-time employment and another 17% were working part-time.

The main activities of those young people who remained in the study in 2007 were classified as being representative of full engagement (full-time work—35 hours or more on average per week; full-time study or training; part-time students who were working part-time or full-time hours), partial engagement (those working fewer than 35 hours per week on average, part-time students who were not employed) or non-engagement (those who were looking for work but not employed and those who were not looking for work but not employed—not in the labour force).

Those young people who were fully engaged and whose responses to the happiness items indicated that they were happier than average (compared with the entire cohort) then formed the sample for the subsequent analysis, which examined the factors that might determine whether a student is successful or not. Multilevel logistic analysis was used to examine what factors differentiated between the 602 sample members who had a successful outcome (in terms of their level of engagement and happiness) and those sample members with not so positive outcomes. The sample included 1596 students from 294 schools.

There was a clear finding that low-achieving students from a low socioeconomic background have a lower likelihood of success than similar students from more affluent homes. There are many reasons for this beyond having more access to financial and educational resources, such as more highly educated parents having more experience of educational systems and so being able to provide their child with a wider range of alternative pathways to success.

Indigenous status, other things equal, was not found to have a significant effect on success or failure. While these results should be treated with some caution—the number of Indigenous respondents was small—this finding, along with the finding about the links with socioeconomic status, add to the current debate in Australia that it is not Indigenous status as such that is related to poorer outcomes, but the interrelationship between Indigenous status and disadvantage.

The significant influence of motivation on students' later outcomes is an important message for parents, teachers and policy-makers. Finding that students who recognise the value of mathematics for their future success are more likely to achieve this success, and that includes being happy with many aspects of their personal lives as well as their future and career, suggests that a focus on the practical applications of mathematics in everyday life may go some way to improving the outlook for students who are not quantitatively inclined and who are not performing well in the mathematics classroom.

Similarly, ensuring that the school experience is a positive one not only impacts on students' lives while they are at school but appears to continue to influence them once they have left. Female

students, in particular, were more likely to be fully engaged in education, employment or a combination of these and to be happy with their situation, if they had enjoyed being at school, enjoyed learning and had felt safe and secure. While it is not possible to eliminate all stress or negative experiences from secondary school, findings such as this remind us of the important aim of education of fostering the social and emotional development of young people, as well as their academic development. It also reminds us that school can be a positive experience for all students, regardless of their achievement level, if an appropriate balance is maintained between the pursuit of personal goals and individual development, and comparison and ranking.

At the same time, young people should be encouraged to think carefully about their futures and to make strategic plans. Those young people, particularly females, who were not achieving well in mathematics and who had not thought about what they might do after leaving school were much less likely to be fully engaged and happy with their lives four years down the track.

Introduction

Achievement and educational and labour market outcomes

The Longitudinal Surveys of Australian Youth (LSAY) have tracked the pathways of young Australians since the early 1990s—through senior secondary school and into the labour force or post-secondary education or training. Research conducted using data from earlier cohorts of LSAY has reported a strong relationship between the achievement of young people when they are in Year 9 and their rates of school completion and participation in post-secondary education and training. This report uses data from the 2003 cohort from the Organisation for Economic Cooperation and Development (OECD) Programme for International Student Assessment (PISA) to examine the short-term outcomes of students who could be classed as low performers.

Why do we want to look at outcomes of low academic achievers?

Students who are high achievers at school generally have successful post-school outcomes, and, conversely, low achievers do less well, and are more likely to leave school early. This study does not compare outcomes for high and low achievers, but instead focuses on students who are low achievers at school, but who have successful post-school outcomes. This is of interest to policy-makers because, if we can identify factors, particularly at the school level, which contribute to this success, resources and assistance can be allocated towards improving post-school outcomes for those who do less well at school and who are most at risk of unsuccessful youth transitions.

What is PISA?

PISA is a means of monitoring the outcomes of education systems, in terms of student performance, on a regular basis and within an internationally accepted common framework. The overall aim of PISA is to measure how well 15-year-olds (which in most OECD countries corresponds to when young people are approaching the end of compulsory schooling) are prepared for meeting the challenges they will face in their lives beyond school. PISA's orientation towards the future of these students is reflected in its approach to assessing various kinds of 'literacy' which are concerned with the capacity of students to apply skills and knowledge from a particular subject area, and to analyse, reason and communicate effectively as they do so. The PISA model of assessment focuses on reading literacy, mathematical literacy and scientific literacy. In each three-year cycle there is a major emphasis on one of these domains and a lesser emphasis on the other two domains (in PISA terms; 'major' and 'minor' domains). In 2003, the major focus of the PISA assessment was mathematical literacy, with a minor emphasis on reading and scientific literacy.

What *is* low performance?

In addition to reporting student performance on continuous scales, PISA has defined a series of six 'proficiency levels' (or bands of scores) which represent groups of tasks of ascending difficulty, with proficiency level 6 as the highest and proficiency level 1 as the lowest. Proficiency at each of these levels can be understood in terms of the competencies that a person needs to successfully complete the tasks in the level. The OECD has defined proficiency level 2 on the PISA scales as representing a baseline level of literacy at which students begin to demonstrate the competencies that will enable them to actively participate in life situations. Students performing below this

baseline, they have argued, are at serious risk of not being able to adequately participate in the twenty-first-century workforce and contribute as productive citizens (see, for example, OECD 2004). Further to this, the Ministerial Council on Education, Employment, Training and Youth Affairs determined that 'the national standards … should be set at a "proficient" standard, rather than a "minimum" standard' (2006, p.4), and set the key performance measure as the percentage of students performing at or above proficiency level 3 on each of the OECD PISA literacy scales.

Finishing school … or not

Those who score lower on achievement tests given as part of the initial LSAY survey (for older cohorts) or as part of the PISA study (which forms the basis of the two youngest LSAY cohorts) are less likely to complete their secondary education than their peers (Curtis & McMillan 2008; Fullarton et al. 2003), which may place them at a disadvantage in terms of entering into or progressing in the labour market or education and training. Research with previous LSAY cohorts, including those who were in Year 9 in 1995, has suggested that low achievers are not only more likely to leave without completing school, but that they are amongst the earliest to leave, and that the relationships between earlier low achievement and non-completion is stronger for male students than for females (McMillan & Marks 2003). Of all the influences on early school leaving that were investigated by McMillan and Marks, achievement was by far the strongest. Furthermore, there are indications that some low achievers who do remain to complete their education at school may be studying subjects that do not provide a cohesive pathway or preparation for life after school, once again placing them at a disadvantage when they do complete Year 12 and take the next steps towards a career or further education and training (Thomson 2005).

Other research examining relationships between earlier achievement and educational and occupational attainment has found that low achievers are more likely to enter apprenticeships upon leaving school (McMillan & Marks 2003). High achievers, on the other hand, are more likely to make use of opportunities for other education and training, particularly higher education.

Labour market outcomes

But once a young person is in the labour force, does it really matter that he or she wasn't good at school work and didn't perform well? Research suggests that it does. As reported earlier, low achievers are more likely as a group to leave school early and thus more likely to enter the labour market without a Year 12 certificate or further qualifications, which places them at greater risk of unemployment or underemployment. On top of this relationship, McMillan and Marks (2003) have found that low achievers were at greater risk of unemployment than their higher-achieving peers, regardless of school completion status.[2] Achievement level was also related to occupational status for those who managed to gain employment, with higher achievement being associated with higher occupational status for school completers and early leavers alike. Higher achievement was also related to higher hourly income rates for those who finished secondary school before entering the labour force. These relationships between achievement levels and labour market outcomes remained once differences in socioeconomic background and other related factors were controlled for, indicating that lower levels of achievement in areas such as reading and mathematics can exert an enduring influence on the lives of young people.

Other influences on outcomes

Nevertheless, this relationship between school achievement and educational participation or labour market outcomes is not always so simple; not all earlier low performers fail to complete Year 12,

[2] Earlier reports using the data from the Australian Youth Surveys, which became the Youth in Transition studies, found that lower achievement and school non-completion were both associated with a greater risk of long-term unemployment upon entry to the labour market in the late 1990s (Lamb & McKenzie 2001).

with many continuing with their education and training at TAFE or university and going on to employment.[3]

Internationally, similar patterns are reported, with young people who perform at lower levels being less likely to remain to complete their secondary education in the United Kingdom, Canada and the United States (Archer & Yamashita 2003). However, research that traces the subsequent educational pathways of low-performing youth is quite rare, with seemingly few countries having invested in longitudinal studies that include a measure of academic performance or achievement. Canada is one of those countries which has, and has established the Youth in Transition Survey (YITS), which traces its PISA cohorts through biennial telephone interviews.

Of particular relevance is a recent report using the Youth in Transition Survey data to examine the educational pathways of young Canadians who performed poorly (below proficiency level 3) on the reading achievement tests in PISA 2000. This research sought to establish what factors resulted in 'educational resilience', a term the authors use to describe the phenomenon in which 'substantial minorities of young people graduate from high school and participate in post-secondary education, despite weak earlier academic performance' (Thiessen 2007, p.1).

Educational resilience can result from factors that have an influence on individual students (individual-level factors), such as having a supportive family and friends who value education or involvement in enriching activities such as extracurricular or volunteer work; or factors that influence identifiable groups of students (system-level factors), such as school location, whether a school has a particularly enriching environment or access to quality intervention or support programs.

Aspirations and identity

Archer and Yamashita (2003) argued that the disengagement with education by young people from lower socioeconomic backgrounds and lower performance is a gradual process, that these young people begin to see themselves as 'not good enough' or 'not having what it takes' to continue with education and to reinvest in other areas of their lives in which they may feel they have greater likelihood of succeeding. Thiessen (2007) found that among low-performing Canadian youth, those who had aspirations to continue their education were significantly less likely to drop out than those without these ambitions, while those who showed evidence of effort at school (completing homework and attending regularly) and participated in extracurricular activities were also less likely to drop out of school without completing.[4] The positive effect of high educational aspirations was apparent even after controlling for measures of later academic performance.

Khoo and Ainley (2005) investigated the influence of students' attitudes towards school and their intentions to complete secondary schooling and to pursue tertiary study and found that previous achievement (in reading and mathematics) had both a mediated (through intentions) and direct effect on their subsequent participation in Year 12 and tertiary study. Having favourable attitudes towards their school on the other hand had a positive effect on an intention to participate, which in turn had a positive influence on actual participation, above the influence of earlier achievement. In other words, even for those who did not perform as well in the early years of secondary school, having favourable attitudes towards school and planning to finish school and participate in further study have a positive effect on actual participation—a presumably positive and desirable outcome for these young people.

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[3] Issues associated with the classification of students as 'at risk' of not completing school based on their personal characteristics, including earlier achievement, and the actual pathways of these students through secondary school are discussed in a forthcoming technical report in the LSAY series.

[4] Participation in extracurricular activities has been investigated as an indicator of engagement with schooling in previous LSAY research, in which it was found to relate to students' achievement, intrinsic motivation, perceptions of the school climate, and their aspirations for further study (Fullarton 2002).

School climate

Research has shown that the academic and social climate of a school can have an influence on outcomes for its students. For example, Fullarton (2002) found that student engagement is higher in schools with supportive climates, where there is a positive school spirit, high levels of learning and quality teachers. Thiessen (2007) reported that lower-performing students were more likely to complete their secondary education when they believed that their peers valued education and planned to pursue further studies and when they were actively involved in the school's community through participation in extracurricular activities. The level of school support in the form of careers advice (as we would describe the activities in Australia) and positive relationships with teachers also had a positive influence on school completion for low performers.

But what *is* a successful outcome?

A key feature of this project is the use of a multifaceted definition of a successful outcome. Previous research that has investigated the relationships between earlier performance or achievement[5] and post-school destinations and outcomes has tended to use a one-dimensional definition of a 'successful' outcome, focusing on participation in tertiary education or employment. The definition of 'success' used in this project was expanded to include satisfaction with life, as well as whether young people are fully occupied with education, employment or a combination of these activities, therefore providing a more holistic view of outcomes than has been used in the past. Those who are fully engaged and happy with their lives were designated as having a 'successful outcome' for the subsequent modelling.

[5] An effort has been made in the review of literature to retain the language of the original authors in terms of usage of 'performance/low performing' and achievement/low achieving'.

Data and methods

The data used in this report have been taken from the Longitudinal Surveys of Australian Youth (LSAY) cohort based on the PISA 2003 assessment (known as the Y03 cohort).

In this assessment the major focus was mathematical literacy, while reading and scientific literacy were assessed as minor domains. Mathematical literacy places its primary emphasis on real-world problems and on the mathematical knowledge and competencies that are likely to be useful for dealing effectively with those problems. The Australian PISA sample for 2003 became a commencing cohort for LSAY (Y03).

Levels of mathematical literacy

Mathematics skill is a continuum; that is, it is not something a student does or does not have, but rather, every 15-year-old shows a certain level of mathematics skill. In PISA, students are assigned a score based on their achievement on the mathematical literacy items. As well as reporting the mean scores, PISA also provides a profile of students' mathematical performance using performance bands, or *proficiency levels*. The use of performance bands, or levels of proficiency, involves an essentially arbitrary division of the continuous scale into discrete parts. For PISA mathematics the scale was divided into five bounded regions, labelled levels 1 to 5, and an unbounded region below level 1 and an unbounded region above level 5, labelled level 6.

The creation of these performance bands leads to a situation where a range of values on the continuous scale is grouped together into each single band (see table 1). Given that range of performances within each level, how do we assign individual students to the levels, and what meaning do we ascribe to 'being at a level'?

Students are assigned to the highest level for which they would be expected to correctly answer the majority of assessment items. If we could imagine a test composed of items spread uniformly across a level, a student near the bottom of the level will be expected to correctly answer at least half of the test questions from that level. Students at progressively higher points in that level would be expected to correctly answer progressively more of the questions in that level. It should be remembered that the relationship between students and items is probabilistic—it is possible to estimate the probability that a student at a particular location on the scale will get an item at a particular location on the scale correct. Students assigned to a particular level will be expected to successfully complete some items from the next higher level, and it is only when that expectation reaches the threshold of 'at least half of the items' in the next higher level that the student would be placed in the next higher level.

Table 1 Summary description for six levels of overall mathematical literacy performance

Score	Level	Description of mathematical literacy
669 points	6	At level 6 students can conceptualise, generalise, and utilise information based on their investigations and modelling of complex problem situations. They can link different information sources and representations and flexibly translate among them. Students at this level are capable of advanced mathematical thinking and reasoning. These students can apply this insight and understandings along with a mastery of symbolic and formal mathematical operations and relationships to develop new approaches and strategies for attacking novel situations. Students at this level can formulate and precisely communicate their actions and reflections regarding their findings, interpretations, arguments, and the appropriateness of these to the original situations.
607 points	5	At level 5 students can develop and work with models for complex situations, identifying constraints and specifying assumptions. They can select, compare, and evaluate appropriate problem-solving strategies for dealing with complex problems related to these models. Students at this level can work strategically using broad, well-developed thinking and reasoning skills, appropriate linked representations, symbolic and formal characterisations, and insight pertaining to these situations. They can reflect on their actions and formulate and communicate their interpretations and reasoning.
545 points	4	At level 4 students can work effectively with explicit models for complex concrete situations that may involve constraints or call for making assumptions. They can select and integrate different representations, including symbolic, linking them directly to aspects of real-world situations. Students at this level can utilise well-developed skills and reason flexibly, with some insight, in these contexts. They can construct and communicate explanations and arguments based on their interpretations, arguments, and actions.
482 points	3	At level 3 students can execute clearly described procedures, including those that require sequential decisions. They can select and apply simple problem-solving strategies. Students at this level can interpret and use representations based on different information sources and reason directly from them. They can develop short communications reporting their interpretations, results and reasoning.
420 points	2	At level 2 students can interpret and recognise situations in contexts that require no more than direct inference. They can extract relevant information from a single source and make use of a single representational mode. Students at this level can employ basic algorithms, formulae, procedures, or conventions. They are capable of direct reasoning and making literal interpretations of the results.
358 points	1	At level 1 students can answer questions involving familiar contexts where all relevant information is present and the questions are clearly defined. They are able to identify information and to carry out routine procedures according to direct instructions in explicit situations. They can perform actions that are obvious and follow immediately from the given stimuli.

Sample

The sample for this project was selected according to the Ministerial Council on Education, Employment, Training and Youth Affairs definition of 'low performance' on the PISA 2003 assessments as a proficiency level lower than 3, rather than the OECD definition of low performance as proficiency level below 2. This decision was taken to bring the project in line with national definitions of groups of concern in education (for example, those not meeting the national standards for performance). A proficiency of level 3 and above in the PISA assessment has been endorsed by the ministerial council as the national proficient standard (Productivity Commission 2009).

The sample was chosen, based on the proficiency level of the students in mathematics in the PISA 2003 assessment. Table 2 provides the number of students in the 2003 assessment and the number retained in each subsequent year who were below proficiency level 3 in mathematics, in reading, and in mathematics and reading.

The reasons for basing the sample for this study on the number of students who did not reach the Ministerial Council on Education, Employment, Training and Youth Affairs proficient standard in mathematics were twofold. Firstly, this would maximise the number of students available for analysis, and, secondly, the assessment of mathematics, as the major domain, is a more robust measure than the assessment of reading literacy in the same cycle.

Table 2 Number of low-performing students (PL<3) in annual LSAY surveys, 2003–07 (unweighted)

Assessment used in definition	Year of survey				
	2003 (age 15)	2004 (age 16)	2005 (age 17)	2006 (age 18)	2007 (age 19)
Mathematics	3238	2779	2441	2022	1636
Reading	2767	2351	2048	1700	1359
Mathematics + reading	2171	1837	1586	1292	1020

Attrition over time

As has been noted in other publications using the LSAY data, attrition from the initial sample, which is designed to be nationally representative, often differs across different sub-groups of the sample, which can result in *attrition bias*, whereby the remaining sample can no longer be considered representative of the original target population. This bias in the data and any analyses performed using information from later interviews is generally addressed by applying weights to the data that adjust for differential attrition of particular groups from the study. In earlier cohorts from LSAY, factors that have been associated with greater attrition include gender (with males more likely to leave the study) and earlier achievement (with lower performers being more likely to leave the study).

Comparing the profiles of the original (2003) and retained (2007) samples of low performers, a number of differences between those who remain in the study and those who drop out over time are revealed (see appendix tables A2 and A3). For example, the proportions of students from Indigenous backgrounds, those whose mathematical literacy score was within proficiency level 1, who reported lower student–teacher relations scores, who wanted to pursue an apprenticeship or traineeship after school, or who were from lower than average socioeconomic status backgrounds who remain in the sample by 2007 are smaller than would be expected if attrition was completely random.

Following the methodology described in Rothman (2009), an examination of potential attrition bias associated with student background characteristics was conducted. The results indicated that some degree of attrition bias was associated with mathematics literacy proficiency levels and the aspirations of young people. The attrition bias associated with those young people who performed at proficiency level 1 does suggest that results of the analyses may not hold true for these young people or represent the influences on their likelihood of success and is thus a limitation for the current study. For the aspirations variables, however, the differential attrition may act in a way as to dilute the effect of the findings: in other words if the 'lost' students were in the sample, it is likely that there would be a stronger effect for the factors identified as significant in the analyses.

Given the focus of this project on the pathways of low performers, the possibility of differential attrition amongst this group is a potential limitation on the results of any analyses. As the low performers are already a sub-group of the original full sample, it is not appropriate to use either the sample or attrition weights that have been calculated for the entire Y03 cohort. Weighting for attrition, it should be noted, is not without its own problems, as it can act to increase the standard errors associated with any estimates, such as means or proportions (Rothman 2009). With large samples, such as the entire Y03 cohort, differences between the standard errors associated with the unweighted and weighted means are much smaller, but with smaller sample sizes, the difference grows.

For this reason, the multilevel analyses were restricted to the subset of low performers for whom full data were available for the years 2003 to 2007 and the multilevel logistic regression analyses were conducted using unweighted data, with the acknowledgement that the results of the analyses may not be representative of the situation for the lowest mathematics performers.

Multilevel analysis

In this study the outcome variable, success, is defined as a dichotomous variable; that is, students are successful or they are not, according to a definition which will be detailed in a later chapter. Dichotomous outcomes are best analysed through logistic regression procedures.

Logistic analyses for binary outcomes attempt to model the odds of an event's occurrence and to estimate the effects of explanatory variables on these odds. The odds for an event is a comparison of the probability that an event occurs (success) with the probability that the event does not occur (failure). When the probability of success is greater than the probability of failure, the odds are greater than 1; if the two outcomes are equally likely, the odds are equal to 1, and when the probability of failure is greater than the probability of success, the odds ratio is less than 1. To examine the effects on the odds of an independent variable, the odds ratio is constructed and compares the odds of success for different values of the explanatory variable.

The original sample of students in PISA from which this group is a sub-sample, was a nested sample; that is, schools were selected at random and then students were selected at random from within these schools. When data are collected across individuals in the same schools, we expect that outcomes will be somewhat dependent on context, that is, that there will be a clustering effect of schools on students. In the case of these data, we wished to examine the effect of some school-level variables on young people's outcomes in the years after they had left secondary school. Such cases require a statistical adjustment for the clustering effect through multilevel analysis. The use of a multilevel approach to analyse dichotomous data is a direct extension of the application of these models for single-level data.

As a first step, it is appropriate to ask whether in fact variation in the dependent variable across schools exists. To gauge the magnitude of this variation between schools in the proportion of low-performing students who go on to have successful outcomes after school, it is useful to begin by estimating an unconditional or empty model, that is, a model with no predictors at either level (Raudenbush & Bryk 2002; Snijders & Bosker 1999). The results (not shown) indicate that within this subset of the main sample there is only a small proportion of variance at the school level; however, as it was deemed important to examine the independent effects of some school-level variables and to take account of the clustering of the original sample, it was decided that the use of multilevel modelling was appropriate. As noted in other research (Steenbergen & Jones 2002), it is not surprising that the individual level accounts for a great deal of the variance when data are measured at the individual level, as is the case in the present study.

Post-school pathways of low mathematics performers

Main activities during 2003 to 2007

The main work and further education or training activities of the low-performing sample were identified for each of the subsequent years they remained in LSAY. Movement between the ten activities is presented in figures 1a and 1b.[6] The proportions of low performers who were in each activity when interviewed in each year from 2004 to 2007 are presented in the large squares, with the smaller squares showing changes from one year to the next, and each year in a column. For example, in 2004, 79% were still in secondary school (figure 1a), while 4% were in full-time work (figure 1b), while in 2005, 60% were still at school and 8% were in full-time work. Returning to those who were at school in 2004 (79% of the low-performing group overall), 71% remained at school in 2005, but 7% had moved into part-time work. Of the 4% who were working full-time in 2004, only 43% were still working full-time in 2005, 3% had returned to school and 19% were now working part-time hours.

Despite their low performance in 2003, the majority of the young people actually remained at secondary school until late 2005 and, when interviewed in 2006 (or subsequent years), indicated that they had completed Year 12 and had been awarded the appropriate qualification for their state.[7] From there, over one-third of the young people moved into employment—part-time or full-time—while under another third went on to tertiary education at a university, TAFE or some other facility.

For those who left secondary school early without completing their qualification, direct entry into the labour force was more common than taking up an apprenticeship or traineeship. Around one in six of these young people had attempted to enter the labour force in 2005, although with varying degrees of success—close to 5% were still looking for work, while the proportion who were in part-time work was slightly larger than the proportion who had found full-time employment.

As has been found in other research using the LSAY data from older cohorts, there is a degree of stability of activity in the post-secondary years that can be a boon to those who make a transition into positive activities, but may be a more negative experience for those who have initial difficulties in finding their place (for example, Marks 2006; Hillman 2005; Hillman & McMillan 2005). In each year, the majority of young people who had a full-time job the previous year continued to be in full-time employment the following year, while for those who were unemployed, around one-quarter were unemployed the following year. Around one-third of those unemployed, however, made the transition to part-time or full-time employment, indicating that, for some young people at least, unemployment was a stop along the path rather than a pathway in and of itself. In 2007, this group of young people, who may have been expected to be experiencing difficulties, given their low achievement, were doing relatively well. Around 40% of those who were contacted in 2007 were in some form of further study or training; just over 30% were in full-time employment and another 17% were working part-time. The unemployment rate among this group of young people was just

[6] Figures 1a and 1b have been split for the convenience of presentation. The total percentages for each collection year sum to 100% across the two figures.

[7] Close to two-thirds of the low performers who remained in the study in 2007 had completed their Year 12 qualification. However, over 80% of the full Y03 cohort who remained in the study in 2007 held a Year 12 qualification, indicating that school completion was indeed lower among the low-performing sample.

under 6%, while estimates for unemployment around this time was around 3.5 % for teenagers (age 15–19) and over 10% for youth (Dusseldorp Skills Forum 2007).

Figure 1a Pathways between activities of low performers from the Y03 cohort, 2003–07

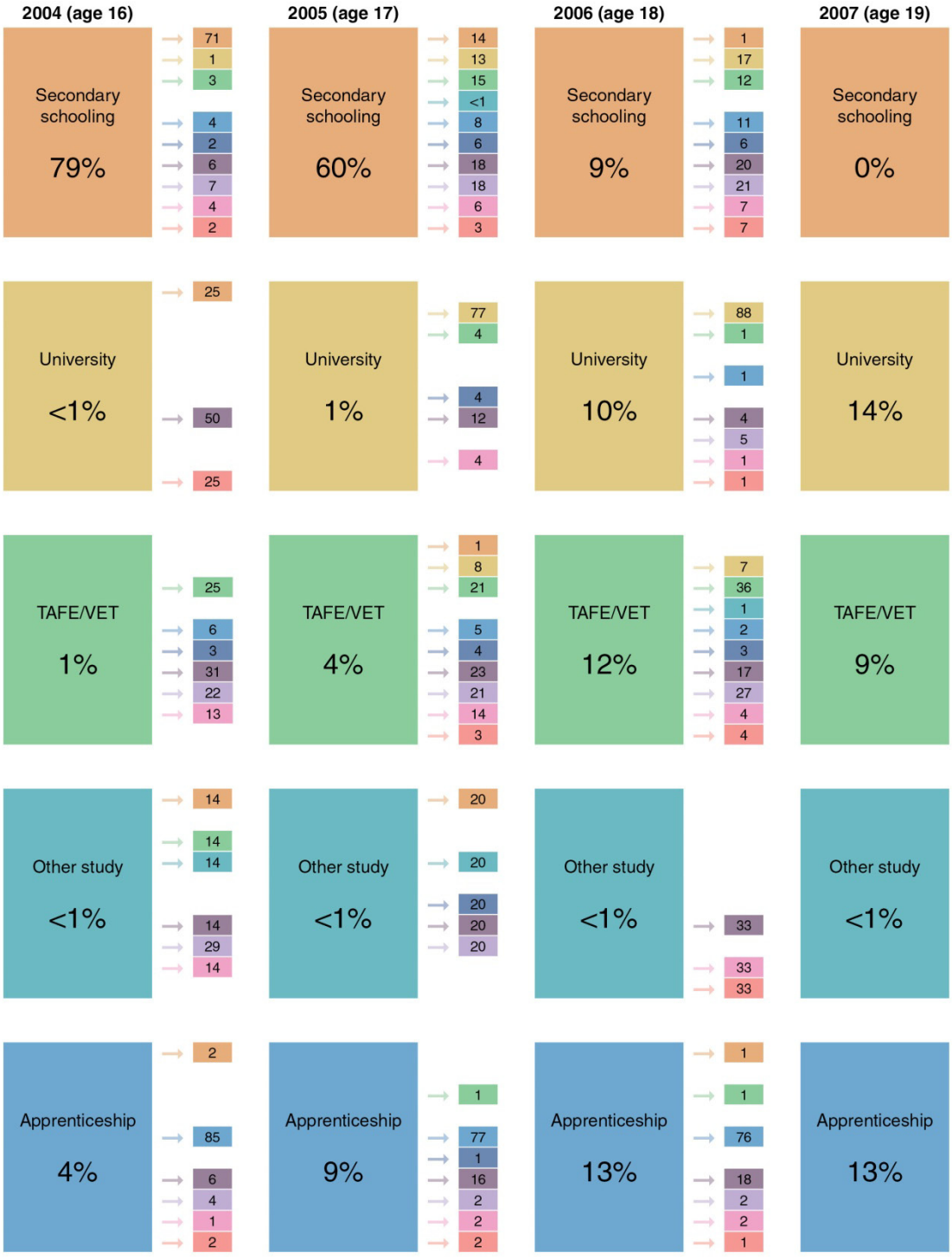
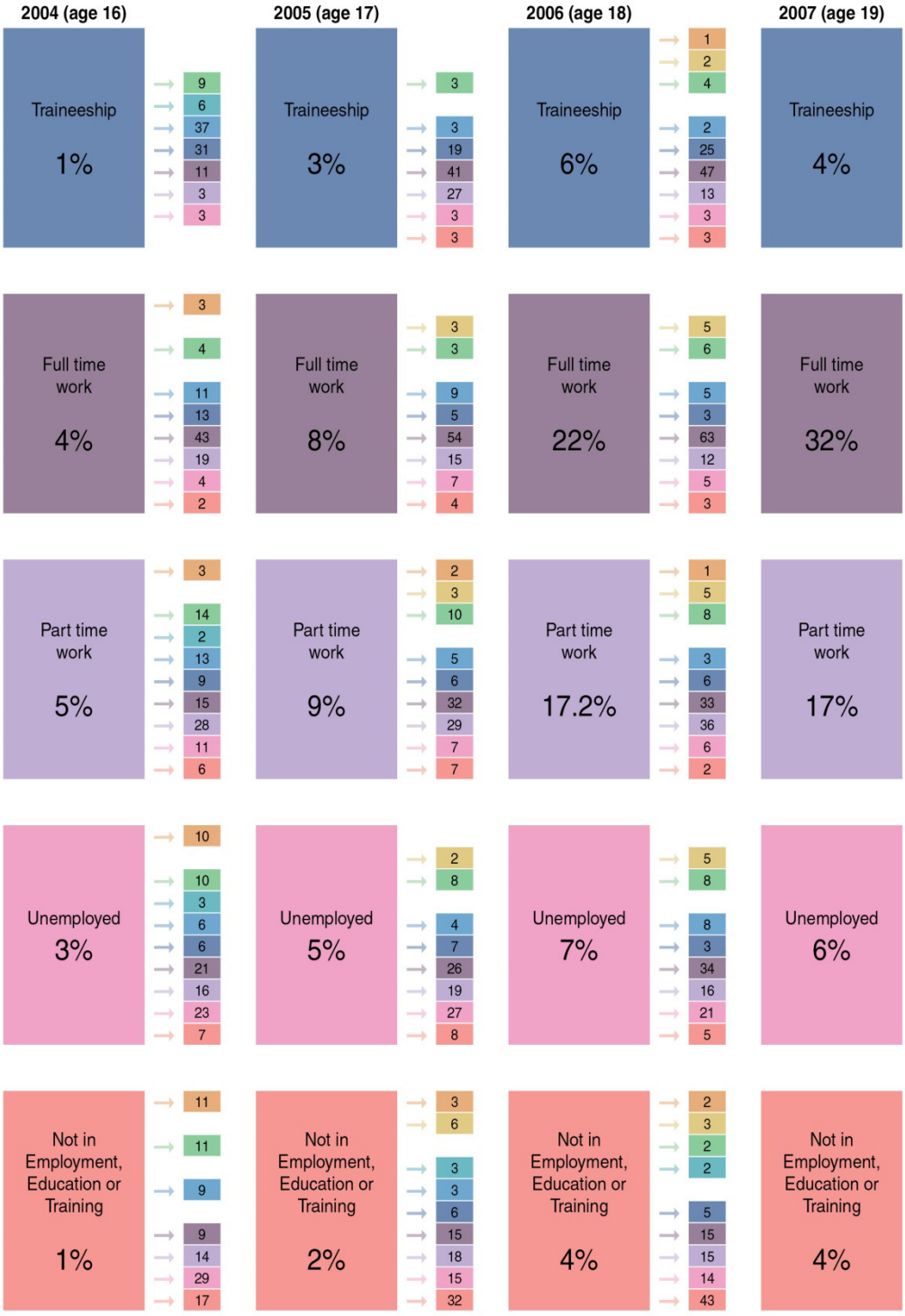


Figure 1b **Pathways between activities of low performers from the Y03 cohort, 2003–07**



Engagement in education, training and employment

The main activities of those low performers who remained in the study in 2007 were classified as being representative of *full engagement* (full-time work—35 hours or more on average per week; full-time study or training; part-time students who were working part-time or full-time hours), *partial engagement* (those working less than 35 hours per week on average, part-time students who were not employed) or *non-engagement* (those who were looking for work but not employed and those who

were not looking for work but not employed—not in the labour force). The proportions of the young people who fell into these groups are presented in table 3.

Table 3 Level of engagement in employment, education and training of low performers, by background variables

Activity status in 2007 (age 19)	Fully engaged		Partially engaged		Unengaged		Difference between groups significant?
	n	%	n	%	n	%	
Gender							
Male	598	78.6	106	13.9	57	7.5	yes
Female	586	67.0	183	20.9	106	12.4	
Indigenous status							
Non-Indigenous	1100	73.1	264	18.9	140	9.3	yes
Indigenous	84	63.6	25	18.9	23	17.4	
Year 12 certificate							
No	393	69.4	91	16.1	82	14.5	yes
Yes	791	73.9	198	18.5	81	7.6	
School location							
Metropolitan	816	72.2	211	18.7	103	9.1	no
Non-metropolitan	368	72.7	78	15.4	60	11.9	
Total	**1184**	**72.4**	**289**	**17.7**	**163**	**10.0**	

Overall, the outcomes in terms of engagement in education or employment for this group of young people appear fairly positive, with around seven in ten fully engaged in education or training, employment or a combination of these. However, by comparison with estimates for the full Y03 cohort and published statistics for the population of comparable age, the situation for this particular group of young people begins to look less favourable.

In 2007, 83% of the full Y03 cohort were fully engaged in education, training and/or employment, while 12% were partially engaged in these activities. Only 5% of the full Y03 cohort were not engaged in education, training or employment, half the proportion of the low-performing sample who were unengaged in these activities in that year (see table 3). *Australian social trends 2005* (ABS 2005) reported on the engagement of different groups of young Australians and found that only 14% of young people aged between 15 and 19 were not fully engaged in 2004, which rose to 31% when only those who had left school in the previous year were considered. By comparison, almost 30% of this group of young people were not fully engaged in 2007, although the majority had actually left school late in 2005.

Successful or not—investigating the differences

The definition of success used in this project involved young people being fully engaged, as defined in the previous chapter, and happy with their lives. Each year they are interviewed, LSAY participants are asked a series of questions about how happy they are with various aspects of their lives. Despite the use of the term 'happy', this measure corresponds more closely with the cognitive aspect of emotional wellbeing (life satisfaction) than with the affective aspect of emotional wellbeing (happiness). These items are presented in box 1.

Box 1 Questions asked in the LSAY surveys regarding life satisfaction/happiness

I am now going to read out a list of different aspects of your life. As I read them, please tell me whether you are *very happy, happy, unhappy,* or *very unhappy* with each one. Firstly, how happy are you with …

- the work you do, at school, at home or in a job
- what you do in your spare time
- how you get on with people in general
- the money you get each week
- your social life
- your independence – being able to do what you want
- your career prospects
- your future
- your life as a whole
- your standard of living
- where you live
- Your life at home

Responses to these items were coded (4 for very happy, 3 for happy, 2 for unhappy and 1 for very unhappy) and the average response across the 2007 items calculated for each individual in the sample.[8, 9] This score was then compared with the average response for the entire Y03 cohort in 2007 (the mean for the entire cohort was 3.42) and those members of the low-performing sample who scored at or above this level (equivalent to a response between 'happy' and 'very happy' across all items) were classified as happy for the purposes of the outcome variable.

The cross-classification of those members of the low-performing sample who remained in the study in 2007 as 'fully engaged' and 'happy' is presented in table 4.

[8] Previous research with the LSAY data that has used these variables has reported that all of the items load together sufficiently in factor analyses (Hillman & McMillan 2005) as to be used in this way.

[9] The models use a cardinal scale for measuring happiness, since the underlying distribution of responses would not influence the outcomes if a binary (happy–unhappy) variable was used, and such models are easier to compare with previous literature.

Table 4 Low performers' level of engagement and happiness in 2007

Activity status in 2007 (age 19)	Respondents who were happy (score ≥ 3.42)		Respondents who were not so happy (score < 3.42)		Total respondents	
	n	%	n	%	n	%
Unengaged	42	26	121	74	163	100
Partially engaged	136	47	153	53	289	100
Fully engaged	602	51	582	49	1184	100
Total	**780**	**48**	**856**	**52**	**1636**	**100**

Previous research with older LSAY cohorts has found an association between levels of engagement in activities and life satisfaction, with higher levels of satisfaction reported by those young people who are fully engaged with education, training or employment or some combination of these activities compared with young people who are only partially engaged or not engaged in such activities (see Hillman & McMillan 2005). Among the young people in this analysis, there was an association between full engagement and being happy, with higher proportions of those who were fully engaged also meeting the criteria for being happy, particularly by comparison with those who were not engaged in any education, training or employment activities when interviewed in 2007.

Multilevel modelling

Multilevel logistic regression models were constructed to examine what factors differentiated between the 602 sample members who had a successful outcome (as defined in the previous section, table 4) and those sample members with not so positive outcomes. The sample included 1596 young people who had originally been studying at 294 schools when they participated in the PISA assessments and were first recruited into LSAY.

The following student (level 1) characteristics were tested in the modelling.[10] The source of the item is indicated. For all categorical or dichotomous variables the first category is considered the reference group.

Young people's background variables

- gender (PISA: female, male)
- Indigenous (PISA: no, yes)
- have Year 12 certificate (LSAY: no, yes)
- Socioeconomic background (PISA).[11] This analysis used the index of economic, social and cultural status (ESCS), which was created in PISA to capture the wider aspects of a student's family and home background. This was divided into quartiles based on data for the whole cohort and then two dummy variables were created: medium SES (which combined the middle two quartiles) and high SES, meaning low SES was the reference group used.

[10] It is acknowledged that not all of the young people could accurately be described as 'students' in 2007; however, because the bulk of the variables included at this level of the model were indeed collected while the young people were students, this is the term that will be used to describe level 1 influences.

[11] The ESCS is based on the highest level of the father's and mother's occupations; the highest level of education of the father and mother converted into years of schooling; the number of books in the home; and access to home educational and cultural resources.

Student motivation variables

Two indices were developed in PISA to assess students' motivation to learn mathematics: the *interest in mathematics* index, which focuses on students' own, or internal, motivations to learn, and the *instrumental motivation in mathematics* index, which focuses on the external rewards that encourage students to learn. These indices were scaled using a weighted maximum likelihood estimate (OECD 2004). Values on the index were standardised so that the mean value for the OECD student population was zero and the standard deviation was one. Thus negative responses on these indices indicate a response that was more negative than the OECD average.

- Interest in mathematics (PISA). In this set of items students were asked to think about their views on mathematics and indicate their agreement on the following statements:
  - I enjoy reading about mathematics.
  - I look forward to my mathematics lessons.
  - I do mathematics because I enjoy it.
  - I am interested in the things I learn in mathematics.
- Instrumental motivation (PISA). Students' levels of instrumental motivation were measured by seeking their responses to statements about the importance of mathematics for their future study and career prospects. Students were asked their level of agreement for each of the following questions:
  - Making an effort in mathematics is worth it because it will help me in the work that I want to do later on.
  - Learning mathematics is important because it will help me with the subjects that I want to study further on in school.
  - Mathematics is an important subject for me because I need it for what I want to study later on.
  - I will learn many things in mathematics that will help me get a job.

Two other variables used in the analyses were part of the LSAY questionnaire and broadly examined students' perceptions of the *quality of school life*. The items were Likert-scaled and the score for the construct was formed as the average of the items that comprised the scale. The scales were:

- Positive affect: Your school is a place where:
  - you feel happy
  - you like learning
  - you get enjoyment from being there
  - you really like to go each day
  - you find that learning is a lot of fun
  - you feel safe and secure.
- Opportunity: Your school is a place where:
  - the things you learn are important to you
  - the work you do is good preparation for your future
  - you have gained skills that will be of use to you
  - the things you learn will help you in your adult life
  - you are given the chance to do work that really interest you
  - the things you are taught are worthwhile.

Perceived classroom climate variables

Two variables from the LSAY questionnaire were used to examine the effect of students' perceptions about the level of orderliness in the classroom and the quality of teaching and of teacher–student relationships.

- Student behaviour (LSAY). This variable was the average response to four items: Your school is a place where students:
  - are eager to learn
  - work hard

- make good progress
- are well behaved.

✧ Teacher–student relationship (LSAY). This variable was the average response to six items: Your school is a place where teachers:
- know their subject matter well
- explain things clearly
- are well prepared and organised
- have the ability to communicate with students
- maintain student interest
- manage student discipline well.

Aspiration variable

In their initial LSAY survey, young people were asked about their plans for the future (post-school plans [LSAY]). Four dummy variables were developed, including the reference group who planned attending university. The other groups were:

✧ plan to do apprenticeship or traineeship

✧ plan to go on to TAFE

✧ plan to get a job

✧ don't know.

School-level variables

At the school level, four variables were used in the modelling. These variables together provide a contextual background for students in terms of school climate: where their school is located, the type of neighbourhood, and two measures of classroom climate—the general feelings about student behaviour and teacher–student relations at the school (among 15-year-olds).

✧ school location (PISA: metropolitan, non-metropolitan)

✧ school-average socioeconomic background; this variable was aggregated from the student-level socioeconomic background for the cohort

✧ school-level student behaviour; this variable was aggregated from the student-level responses to these items for the sub-sample

✧ school-level teacher–student relationships; this variable was aggregated from the student-level responses to these items for the sub-sample.

Results

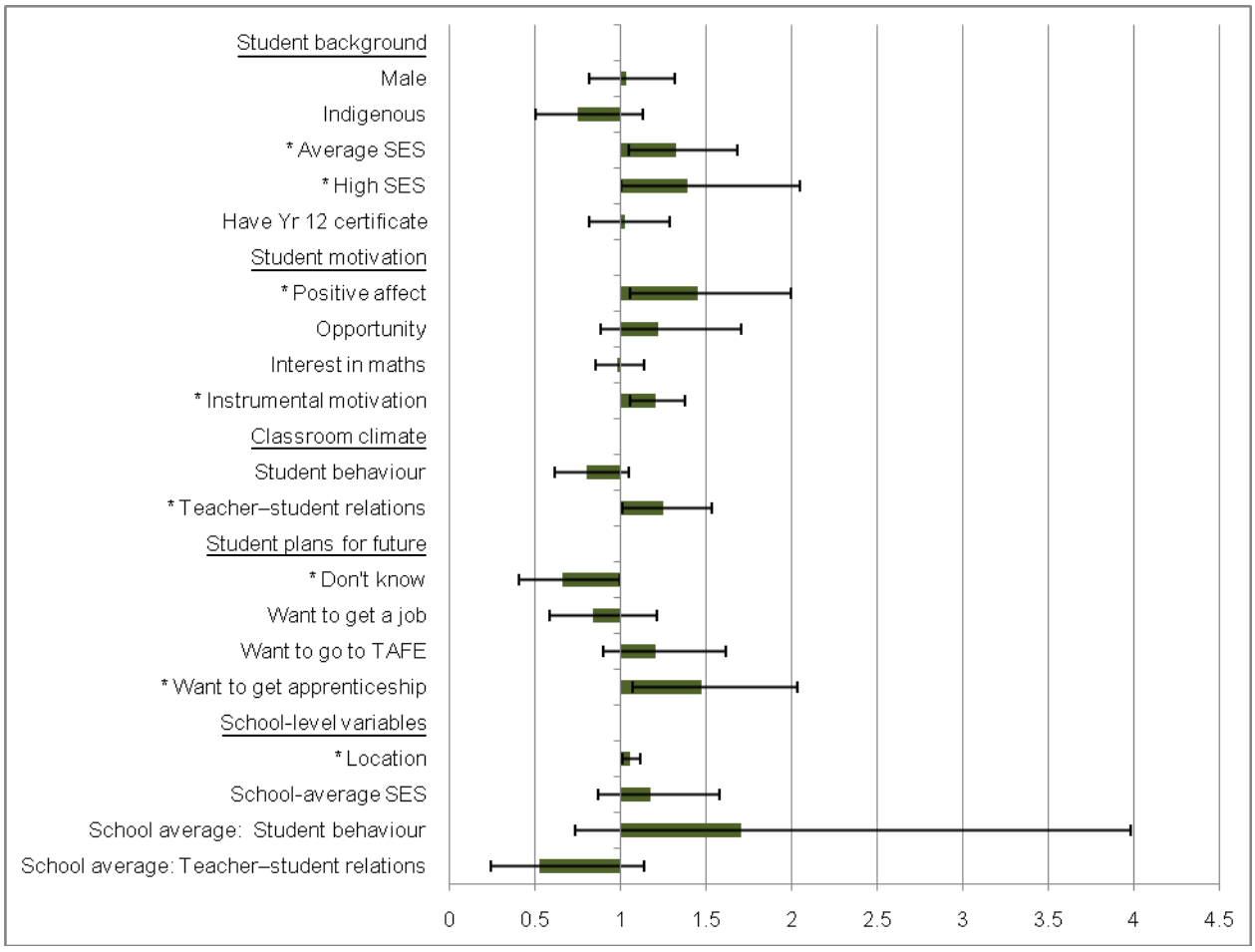
Figure 2 shows the results for the whole group graphically.[12] In this figure, the solid bars represent the odds ratio of the event and the lines represent the confidence interval around this odds ratio. Statistically significant odds ratios are indicated with an asterisk. In this section we will refer to both the calculated odds ratios and the associated predicted probabilities. For the reference group, an odds ratio of 1 and the associated predicted probability[13] of 0.5 means that success is as likely as failure; thus, odds ratios significantly higher or lower than 1, with associated predicted probabilities higher or lower than 0.5, mean that success or failure is more or less likely.

Of the background variables, only socioeconomic background was found to have a statistically significant association with success. Low-performing young people from medium and high socioeconomic backgrounds were more likely to be successful than young people from a low socioeconomic background. For those from an average socioeconomic background, the odds ratio was 1.3. The associated predicted probability of young people from average socioeconomic backgrounds being successful was 0.57. Similarly for higher socioeconomic background the predicted probability was 0.58. Gender and Indigenous status were not found to be significant correlates of the likelihood of success among low-performing youth, and neither was the attainment of a Year 12 certificate.

[12] The data behind these graphs are provided in appendix 1.

[13] The predicted probability is calculated as probability = odds /(1+odds).

Figure 2 Odds ratios for multilevel model of low performers' successful outcomes



Note: * $p < 0.05$

The next set of variables entered into the regression concerned motivation. Of these, two were found to be significant: positive affect, the extent to which students reported enjoying being at school and learning, and instrumental motivation, or how important students thought mathematics would be for their future. The predicted probability of a successful outcome for young people in the low-performing sample with a higher score on positive affect was 0.59 and for those with a higher score on instrumental motivation, 0.54.

Of the perceived classroom climate variables at the student level, only perceived teacher–student relationships were found to be significant, with those young people perceiving a more positive classroom climate more likely to be successful in later years.

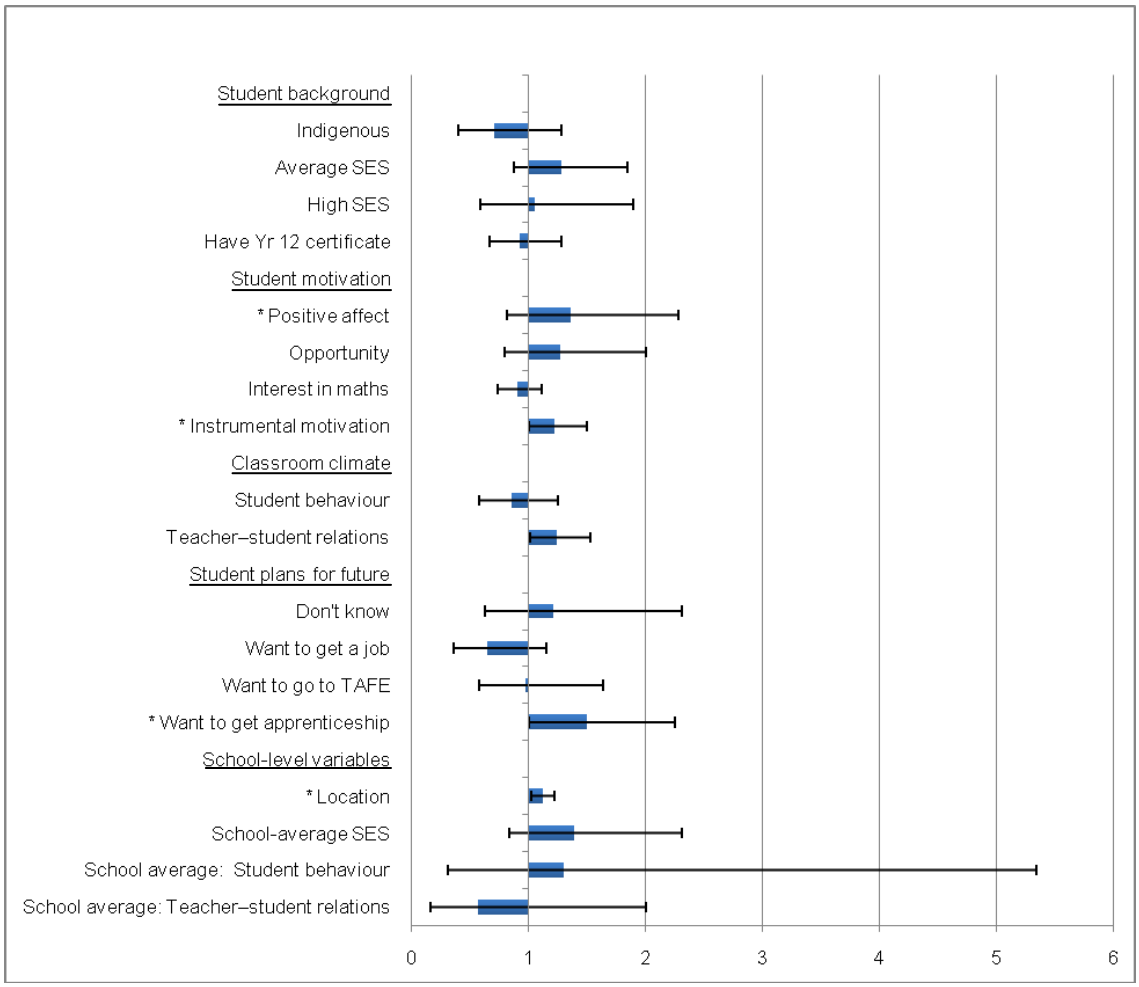
In terms of aspirations or plans for the future, the expressed aim of obtaining an apprenticeship was associated strongly and positively with later success, while not having any definite aim was found to be significantly negatively related to success, with the probability of success for those young people answering 'I don't know' to this question around 0.4.

Finally, of the school-level variables investigated, the only one that was found to have a significant influence was location. Young people who had attended schools in a non-metropolitan location were found to be significantly more likely to be successful than those who had attended schools from a metropolitan location, other things equal. While student–teacher relationships was a significant influence on outcomes at the student level, it was not significant at the school level. This underlines the importance of these relationships to the individual young person. The next step in

the analysis was to examine the same model separately for males and females. Figure 3 shows the results of the analysis for males and figure 4 for females.

What we can learn from these separate analyses is that different factors influence the probability of young male and female low performers succeeding. For males, the most important influence is the aim to get an apprenticeship, with a predicted probability of success for students expressing such an ambition of 0.6. By comparison, for females there were no significant effects of expressing an ambition; the only significant effect found was a strong negative influence for not expressing any aim whatsoever. Female low performers who were unable to indicate what their plans were post-secondary school had a predicted probability of only 0.2 of success.

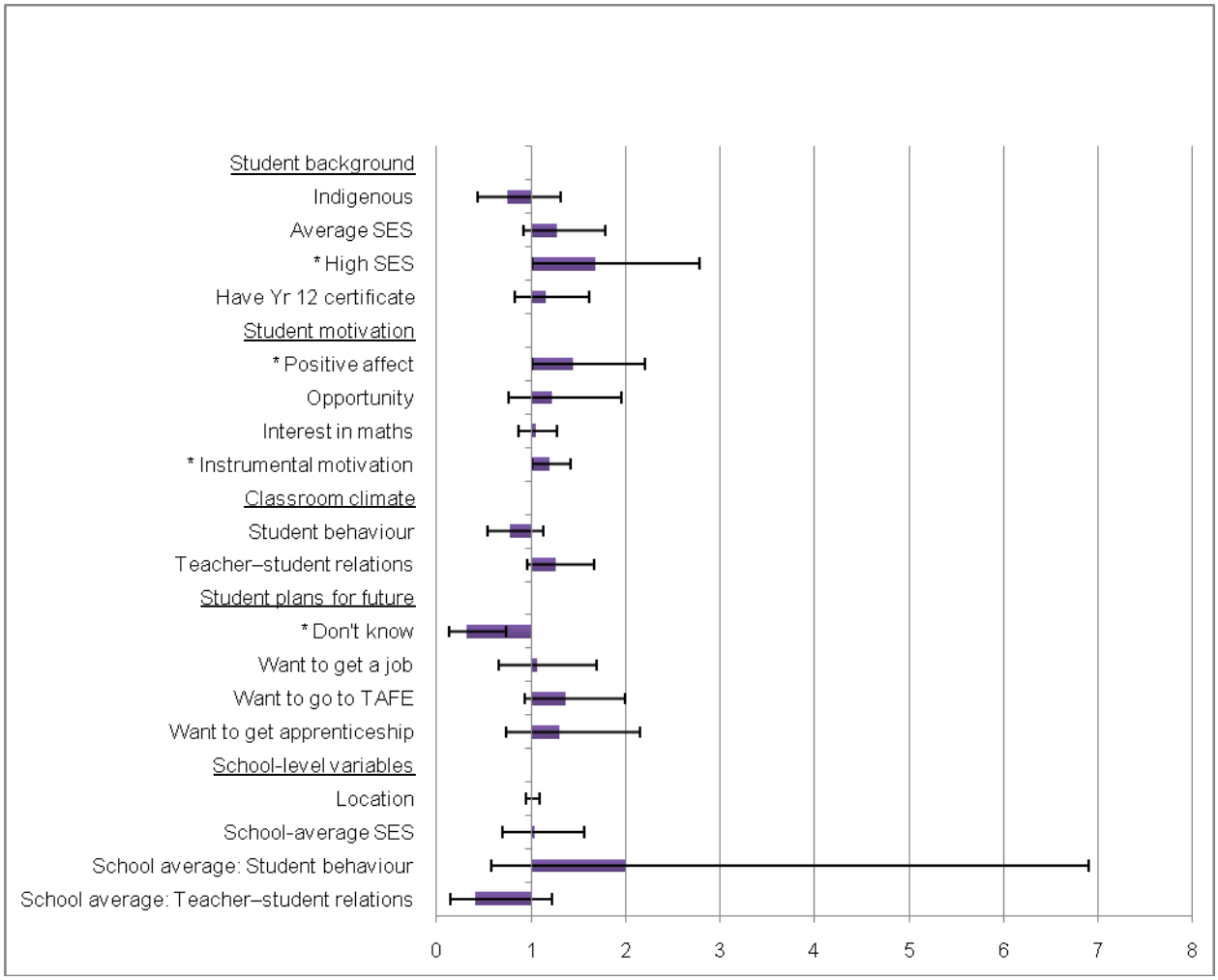
Figure 3 Odds ratios for multilevel model of male low performers' successful outcomes



Note: * $p < 0.05$

For male low performers, location had a significant effect on success, with young men who had been schooled in a non-metropolitan area having a probability of 0.53 of success compared with those educated in metropolitan areas, other things equal.

Figure 4 Odds ratios for multilevel model of female low performers' successful outcomes



Note: * $p < 0.05$

Instrumental motivation was found to have a significant positive effect on success for both males and females. The probability of success for both young men and women who had a more practical view about learning mathematics when at school was around 0.55. For females, positive affect also exerted a strong positive effect on success. The probability of success was 0.59 for females who had a high score on positive affect.

The final variable that had strong positive effect on achievement for female low performers only was high socioeconomic background. Female low performers with such backgrounds were much more likely to be successful than those from lower socioeconomic backgrounds; the predicted probability of success for high socioeconomic background females was 0.63.

Discussion

In following the pathways of this sample of young Australians who had performed at relatively low levels on the PISA mathematics assessment (below proficiency level 3), this study aimed to examine whether this low performance resulted in poor short-term outcomes for these young people and to identify the factors that differentiated those who went on to succeed and those whose outcomes were not as positive in the years following secondary schooling.

Despite their low performance, the majority of the young people actually remained at secondary school until late 2005 (when the majority would have been in Year 12) and, when interviewed in 2006 (or subsequent years), indicated that they had completed Year 12 and had been awarded the appropriate qualification for their state—a positive initial outcome for many young people. After leaving school, over one-third of the young people moved into employment—part-time or full-time—while under another third went on to tertiary education at a university, TAFE or some other facility.

As has been found in other research using the LSAY data from previous cohorts, what happens in the immediate post-school years can have important consequences for young people. An overwhelming proportion of those who find a job or commence further study continues in those activities. For those who find it hard to secure a place in work or study, the future is less certain, although, even among these, most establish a foothold after a further year. This finding emphasises the importance of this period in the lives of young people, particularly those who have a history of low performance, and reinforces the need for support and information for all young people about the pathways and opportunities available to them upon leaving school.

Overall, in 2007 this group of young people, many of whom may have been expected to be experiencing difficulties, given their low performance, were doing relatively well. Around 40% of those who were contacted in 2007 were in some form of further study or training; just over 30% were in full-time employment and another 17% were working part-time. When these activities in 2007 were reclassified in terms of full engagement, partial engagement or non-engagement, the outcomes were again fairly positive, with around seven in ten fully engaged in education or training, employment or a combination of these.

In terms of factors that differentiate between low performers who have successful outcomes and those who do not, it is clear that low-performing young people from a low socioeconomic background have a lower likelihood of success than those from more affluent homes. There are many reasons for this beyond having more access to financial and educational resources, such as more highly educated parents, who have more experience of educational systems and are therefore able to provide their child with a wider range of alternative pathways to success.

Indigenous status, all other things equal, was not found to have a significant effect on success or failure. However, the number of Indigenous students included in the sample is small, and so the lack of effect should be treated with some caution. In association with the findings about socioeconomic status as described in the previous paragraph, however, it may be interpreted in light of the current debate in Australia over whether it is not Indigenous status as such that is related to poorer outcomes, but the strong interrelationship between Indigenous status and disadvantage.

The significant influence of motivation on young people's later outcomes is an important message for parents, teachers and policy-makers. Finding that young people who, as students, recognise the value of mathematics for their future success are more likely to achieve this success, and that includes being happy with many aspects of their personal lives as well as their futures and careers, suggests that a focus on the practical applications of mathematics in everyday life may go some way to improving the outlook for students who are not quantitatively inclined and who do not perform well in the mathematics literacy.

Similarly, the school experience impacts on the lives of young people and appears to continue to influence them once they have left. Ensuring that this is a positive time is therefore important. Young women, in particular, were more likely to be fully engaged in education, employment or a combination of these and to be happy with their situation, if they had enjoyed being at school, enjoyed learning and had felt safe and secure. While it is not possible to eliminate all the stress or negative experiences associated with secondary school, findings such as this remind us of the important aim of education—that of fostering the social and emotional development of young people as well as their academic development. School can be a positive experience for all students, regardless of their achievement level, if the appropriate balance is found between the encouragement of the pursuit of personal goals and development, and comparison and ranking.

At the same time, young people should be encouraged to think carefully about their future and to make strategic plans. Those young people, particularly females, who were not performing well in mathematics and who had not thought about what they might do after leaving school were much less likely to be fully engaged and happy with their lives four years down the track. The importance of careers advice for young people has been emphasised in other LSAY reports using data from the full cohort from PISA 2003 (Rothman & Hillman 2008), and the importance of choosing school subjects, mindful of where such choices may lead or not lead, is highlighted in another LSAY report examining the consequences of Year 12 subject choice (Thomson 2005). The role of apprenticeships as a pathway for young males (predominantly) is important, but we should not forget that applied mathematics will be a part of most of these vocations and that their mathematics education needs to continue outside the classroom if they choose this pathway. A builder, plumber or mechanic who cannot calculate materials needed, distances covered or add up charges correctly will not succeed in his chosen profession any more than a banker or dentist would.

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Appendix

Table A1 Original sample of low performers (2003) compared with those lost from and retained in sample (2007), categorical variables

		Original sample		Lost from sample		Retained in sample to 2007	
		unweighted n	%	unweighted n	%	unweighted n	%
Sex	Male	1558	48	797	50	761	47
	Female	1680	52	805	50	875	53
Indigenous status	Non-Indigenous	2863	88	1359	85	1504	92
	Indigenous	375	12	243	15	132	8
School sector	Government	2459	76	1267	79	1192	73
	Catholic	514	16	223	14	291	18
	Independent	265	8	112	7	153	9
Location	Metro	2169	67	1039	65	1130	69
	Non-metro	1069	33	563	35	506	31
Post-school plans	University	1074	33	441	28	633	39
	Apprenticeship/ traineeship	764	24	433	27	331	20
	TAFE or other study	650	20	313	20	337	21
	Work	402	12	211	13	191	12
	Other (inc. DF or travel)	61	2	26	2	35	2
	Don't know	286	9	177	11	109	7
Math proficiency level	Below PL 1	350	11	194	12	156	10
	PL 1	972	30	542	34	430	26
	PL 2	1916	59	866	54	1050	64
Reading proficiency level	Below PL 1	272	8	165	10	107	7
	PL 1	664	21	373	23	291	18
	PL 2	1235	38	613	38	622	38
	PL 3	903	28	394	25	509	31
	PL 4	158	5	55	3	103	6
	PL 5 or above	6	0	2	0	4	0

Table A2 Original sample of low performers (2003) compared with those lost from and retained in sample (2007), categorical variables

	Status 2007	Mean	Std. error mean	*t* statistic[a] (sig)	Mean difference	se of mean difference
Economic social cultural status	lost	-.213	.020	-5.577**	-0.155	0.028
	retain	-.058	.020			
Opportunity	lost	3.14	.01	-2.123*	-0.031	0.015
	retain	3.18	.01			
Positive affect	lost	2.89	.01	-4.597**	-0.072	0.016
	retain	2.96	.01			
Student behaviour	lost	2.64	.01	-1.078	-0.017	0.016
	retain	2.66	.01			
Student–teacher relations at school	lost	3.92	.02	-4.174**	-0.096	0.023
	retain	4.02	.02			
Interest in mathematics (WLE)	lost	-.195	.023	-0.486	-0.016	0.033
	retain	-.179	.023			
Instrumental motivation in mathematics (WLE)	lost	.036	.023	-1.012	-0.033	0.033
	retain	.069	.023			

Notes: a Equal variances not assumed.
* p<0.05
** p<0.001

Table A3 Multilevel odds-ratio coefficients and confidence intervals—all students

	Odds ratio	Confidence interval	
Student background			
Male	1.0	0.81	1.32
Indigenous	0.8	0.50	1.12
* Average SES	1.3	1.04	1.68
* High SES	1.4	1.00	2.05
Have Yr 12 certificate	1.0	0.81	1.29
Student motivation			
* Positive affect	1.4	1.05	2.00
Opportunity	1.2	0.88	1.70
Interest in maths	1.0	0.85	1.14
* Instrumental motivation	1.2	1.05	1.37
Classroom climate			
Student behaviour	0.8	0.61	1.04
* Teacher–student relations	1.2	1.01	1.53
Student plans for future			
* Don't know	0.7	0.41	0.99
Want to get a job	0.8	0.58	1.21
Want to go to TAFE	1.2	0.90	1.61
* Want to get apprenticeship	1.5	1.07	2.03
School-level variables			
* Location	1.1	1.01	1.11
School-average SES	1.2	0.86	1.57
School average—Student behaviour	1.7	0.73	3.98
School average teacher–student relations	0.5	0.24	1.13

Note: * p < 0.05

Table A4 Multilevel odds-ratio coefficients and confidence intervals—male students

	Odds ratio	Confidence interval	
Student background			
Indigenous	0.7	0.40	1.28
Average SES	1.3	0.88	1.85
High SES	1.1	0.59	1.90
Have Yr 12 certificate	0.9	0.67	1.28
Student motivation			
Positive affect	1.4	0.82	2.28
Opportunity	1.3	0.80	2.01
Interest in maths	0.9	0.74	1.11
* Instrumental motivation	1.2	1.01	1.50
Classroom climate			
Student behaviour	0.9	0.58	1.26
Teacher–student relations	1.2	1.01	1.53
Student plans for future			
Don't know	1.2	0.63	2.32
Want to get a job	0.7	0.37	1.16
Want to go to TAFE	1.0	0.59	1.64
* Want to get apprenticeship	1.5	1.01	2.25
School-level variables			
* Location	1.1	1.03	1.22
School-average SES	1.4	0.84	2.31
School average—student behaviour	1.3	0.32	5.34
School average teacher–student relations	0.6	0.16	2.01

Note: * $p < 0.05$

Table A5 Multilevel odds-ratio coefficients and confidence intervals—female students

	Odds ratio	Confidence interval	
Student background			
Indigenous	0.8	0.43	1.31
Average SES	1.3	0.92	1.79
* High SES	1.7	1.01	2.78
Have Yr 12 certificate	1.2	0.83	1.62
Student motivation			
* Positive affect	1.4	1.01	2.21
Opportunity	1.2	0.77	1.95
Interest in maths	1.1	0.87	1.27
* Instrumental motivation	1.2	1.01	1.42
Classroom climate			
Student behaviour	0.8	0.54	1.13
Teacher-student relations	1.3	0.96	1.67
Student plans for future			
* Don't know	0.3	0.14	0.74
Want to get a job	1.1	0.66	1.70
Want to go to TAFE	1.4	0.93	1.99
Want to get apprenticeship	1.3	0.73	2.15
School-level variables			
Location	1.0	0.94	1.10
School-average SES	1.0	0.70	1.57
School average—student behaviour	2.0	0.58	6.90
School average teacher–student relations	0.4	0.14	1.22

Note: * $p < 0.05$

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